



Securing Permanent Forests to Combat Climate Change and Enhance Sustainable National and Local Economies in Cameroon

ANNEX 2A

FEASIBILITY STUDY REPORT

VERSION DATE: 27/05/2026

ABBREVIATIONS AND ACRONYMS

AE	Accredited Entity
AEZ	Agroecological Zones
AFOLU	Agriculture, Forestry, And Other Land Use
AFR100	African Forest Landscape Restoration
ANAFOR	National Agency For Support To Forestry Development
AU	African Union
BNP	Benue National Park
CAFI	Central African Forest Initiative
CIFOR	Center For International Forestry Research
COMIFAC	Commission des Forêts d'Afrique Centrale
CRESA FOREST-WOOD	Regional Centre for Special Education In Agriculture
CSO	Civil Society Organizations
DD	Deforestation and Forest Degradation
EDP	Micro-Enterprise Development Plan
ENEF	National School of Forestry
ESIA	Environmental And Social Impact Assessment
ESMP	Environmental And Social Management Plans
EU	European Union
FAA	Funded Activity Agreement
FAO	Food And Agriculture Organization
FASA	Faculty Of Agronomy And Agricultural Sciences
FLR	Forest And Landscape Restoration
FMU	Forest Management Units
FNPV	Financial Net Present Value
GCF	Green Climate Fund
GDP	Gross Domestic Products
GHG	Greenhouse Gas
GIZ	German Development Agency
GOC	Government of Cameroon
ICRAF	World Agroforestry Centre
IDP	Internally Displaced People
IFAD	International Fund for Agricultural Development
IP	Indigenous People
IRAD	Agricultural Research Institute For Development
IUCN	International Union for Conservation Of Nature
KFW	German Development Bank
LCBC	Lake Chad Basin Commission
LDN	Land Degradation Neutrality
LNP	Lobéké National Park
LOAS	Letters of Agreement
MAD	Market Analysis and Development
MINADER	Ministère De l'Agriculture Et Du Développement Rural
MINATD	Ministry of Mines and Technological Development
MINEE	Ministry of Water Resources and Energy
MINEPDED	Ministry of Environment, Nature Protection And Sustainable Development
MINEPIA	Ministry of Livestock, Fisheries and Animal Industries

MINFOF	Ministry of Forestry And Wildlife
MINTOUL	Ministry of Tourism And Leisure
MSE	Micro-Sized Enterprises
MTR	Mid Term Report
NAP	National Adaptation Plan
NCCAP	National Climate Change Adaptation Plan
NDA	Nationally Designated Authority
NDC	Nationally Determined Contribution
NFMS	National Forest Monitoring System
NGO	Non-Governmental Organisation
NPFE	Non-Permanent Forest Estate
NPV	Net Present Value
ONACC	Observatoire National Sur Les Changements Climatiques
PA	Permanent Areas
PADFA	Projet d'Appui Au Développement Des Filières Agricoles
PFA	Permanent Forest Area
PFE	Permanent Forest Estate
PIR	Project Implementation Report
PMU	Project Management Unit
RCP	Representative Concentration Pathway
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RIL	Reduce Impact Logging
ROAM	Restoration Opportunities Assessment Methodology
ROC	Republic of Cameroon
SC	Steering Committee
SFM	Sustainable Forest Management
SIS	Safeguard Information System
SMES	Small And Medium-Sized Enterprises
SND 30	National Development Strategy
TE	Terminal Evaluation
UNCCD	United Nations Convention To Combat Desertification
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNWTO	World Tourism Organization
VNC	Village Nurseries Center
WNP	Waza National Park
WPAB	Work Plan And Annual Budget
ZIC	Zones of Hunting Interest
ZIGGC	Community-Managed Hunting Zones

TABLE OF CONTENTS

ABBREVIATIONS AND ACRONYMS	2
INTRODUCTION	6
1.1. CONTEXT	6
1.2. OBJECTIVES AND STRUCTURE OF THE REPORT	7
1.3. METHODOLOGY.....	7
2. COUNTRY PROFILE	7
2.1. GEOGRAPHIC AND CLIMATE CHARACTERISTICS	7
2.2. SOCIO-ECONOMIC CHARACTERISTICS	8
2.3. GOVERNANCE AND NATIONAL CLIMATE ACTION GOALS.....	8
3. PROJECT INSTITUTIONAL AND POLICY CONTEXT.....	9
3.1. INSTITUTIONAL FRAMEWORK OF THE FORESTRY SECTOR	10
3.2. REGULATORY FRAMEWORK OF THE FORESTRY SECTOR	11
3.3. POLICY AND STRATEGIC CONTEXT OF THE PROJECT	11
4. PROJECT AREA PROFILE	19
4.1. LOCATION OF PROJECT SITES	19
4.2. FINANCING IN THE PROJECT AREAS	25
5. CLIMATE RATIONALE – ADAPTATION.....	30
5.1. PAST AND FUTURE CLIMATE VARIABILITY	30
5.2. CLIMATE CHANGE VULNERABILITY AND IMPACTS ON FOREST AND COMMUNITIES.....	35
5.3. WITHOUT-PROJECT SCENARIO	45
5.4. ADAPTATION OPTIONS/ACTIONS AND BENEFITS.....	47
5.5. CONSTRAINTS OR BARRIERS TO THE UPTAKE OF ADAPTATION ACTIONS	49
6. CLIMATE RATIONALE – MITIGATION.....	51
6.1. FOREST COVER AND LAND USE CHANGE	51
6.2. DIRECT AND INDIRECT DRIVERS OF DD	69
6.3. ACTIONS TO REDUCE DEFORESTATION IN AND AROUND PFAs	86
6.4. FOREST LANDSCAPE RESTORATION POTENTIALS	87
6.5. ACTIONS TO ENHANCE FOREST LANDSCAPE RESTORATION IN AND AROUND PFAs.....	90
6.6. BARRIERS TO THE UPTAKE OF RESTORATION ACTIVITIES	94
6.7. BARRIERS TO THE UPTAKE OF ACTIONS TO REDUCE DD	96
6.8. EMISSION REDUCTION/SEQUESTRATION POTENTIAL.....	96
7. MARKET AND VALUE CHAIN DEVELOPMENT.....	100
7.1. CONTEXT.....	100

7.2.	OPTIONS TO ENHANCE VALUE CHAIN AND MARKET DEVELOPMENT	121
7.3.	OPERATIONAL STRATEGY FOR ENHANCING VALUE CHAINS ACROSS THE AGRO- ECOLOGICAL ZONES.....	124
8.	<i>PROJECT JUSTIFICATION</i>	126
8.1.	EVALUATION OF THE INTERVENTIONS ACCORDING TO THE INVESTMENT CRITERIA OF THE GREEN CLIMATE FUND.....	127
8.2.	RATIONALE FOR FUNDING REQUEST	134
8.3.	EXIT STRATEGY AND SUSTAINABILITY	135
	<i>CONCLUSION</i>	137

INTRODUCTION

1.1. CONTEXT

The sustainable management of forests is an important pathway to achieve the objectives of three key international conventions - the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biodiversity (CBD), and the United Nations Convention to Combat Desertification (UNCCD) (Faggin & Behagel, 2017). Article 5 of the UNFCCC Paris Agreement underscores the important role of forests in climate change mitigation through the avoided deforestation, avoided degradation, sustainable management of forests, and the enhancement and conservation of forest carbon stocks (REDD+) initiative. Substantial emissions result from unsustainable forestry activities (Faggin & Behagel, 2017). There is a need to pay attention to the dynamics and causes of unsustainable forestry activities, particularly in tropical countries interested in reducing emissions from forestry.

Cameroon has identified the forestry and land use-related sectors as an important option for making contributions to its global climate change mitigation and adaptation commitments (RoC, 2021). Forest management in Cameroon is underpinned by the 1994 Forest Code, which is being implemented through several legislative and regulatory acts intended to drive sustainable forest use. Over the years, Sustainable Forest Management (SFM) has made progress with the increase in the number and size of forest types managed under SFM principles and guidelines. These different forest types are expected to be managed through the design and implementation of forest management plans to ensure that the ecological, economic, and social dimensions of SFM are achieved (Cerutti et al., 2017). However, the SFM efforts of these forest types are suffering from a mix of challenges related to governance, economic, technical, and financial issues (Ewane et al., 2015; Cerutti et al., 2017, Chia et al 2019).

The Government of Cameroon has taken a series of fundamental steps to conserve and protect forest ecosystems in the country. For example, about 12.6 million ha of permanent forests, which is about 26.5% of national territory, have been classified. About 19.5 million tons of carbon are released each year from permanent forests due to deforestation and forest degradation (MINEPDED, 2017).

The Green Climate Fund (GCF) expressed its willingness to assist the Government of Cameroon in the preparation of a GCF project for submission to the GCF Council. The initial project idea is titled: Securing permanent forests to combat climate change and strengthen sustainable national and local economies in Cameroon. It aims to encourage investments in PFAs, at the community level and in buffer zones outside of permanent forest areas. This will not only generate economic and socio-cultural benefits, but also provide incentives for the private sector, communities, and government to protect permanent forests. The project is expected to contribute to climate change mitigation by sequestering 9.14 million tCO₂e (MINEPDED, 2018) and improve the resilience of 769 980 people living around permanent forest areas. The initial project idea is designed around four components: i) sustainable forest management and restoration, ii) stakeholder capacity building, market development, supply chain transformation and project management, iii) monitoring, and iv) partnership. Throughout the development and implementation of the project, MINFOF expects the project to contribute to the country's efforts to fight against climate change. The project development process includes a feasibility study that will help refine the project idea and guide the development of the full proposal and related operational documents.

1.2. OBJECTIVES AND STRUCTURE OF THE REPORT

The objective of this study is to assess and provide the necessary and sufficient background information and data on the proposed project to provide the GCF with sufficient information and data for decide if the proposed project is justified and viable for funding and implementation.

The study presents the geographical context, environmental, social and economic situation, and the legal, institutional, and policy framework of the forestry sector in Cameroon. It identifies the problems to be addressed, and proposes project interventions and outputs structured in components, including the implementation arrangements.

Additionally, the study provides necessary information for identifying the contribution of the project to the GCF Integrated Results Management Framework and assessing the expected performance in relation to the associated investment criteria and the GCF's rationale for the financing of the proposed project. A financial and economic analysis is also presented together with the monitoring and evaluation mechanism.

1.3. METHODOLOGY

This feasibility study report draws on information generated by several sub-analytical reports developed based on primary and secondary data. Primary data was collected through individual and group consultations at the national and landscape levels. Secondary information was generated through the review of policy and regulatory, strategy documents, including development reports and scientific literature. The methods section of each of the sub-reports explain the data collection processes.

2. COUNTRY PROFILE

2.1. GEOGRAPHIC AND CLIMATE CHARACTERISTICS

Cameroon is located on the Atlantic coast along the Gulf of Guinea and forms part of the Congo Basin Forest block with a unique diversified ecosystem often described as “Africa in miniature”. The territory covers an area of 475,650 km², stretching 1,500 km from south to north (2-13°N) and 800 km from west to east (9-16°E). In the heart of the Congo Basin, the country is about 46% covered by forests (RoC, 2021). Cameroon can be partitioned into four geographic regions, namely the Northern, Central, Southern and the Western regions. The savannah plain spans from North of the Benue River to the Lake Chad with a northward decline in elevation. This region contains scattered inselbergs, which are mounds of erosion-resistant rocks that rise above the plains. The Gotel Mountains of the Adamawa Plateau span from south to north, ending in the Mandara Mountains in the northwest¹. Tropical rainforests extend in the coastal plain in the southern region, and the western region is a forested volcanic mountainous region with one of Africa's highest volcanic mountains –Mt. Cameroon (4,095m) (RoC, 2017).

Cameroon has a diverse climate with a wide latitudinal extension meaning that it has a monomodal rainfall deficit in the Sahelian agro-ecological zone (AEZ) (500 to 800 mm), a monomodal rainfall (1800 to 2800 mm) in the savannah and western plateau AEZ, a relatively abundant bimodal rainfall (1500 - 2000 mm) in the forest AEZs, and a significant monomodal rainfall (3000 - 8000 mm) in the coastal AEZ. The temperature varies throughout areas, ranging between 20°C and 35°C with a thermal amplitude ranging from 3°C to more than 12°C (RoC,

¹ <https://www.britannica.com/place/Cameroon>

2021). According to FAO (2021), the country is dominated by one main rainy season that lasts from May to November with the peak month corresponding to the lowest average temperature of the year. The southern plateaus demonstrate two short rainy seasons in May-June and October-November while the dry season lasts from December to April, corresponding to the highest average mean temperature. Varying with altitude, the mean average annual temperature ranges from 20-25°C while the Northern zone, with its semi-arid and dry nature, has a temperature range of 25-30°C with less than 100mm of rainfall a month while the wettest season has more than 400 mm of rainfall per month. Mean annual temperature has increased by 0.7°C since 1960 and rises rapidly in March-April at the rate of 0.19°C per decade throughout the national territory. The northern zone experienced the most sudden rise in the periods of December-February and September-November at rates of 0.2-0.4°C per decade. The Sudano-Sahelian regions are ecologically fragile and likely to be subjected to increasing incidence of drought, high temperatures, water shortages, and salinization of water and soil, due to climate change (HFTT, 2019).

2.2. SOCIO-ECONOMIC CHARACTERISTICS

Cameroon is a lower-middle-income country at the crossroad of West and Central Africa with a population of around 26 million people (ARI, 2020; World Bank, 2021). The population is growing rapidly at the rate of 2.6% in 2018 and a total fertility rate of 4.8 births per woman in 2018 (NIS and ICF, 2020). The country is endowed with natural resources: oil, gas, high-value timber species, minerals, and agricultural products (e.g. coffee, cotton, cocoa, maize, and cassava) (World Bank, 2021).

According to the World Bank's official data, the Gross Domestic Product (GDP) of the country was estimated at 39.8 billion US dollars in 2020, representing 0.04% of the world economy. Exports represented 20.2% of the GDP in 2019. Cocoa, coffee and cotton are major agricultural exports, although oil and gas are Cameroon's main exports (ARI, 2020). The country's diversified economy features oil and gas, timber, aluminium, agriculture, mining, and the service sector (World Bank, 2021). Agriculture employs about 60% of the population and remains the predominant sector of the national economy, both in contributions to the GDP at 23% (2015) and the effect it has on other sectors. Inflation has been low at around 1.5% per year between 2015-2019.

Cameroon is ranked 37th poorest country in the world out of 189 countries, according to the Human Development Index (UNDP, 2021). It has experienced a slow but steady economic growth in recent years as real Gross National Income (GNI) per capita grew at 1.4% per year between 2015-2019 (ARI, 2020). According to the National Development Strategy (RoC, 2020), Cameroon experienced a slight drop-in poverty rate from 39.9% in 2007 to 37.5% in 2014. The poverty rate fluctuates across the territory and dropped significantly in urban areas by 3.3% in 2014 and increased in rural areas by 1.1%. In addition, 90% of poor people live in rural areas and the poorest regions in descending order are the Far North, North, Northwest, and Adamawa regions (RoC, 2020).

2.3. GOVERNANCE AND NATIONAL CLIMATE ACTION GOALS

Cameroon is experiencing the impacts of climate change and is part of the global effort to fight against climate change. At the national level, the country has put forward policy, governance and institutional frameworks, actions, and commitments to respond to both national climate priorities and international commitments. Through Presidential Decree number 2004/320 on December 8, 2004, the country was organized into 29 ministries with the Prime Minister as the head of government. Among these ministries, the Ministry of Environment, Nature Protection and

Sustainable Development was given the responsibility for the formulation and implementation of the policy on the environment and nature protection, with an emphasis on sustainable development².

Considering the impact of climate change on the society, the environment and the economy, the government has engaged in various processes to combat climate change (see section 3.3). Based on these processes, the government has set an ambitious target in its Nationally Determined Contribution (NDC) to reduce 35% of greenhouse gas (GHG) emissions by 2030 with focus on the energy, waste and Agriculture, Forestry and Other Land Use (AFOLU) sectors (RoC, 2021). This is to be realized through policies, strategies and plans at both national and local scale, through which programs and projects will be developed and implemented to help achieved the countries efforts towards curbing climate change impacts.

They include among others:

- National Development Strategy (SND 30) which among other objectives aim to strengthen climate change adaptation and mitigate the effects of climate change, ensure environmental management that assures sustainable and inclusive economic growth, societal development, and improve governance to enhance policy performance toward achieving developmental goals;
- National Adaptation Plan (NAP) for Climate Change which proposes actions to enhance access to sustainable livelihoods, reduce population vulnerability and enhance the adaptive capacity to implement new opportunities for the country's development;
- The GCF country programme which was developed to better leverage the GCF funding mechanism in order to build a low carbon and climate-resilient economy;
- Reducing Emissions from Deforestation and Forest Degradation (REDD+) Strategy which contributes to climate stabilization through emissions from deforestation and forest degradation, conservation of forest carbon stocks, enhancement of forest carbon stocks, increasing forest carbon stocks and sustainable forest management, while improving the livelihoods of local communities and forest-dependent people and ensuring economic and social development, while ensuring fair, equitable and sustainable economic and social development;
- Land Degradation Neutrality (LDN) strategy which was created to enhance resilience to climate change impacts and act as a driving force for the implementation of the United Nations Convention to Combat Desertification (UNCCD);
- Forest and Landscape Restoration (FLR) Strategy which aims to enhance the landscape restoration in Cameroon restoring 12,062,768 hectares of degraded land by 2030;
- The Great Green Wall (GGW) Initiative strategy and action plan which aims to improve the livelihoods of local communities in the Sahelo-Saharan zone through the sound management of ecosystems between the 100 mm isohyets in the North and 400 mm in the South; and
- National Biodiversity Strategic Action Plan with the goal of addressing underlying causes of biodiversity degradation and loss, promoting sustainable utilization, improving the status of biodiversity and mainstreaming biodiversity in strategic plans.

3. PROJECT INSTITUTIONAL AND POLICY CONTEXT

This section presents the regulatory, institutional, policy and related frameworks relevant for the project design and implementation of the project from the international, national, and local levels.

² <https://minepded.gov.cm/en/the-ministry/organizational-chart/missions/>

It also highlights key areas of alignment between proposed project and existing policies, strategies, and initiatives (Annex 1).

3.1. INSTITUTIONAL FRAMEWORK OF THE FORESTRY SECTOR

The management of forest resources in Cameroon is led by the state accompanied by the private sector, civil society organizations (CSOs), local and Indigenous communities, and financial and technical partners. Decree No 2011/408 of 09 December 2011 related to the reorganization of the government stipulates that MINFOF is responsible for the development and implementation of policy on forest and wildlife through the management and protection of the national forest estates, inventory and protection of fauna and flora, development and monitoring of regeneration programs, reforestation, inventory and forest management, monitoring compliance in forest and wildlife exploitation and application of administrative penalties where appropriate, development and management of botanical and zoological gardens, implementation of international conventions, and other related engagements on forests and wildlife.

MINFOF is accompanied in its mission by other rural sector development ministries for agriculture, livestock, environment. MINFOF also works closely with key ministries involved in the design and implementation of government development policy regarding the economy, planning and regional development, finance, social and women's affairs. Overall the collaboration between MINFOF and these administrations is necessary for the coordination and exercising of shared responsibilities in the management of natural resources.

Additionally, specialised technical institutions such as the National Agency for Support to Forestry Development (ANAFOR), the National School of Forestry (ENEF) in Mbalmayo, the Wildlife School of Garoua, the Faculty of Agronomy and Agricultural Sciences of the University of Dschang (FASA) and the Regional Centre for Special Education in Agriculture (CRESA Forest-Wood) aid in the implementation of forest management alongside MINFOF.

The private sector is a major player in all production and enhancement activities of the forestry and wildlife sub-sector. Companies are growth engines for investments, added value, wealth, and jobs. The private sector contributes to forest and wildlife resource management activities at all levels, including education, forest and wildlife management, exploitation and processing of timber and non-timber forest products, as well as other services related to forest and wildlife in production areas and conservation zones. The private sector is organized in unions that defend the interests of its members. The best-known unions are the Timber Industry Group of Cameroon and Cameroon's Wood Inter-Profession Association.

Civil society organisations in the form of associations and non-governmental organisations (NGOs) operate at the local, sub-national and national levels, providing institutional support to the government including capacity building and support to local and indigenous communities in various forestry and wildlife related activities. They are structured into several networks engaged in different thematic areas - community forestry, management of forestry fees, REDD+ and Climate Change. Their discussions and dialogue forums add momentum to processes related to forest governance, revenue sharing, protected area management, national heritage and rights and interests of local forest communities.

Local communities and Indigenous peoples (Ips) have a stake in the management of forest resources following the participatory and decentralised approach to forest management in Cameroon. Concerning permanent forests, they are organized in forest committees that participate in SFM and local forest monitoring. They are also organized in associations or common initiative groups for the allocation and management of community forests. The village committees

participate in revenue sharing processes of councils and village communities for incomes generated through the exploitation of forest and wildlife resources.

Lastly, financial, and technical partners support the Government of Cameroon in the development and implementation of forest and wildlife policies. This is done through financial and technical assistance with field projects but also through support of field activities by public institutions, regional and local authorities, CSOs, NGOs and local and Indigenous communities. These partners include bilateral and multilateral development agencies and international NGOs. Bilateral cooperation is well developed and operational with countries such as Germany, France, United States of America, Japan etc., through their development agencies.

3.2. REGULATORY FRAMEWORK OF THE FORESTRY SECTOR

The Government of Cameroon put forward legislative and regulatory frameworks to improve forest management. The legislative and regulatory frameworks and their implementation instruments include:

- Adoption of the 1993 forest policy;
- Enactment of Law No 94/01 of 20 January 1994 pertaining to forestry, wildlife and fisheries and the different implementing regulations;
- Enactment of Law No 96/12 of 05 August 1996 providing a framework on environmental management; and
- Operationalization of the institutional and policy framework with technical implementing instruments such as:
 - i) Decree No 95/678/PM of 18 December 1995 establishing an indicative framework of land use in southern forest areas under the first national inventory carried out with the support of Canadian Cooperation between 1984 and 1987;
 - ii) Decree No 0222 of 25 May 2001 on procedures for drafting, approval, monitoring and control of implementation of management plans of PFA in production forests;
 - iii) Joint Order No 0076/MINATD/MINFI/MINFOR of 26 June 2012 formalizing detailed rules of application, user and monitoring revenue management from exploitation of forest and wildlife resources for municipalities and village communities;
 - iv) Decree No 2005/0577/PM of 23 February 2005 formalizing procedures for conducting environmental impact studies;
 - v) Decree No 2013/0171/PM of 14 February 2013 formalizing procedures for conducting environmental and social impact assessments;
 - vi) Order No 2513/MINEF/GGF/SDF/SRC of 28 June 1998 formalizing list of animals for classes A, B and C and distribution of harvesting rates as per category of sports hunting license; and the
 - vii) Agreement (signed on October 6, 2010) with the European Union on the Voluntary Partnership Agreement under the Forest Law Enforcement, Governance and Trade Exchanges program (VPA/FLEGT).

3.3. POLICY AND STRATEGIC CONTEXT OF THE PROJECT

The project is linked to several policies, strategies, initiatives, and programs at the international, regional, sub regional and national levels on climate change, forests and development.

3.3.1. INTERNATIONAL LEVEL

- i) **The Paris Agreement:** Cameroon is a signatory to the 2015 Paris Agreement. Article 5 of the Paris Agreement is dedicated to REDD+. Parties under Article 5 of the Paris Agreement are encouraged to act, implement, and support, through results-based payments, the existing framework as set out in related guidance and decisions already agreed under the Convention. These agreed guidance and decisions include policy approaches and positive incentives for activities relating to reducing emissions from deforestation and forest degradation and improving the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries. Other guidance includes alternative policy approaches, such as joint mitigation and adaptation approaches for the integral and sustainable management of forests, while reaffirming the importance of incentivizing non-carbon benefits associated with such approaches (UNFCCC, 2015).
- ii) **New York Declaration on Forests:** A non-legally binding political declaration that emerged from a dialogue among governments, companies, and civil society, spurred by the UN Secretary General's Climate Summit in 2014. World leaders endorsed a global timeline to cut natural forest loss in half by 2020 and strive to end it by 2030. It also called for restoring forests and croplands of an area larger than India. Meeting these goals, the participants at this summit agreed, would cut between 4.5 and 8.8 billion tons of carbon pollution every year – about as much as the current emissions of the United States (UN Climate Summit, 2014).
- iii) **Bonn Challenge:** A global goal to bring 150 million hectares of degraded and deforested landscapes into restoration by 2020 and 350 million hectares by 2030. Launched by the Government of Germany and IUCN in 2011, the challenge has surpassed the 150-million-hectare milestone for pledges in 2017 (Bonn Challenge, 2020). The project aligns with these international processes that Cameroon is part of (Table 1).

Table 1. Alignment of the project under preparation with the objectives of international forest policies and initiatives

International forest policy and initiatives	Objectives	Alignment of the project under preparation with the objectives of international forest policies and initiatives
New York Declaration on Forest	Cut natural forest loss in half by 2020 and end the lost by 2030 through forests and croplands restoration.	The project under preparation aligns with the objective of the New York Declaration on Forest in that it will restore degraded lands and forests in and around PFAs in the project sites.
Bonn Challenge	Bring 150 million hectares of degraded and deforested landscapes into restoration by 2020 and 350 million hectares by 2030.	The project under preparation aligns with the objectives or contributes to attain the objectives of the Bonn Challenge since it has a landscape restoration component. This will contribute to ensuring that Cameroon is able to meet up with its commitment under the

		Bonn Challenge which is to restore over 12 million hectares of deforested and degraded land by 2030.
Paris Agreement	Article 5 of the Paris Agreement encourages parties that are rich in forests including Cameroon to take concrete action in reducing emissions from deforestation and forest degradation, promoting conservation and sustainable forest management, as well as enhancing forest carbon stocks.	The project under preparation seeks to promote Cameroon's REDD+ payment mechanisms in sustainably managed PFAs and support forest governance systems outside permanent forests.

3.3.2. REGIONAL LEVEL -AFRICA

- i) The African Forest Landscape Restoration Initiative (AFR100): This initiative aims to bring 100 million hectares of land in Africa to restoration by 2030. AFR100 contributes to the Bonn Challenge, the African Union Agenda 2063, the SDG, and other targets (WRI, 2015). Since its launch in 2015, AFR100 has secured political commitments in Africa and defined restoration strategies. Currently, the initiative focuses on implementing forest landscape restoration action plans and monitoring systems and raising private investment for restoration.
- ii) The Great Green Wall initiative: This is an African-led movement with the objective to grow a 8,000 km natural wonder of the world across the entire width of Africa. By 2030, the Wall aims to restore 100 million hectares of currently degraded land, to sequester 250 million tonnes of carbon, and create 10 million jobs in rural areas (Great Green Wall, 2021).
- iii) African Union Agenda 2063: The goals of Africa Union Agenda 2063 is to promote environmentally sustainable and climate resilient economies and communities (AU, 2021). To achieve this goal, the African Union (AU) has set three priority areas for action: - Sustainable and inclusive economic growth; Biodiversity, conservation, and sustainable natural resource management; Climate resilience and natural disasters preparedness. This project aligns with the with these Africa wide regional initiatives (table 2).

Table 2. Alignment of the project under preparation with the objectives of regional forest policies and initiatives

Regional forest policy and initiatives	Objectives	Alignment of the project under preparation with the objectives of the regional forest policies and initiatives
AFR100	Restore 100 million hectares of land in Africa by 2030.	The project will restore degraded land and forests in and around PFAs and promote sustainable harvesting of forest commodities especially NTFPs.
The Great Green Wall initiative	By 2030, the initiative aims to restore 100 million	The project will contribute to carbon sequestration through the restoration of

	hectares of currently degraded land in Africa, thereby sequestering 250 million tons of carbon in African forests.	degraded forests and lands in and out of the PFAs
African Union Agenda 2063	Promote environmentally sustainable and climate resilient economies and communities.	The project will improve governance systems for sustainable forest management of PFAs, promote sustainable use of wood by communities, notably by harnessing value for NTFPs. The project will also diversify energy sources for communities to alleviate pressure on fuelwood e.g. improve cook stoves, and secure / restore woodland dedicated to exploitation for fuelwood to meet the needs of local communities. Finally, the project is expected to deliver adaptation needs as benefits.

3.3.3. SUB REGIONAL – CENTRAL AFRICA

- i) COMIFAC Convergence Plan: The Convergence plan was elaborated and adopted in 2005 and revised in 2014. The Plan outlines actions for sustainable forest management and forest conservation in Central Africa. The plan's strategies include harmonizing forest and tax policies, developing alternative forest activities, reducing poverty through sustainable forest management, and livelihoods improvement of forest-dependent communities (COMIFAC, 2015).
- ii) Central African Forest Initiative (CAFI): The Central Africa Forest Initiative (CAFI) is as a collaborative partnership that was created in 2015. This initiative provides funding to Central African partner countries including Cameroon, Central African Republic, Republic of Congo, the Democratic Republic of the Congo, Equatorial Guinea, and Gabon to promote sustainable forest management and green initiatives in the forest sector in these countries (CAFI, 2020). The project aligns with the objectives of the sub regional initiatives (table 3).

Table 3. Alignment of the project under preparation with the objectives of sub-regional forest policies and initiatives

Sub-regional forest policy and initiatives	Objectives	Alignment of the project under preparation with the objectives of the sub-regional forest policies and initiatives
COMIFAC convergence plan	Harmonize forest and tax policies, develop alternative forest activities, and reduce poverty through sustainable	The project will boost conservation and, sustainable production and marketing of natural resources from PFAs such as wood and NTFPs

	forest management and livelihoods improvement of forest-dependent communities.	thereby improving the livelihood of forest-dependent communities in the project sites.
Central African Forest Initiative	Financially support sustainable forest management including REDD+ investments in Cameroon and other countries in the Central African sub region.	The project will support sustainable management and exploitation of timber and other forest products in PFAs (forest concessions and Council Forests), notably through the development and implementation of improve SFM instruments that integrates climate change mitigation and adaptation.

3.3.4. NATIONAL LEVEL – CAMEROON

- i) National Development Strategy (SND 30): The objective of Cameroon's National Development Strategy (SND 30) are (a) to establish conditions favourable for economic growth and accumulation of national wealth and ensure that the structural changes indispensable for the industrialisation of the country are achieved, (b) improve the living conditions of the population and their access to basic social services by ensuring significant reduction and unemployment, and (c) strengthen climate change adaptation and mitigate the effects of climate change, ensure environmental management that assures sustainable and inclusive economic growth, societal development, and improve governance to enhance policy performance toward achieving developmental goals (RoC, 2020).
- ii) Cameroon' Nationally Determined Contributions (NDC): The long-term goal is to achieve a reduction of 35% of its GHG emissions compared to a baseline scenario for the target year (2030). To accomplish this goal, the country plans to implement some of the following fundamental forestry related climate change adaption and mitigation strategies (RoC, 2021):
 - Improving productivity and competitiveness;
 - Sustainable forest management through the exploitation and development of productive forests within the framework of management plans;
 - Biodiversity conservation through the reinforcement of the national network of protected areas; and
 - Ensuring coherence in the land tenure system through zoning plans.
- iii) National Climate Change Adaptation Plan (NCCAP): The plan provides orientations and actions to enhance resilience and adaptive capacity across the different development sectors and agroecological zones. The Plan proposes actions on improving access to sustainable livelihoods, climate change education, informing, distributing, and mobilising the population on climate change adaptation and integration of climate change adaptation in national development policies and strategies. On forestry, the plan proposes better education and research on the positive and negative effects of climate change on forests, installation of monitoring systems for forest fires, support and reinforce the implementation the REDD+ strategic options (MINEPDED, 2015).

- iv) Cameroon's Country Program for GCF investment: The program was developed to better leverage GCF funding mechanism, that will contribute to build a low carbon and climate resilient economy. It represents the strategic framework relationship of Cameroon vis-à-vis not only the GCF, but also with the accredited entities intervening in Cameroon. It has key priority areas that are linked to forestry such as: Securing, conservation, adaptive and sustainable management of forests; Reducing Emissions from Deforestation and Forest Degradation; Forest ecosystems resilient to climate change etc (RoC, 2019). This project aligns with the objectives of the strategy documents (Table 4).

Table 4. Alignment of the project under preparation with the objectives of national commitments and development policies

National commitments and development policies	Objectives	Alignment of the project under preparation with the objectives of the national commitments and development policies
Cameroon's National Development Strategy (SND 30)	Establish favorable conditions for economic growth there by improving the living conditions of the population and strengthen climate change adaptation and mitigate the effects of climate change.	The project will boost sustainable production and marketing of forest resources from PFAs such as wood and NTFPs, thereby improving the livelihood of forest-dependent communities in the project sites and contribute to climate change mitigation and adaptation.
Cameroon' Nationally Determined Contributions- updated (NDC)	Achieve a reduction of 35% of its Green House Gas (GHG) emissions compared to a baseline scenario for the target year (2030) through the development of agricultural production that reduces deforestation and forest degradation; as well as intensification of agroforestry/agricultural systems.	The project will enhance commodity value chains that relate with forest cover loss.
Cameroon's National Adaptation Plan (NAP) for Climate Change	Support and reinforce REDD+ implementation strategies and policies in the country, among others. Enhance access to sustainable livelihoods from forest-related resources.	The project seeks to promote Cameroon's REDD+ payment mechanisms in sustainably managed PFAs.
Cameroon's Country Programme for GCF investment	Secure, conserve and promote sustainable management of forests ecosystems as well as reducing emissions from deforestation and forest degradation, among others.	The project will improve governance systems for sustainable forest management of PFAs thereby contributing to reducing emission from deforestation and forest degradation in these PFAs.

- v) REDD+ Strategy: Cameroon has elaborated a REDD+ strategy with the main goal to contribute to climate stabilization through reducing emissions from deforestation and

forest degradation, conservation of forest carbon stocks, enhancement of forest carbon stocks, increasing forest carbon stocks and sustainable forest management. Implementation of REDD+ is expected to improve the livelihoods of local communities and forest-dependent people and ensuring economic and social development, while ensuring fair, equitable and sustainable economic and social development. The strategy will be implemented through sectoral strategic options with the forestry sector being one of the key sectors. (MINEPDED, 2018).

- vi) Land Degradation Neutrality (LDN): Cameroon is part of the LDN initiative under the UNCCD. As requested by the UNCCD the government of Cameroon has set voluntarily targets of halting and reversing land degradation to be reached by 2030. Restoration has a great role to play in achieving these targets.
- vii) Forest and Landscape Restoration (FLR) Strategic Framework: The Framework provides key orientations on how Cameroon will mobilise efforts to achieve the target to restore 12,062,768 hectares of degraded land by 2030 under the AFR100 initiative and the Bonn Challenge framework. The priority orientations areas include:
 - Establishing the elements for achieving the National FLR Commitment;
 - Develop a multi-sectoral approach to FLR;
 - Adopt and operationalize monitoring, evaluation and communication systems on landscape and forest restoration;
 - Developing sustainable financing mechanisms for FLR; and
 - Capitalize on and enhance the role of research in implementing and scaling up FLR (MINFOF- MINEPDED, 2020).
- viii) The Great Green Wall Initiative Strategy and action plan: The strategy has as objective to create conditions for socio-economic and environmental development in the Sudano-Sahelien region. The implementation of the strategy involves actions aimed at:
 - Conserving, restoring and enhancing biodiversity and soils;
 - Diversifying farming systems;
 - Satisfying domestic needs and increasing income through the promotion of income-generating activities;
 - Improving/installing basic infrastructure; and
 - Eradicating poverty (MINEPDED, 2020).

The proposed project aligns with these strategies (table 5).

Table 5. Alignment of project under preparation with objectives of national strategies

National Strategy	Objectives	Alignment of the project under preparation with the objectives of the national strategy
National REDD+ Strategy	The main goal of the national REDD+ strategy is to contribute to climate stabilization through emissions from deforestation and forest degradation, conservation of forest carbon stocks, enhancement of forest carbon stocks, increasing forest carbon stocks and sustainable forest management, while improving the livelihoods of local	The project will contribute to reducing emissions resulting from deforestation and forest degradation through: - Strengthening the forest governance systems and management systems in PFAs; and

	communities and forest-dependent people and ensuring economic and social development. while ensuring fair, equitable and sustainable economic and social development.	- Building the capacity of stakeholders involved or influencing PFAs ranging from government, CSOs, communities and communities around PFAs on sustainable management and use of natural resources and in MRV of forest cover and carbon stock - The project seeks to increase carbon stocks in protected areas through restoration of degraded lands and forests around The project will enhance sustainable livelihood of local communities around PFAs through the development of NTFP value chains and forest business models.
Land Degradation Neutrality	The objective is for member states to voluntarily set targets of halting and reversing land degradation to be reached by 2030.	This project seeks to strengthen forest protection, restoration of degraded lands and sustainable adaptive management of forest resources in 3 major regions in Cameroon, namely, the northern savannahs, Humid dense forests constituting an estimated 11,103,475 ha of PFAs and immediate peripheries.
Forest and Landscape Restoration (FLR) Strategy	The objective of the strategic framework is to map out policy options for a National FLR Strategy (NFLRS). This strategic framework laid out a vision and an operational action plan to achieve the goal of restoring 12 million hectares of degraded forests and landscapes by 2030. This will be achieved through the following strategic orientation: - Establishment of the Elements for Achieving the National FLR Commitment - Development of a multi-sectoral approach to FLR - Adoption and operationalisation of monitoring, evaluation and communication systems on landscape and forest restoration	This project will restore degraded lands in and around protected areas in the targeted project areas thereby contributing to achieving the country's commitment of restoring 12 million hectares of degraded landscapes. The project will also build the capacity of stakeholders' forest cover and carbon stock MRV.

	- Developing sustainable financing mechanisms for FLR - Capitalisation on and enhancement of the role of research in implementing and scaling up FLR	
The Great Green Wall Initiative: Strategy and action plan for implementation in Cameroon	At global level, the vision of the Great Green Wall is to resolutely tackle the main environmental and climate threats through regional cooperation and synergy of actions. In Cameroon the objective of the national strategy is to create conditions for socio-economic and environmental development.	The project underdevelopment will involve the restoration of degraded lands in the Sudano-Sahelian region, that constitute part of the Great Green Wall Initiative surface area. Similar goals are shared in that the adaptive capacity of vulnerable communities is enhanced and sustainable livelihoods are promoted.

4. PROJECT AREA PROFILE

4.1. LOCATION OF PROJECT SITES

Project implementation will target three AEZs each having an impact and intervention area. The intervention areas include Waza in the Sudano-Sahelian AEZ, the Dja-Lobeke intervention site in the Bimodal Rainforest AEZ, and the Bakossi-Bamboutos area in the Western Highlands (Figure 1).

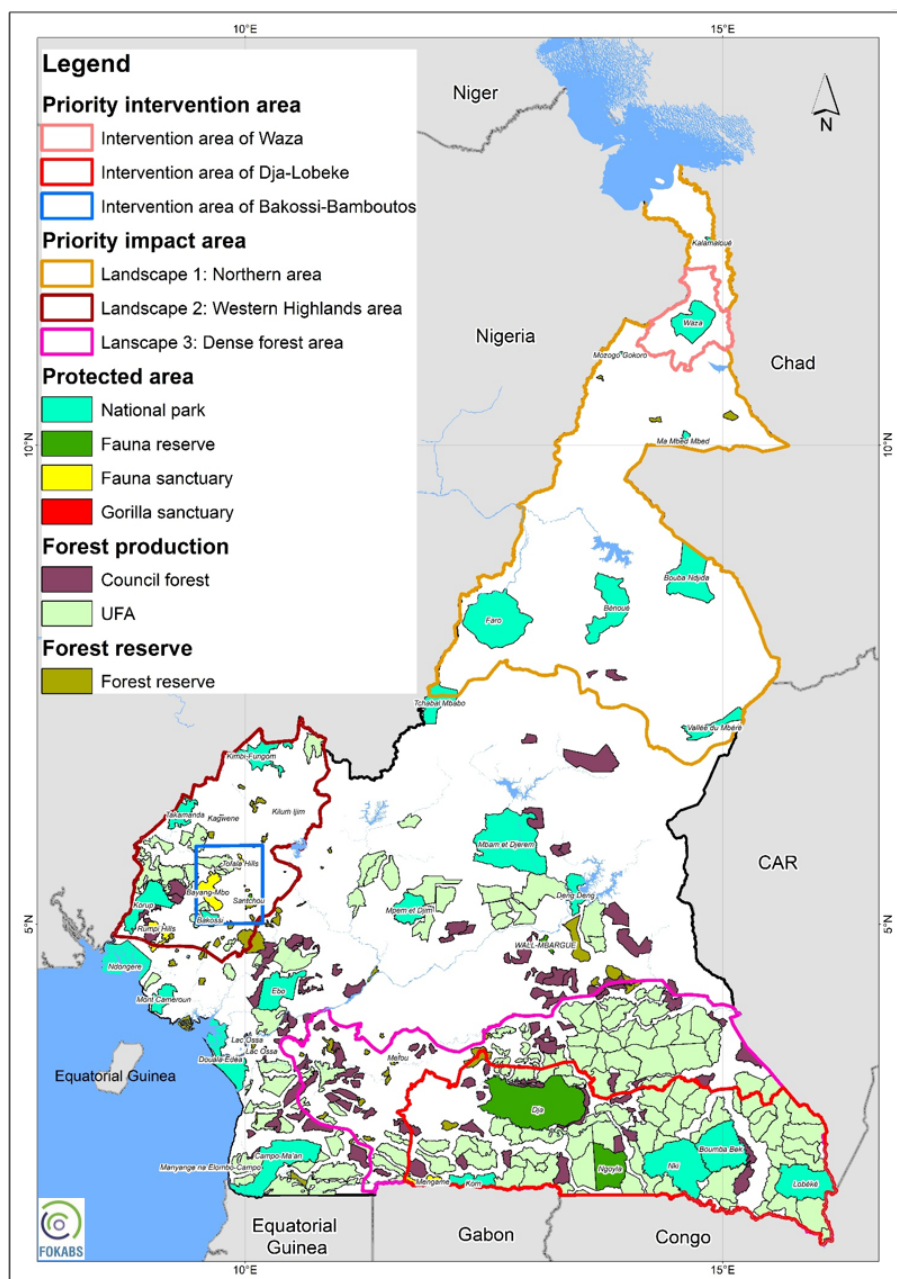


Figure 1. Map showing the project implementation areas

4.1.1. WAZA LANDSCAPE

- Socioeconomic conditions

The Waza intervention site (considered herein as landscape) is in the Far North region of Cameroon with a total area of 655,789.50 ha. It is part of the project impact area that covers the entire Sudano-Sahelian AEZ. The impact area is a formation of wooded, shrubby, and grassy savannahs that includes several categories of permanent forests representing a total area of 3,506,344 ha, i.e., 9 parks, 2 protection forests, 26 areas of hunting interest, and 5 hunting areas managed by communities.

At the administrative level, the Waza landscape extends over 3 divisions and 3 subdivisions. This landscape is constituted essentially of the Waza National Park (WNP) and its periphery. The WNP, a protected area that has been a UNESCO Biosphere Reserve site since 1982, extends between latitudes 11° 03' and 11° 30' North and longitudes 14° 28' and 14° 56' East. It is located in the Far North region of Cameroon, in Waza subdivision, Logone and Chari. Division its periphery extends into Zina (Logone and Chari Divisions) and Pétté (Diamaré Division). The evolution in its status, from hunting reserve to Ramsar site, shows the importance given by the high international authorities in environmental matters to this protected area on the basis of its species richness and the advantages of its sustainable management for the populations and the ecosystems. The landscape cuts across the Waza and Zina subdivisions in the Logone et Chari division and the Pétté subdivision in the (Diamaré Division) subdivisions respectively.

The Waza area is one of the most densely populated areas in the Sudan-Sahelian AEZ estimated at 118.2 inhabitants/km². It is largely multi-ethnic and includes 13 ethnic groups: Kanouri or Bornoi or Sirata, Arab, Kotoko, Mousgoum, Peuhl, Mafa, Toupouti, Moufou, Mada, Moungang, Haoussa, Sara, and Kera) spread over forty-eight villages and the town of Waza (MINFOF, 2014).

The ethnic groups and villages are ruled through chiefdoms representing state the administration at the village level. There are three types of traditional chiefdoms in the Waza landscape:

- First degree chiefdoms (Logone Birni and Pétté);
- Second degree chiefdoms (Waza, Zina and Ngamé);
- Third level chiefdoms (Mahe).

In the Waza landscape, agriculture is the main livelihood activity. The main food crops are cereals - sorghum, finger millet, muskuwari, maize, cowpeas, peanuts, okra, Guinea sorrel, voandzou, sesame, rice and legumes. The cultivation of these crops is strongly correlated with rainfall. At the same time, rice and peanut cultivation have declined in favour of the emergence of other crops such as onions, yams, and cowpeas, whose production has doubled in the last decade (RoC, 2021).

The population in the Waza landscape is involved in livestock as a livelihood activity. The main types of livestock include cattle (zebus), horses, poultry, sheep, and goats, which are managed through one of the following systems in the area: nomadism, transhumance, and sedentary livestock.

Fishing is also practiced in the area. It is estimated that more than 12,000 tons of fresh fish are harvested annually in the Logone floodplain and 2,000 tons in Lake Maga (IUCN-Waza Logone Project, 2000). The main species found in the area are catfish, eels and carp. However, due to the drought and the multiplication of fishing channels, the quantities produced have decreased considerably (MINFOF, 2014).

Traditional hunting is practiced in the Waza landscape and is intended for local consumption. However, there is also poaching for commercial and socio-cultural purposes. In the Waza area and its periphery, guinea fowl (*Numida meleagris*), ducks scammed, cobes (*Kobus Kob*), damalisque (*Damaliscus konnigun*) and hypotragus (*Hippotragus equinus*) are the most poached game animals (MINFOF, 2014).

Communities living near the WNP are also involve in the collection of various non-timber plant products (NTFPs) in and around the park (see section 7 and annex 7 for details).

Tourism has been a major source of income generation. However, the activities related to has experience a serious decline due to the reduction in the number of visits to the WNP Since 2012,

approximately 3,000 visitors have visited the park each year compared to very high attendance in the past (Jiagho, 2018).

In terms of road infrastructure, roads around the WNP provide easy access to the park. The WNP is located 120 km, or 2 hours by road, from Maroua. Generally, poor road infrastructure in the park is a challenge to tourism activities.

Regarding educational infrastructure, the Waza council area has 01 nursery school, 10 elementary school, 01 high school. The Zina council has 08 parents' schools, 18 public primary schools and 01 high school of General Education. As for the commune of Petté, it has 15 primary schools and 01 secondary school (MINFOF, 2014).

- **Biophysical conditions**

In the Waza landscape, the vegetation is Sahelian in nature characterized by a thorny steppe of the genus *Acacia seyal*, strewn with *Balanites aegyptiaca* that is lined by a grassy plain rich in annual and perennial grasses (MINFOF, 2014).

The area has a semi-arid type of climate characterized by a long dry season that lasts between 7 and 8 months (October-May) interspersed with a period of haze of about 1.5 months (December-mid January) and a short rainy season of 3 to 4 months (June-September). Maximum temperatures are between 40°C and 45°C in April-May and minimum temperatures between 18°C and 20°C in December-January, with average annual rainfall of 650 to 700 mm and average temperatures around 25°C.

In terms of wildlife, Waza National Park has an exceptional and diverse concentration of wildlife. There are herbivores, carnivores, rodents, primates, (Appendix) insects, reptiles, birds, etc. In addition, the WNP is home to an important avifauna composed of more than 370 species of birds, including more than 71 species of waterbirds, of which about 20 are migratory (Dodman et al. 1996). However, considerable changes are ongoing in the number and type of wildlife species found in this protected area.

The park has a water resource problem. The presence of water in the park depends on rainfall and flooding from the Logone or Mandara Mountains. However, due to climate change and the decrease in rainfall, the pools dry up more rapidly between the months of March and June, followed closely by the arrival of the dry season. During this period, the “yaérés” zone has a few ponds until the next rainy season.

4.1.2. DJA-LOBEKÉ LANDSCAPE

- **Socioeconomic conditions**

The Dja-Lobéké Landscape is in south-eastern Cameroon with a total area estimated about 6,537,230.49 ha. It is a bimodal forest landscape that contains several categories of permanent forests that represent a total area of 7,540,411 ha, including 5 national parks, 2 wildlife reserves, 1 wildlife sanctuary, 40 communal forests and 83 Forest Management Units (FMU).

The landscape cuts across 3 divisions (the Boumba-et-Ngoko, Haut-Nyong and Dja-et-Lobo divisions). Human population densities in the Dja-Lobéké area (approximately 1 inhabitant/km²) are among the lowest in Cameroon. Several ethnic groups are present in the Dja-Lobéké landscape scattered across several localities (communities). The Baka pygmies are the main ethnic minority group in the landscape scattered. Across nearly 75% of the villages in the landscape. The Bantu are the majority ethnic group. They are subdivided into ethnic subgroups: Bangando, Mboman, Bimo, etc.

Income-generating activities include agriculture, livestock, hunting, fishing, NTFP collection, mining, logging, fuelwood, handicrafts, and small-scale commerce.

In terms of agriculture the main crops include plantain, cassava, cocoyam, maize, groundnuts etc. where on average 75% and 25% are consumed and commercialised respectively. Cocoa (*Theobroma cacao*) and coffee (*Coffea robusta*) are the main cash crops; they are grown by almost all the active male population of the villages. Cocoa farms have an average surface area of 1-5 ha, with minimums of 1 ha and maximums of up to 10 ha (during exploitation). They are found under a forest cover containing trees scattered all over in the plantation, giving it the appearance of a secondary forest. The workforce is essentially family-based with an average production of 4 to 8 bags per hectare. For NTFP collection and transformation, see ANNEX 2B for details.

Livestock production in the Dja-Lobéké landscape has very little added value. The livestock activity is extensive with animals such as goats, sheep, pigs, poultry that are intended for sale in the village markets rather than for household consumption (see ANNEX 3A for more details).

Hunting in the Dja-Lobéké landscape is practiced exclusively by men and young boys in the forest and around plantations. Hunting takes two forms: controlled hunting and traditional subsistence hunting. Controlled hunting is practiced in zones of hunting interest (ZIC) and community-managed hunting zones (ZIGGC). ZIGGCs are hunting territories managed by adjacent communities (PCDM, 2011). The species regularly killed in the ZICs and ZIGGCs are: blue duiker (*Cephalophus monticola*), Buffalo (*Syncerus caffer nanus*), Elephant (*Loxodonta africana*) and Bongo (*Tragelaphus euryceros*) (PCDM, 2011). Traditional subsistence hunting is practiced by riparian populations to meet their subsistence needs and to protect their crops from destruction. The populations of this area practice fishing, which is generally a secondary activity. It is practiced mostly in the dry season (December-March and July-August). The types of fishes include catfish, tilapias, and pikes, in addition to shrimps and crabs. The fishing techniques used are: i) fishing with lines and nets practiced by men; ii) fishing with nets and weirs, practiced by women and children.

- **Biophysical conditions**

The landscape has a Guinean equatorial climate characterized by alternating rainy and dry seasons. For example, i) A short rainy season from mid-March to June; ii) A short dry season from June to mid-August; iii) A long rainy season from mid-August to mid-November; v) A long dry season from mid-November to mid-March. The rainiest months are October, September, and May, while the least rainy month is December. Relative humidity ranges from 80 to 98%; saturation levels can occur on dry season nights. The average annual temperature of 24°C and the average rainfall of more than 1500 mm per year are favorable factors for the development of forests (CTFC, 2009).

The relief of the Dja-Lobéké landscape is quite diverse with a topography of plains, valleys and hills having an average altitude between 500 and 850 m. The soils in this landscape are of several types: red ferralitic soils representing the bulk of the soils in the area; ferralitic soils, gley or alluvial soils and hydromorphic soils.

This wildlife in the area is made of several categories, in particular small rodents, chiropterans, insectivores, more than 100 species of mammals among which species of primates, more than 150 species of fish (some being newly discovered: *Aphyosemion* sp. nov. and *Phenacogrammus* sp. nov.), more than 80% of forest species of butterflies, more than 100 species of lepidopterans,

more than 500 species of birds; many species of freshwater shrimp; ungulates, carnivores; reptiles and amphibians.

4.1.3. BAMBOUTOS-BAKOSSI LANDSCAPE

- Socioeconomic conditions

The Bamboutos-Bakossi landscape is in the western and north-western Cameroon with an area of 704,412.72 ha. It is part of the impact zone that covers the entire Western Highlands. This impact zone is a mosaic of forest-savannahs on the Bamboutos side and a dense forest formation on the Bakossi side, which alone encompasses several categories of permanent forests representing a total area of 904,697 ha. At the administrative level, the administrative division of the Bamboutos-Bakossi landscape indicates that it extends across 3 regions, 4 divisions, 8 subdivisions.

The human density of the Bamboutos-Bakossi landscape, averaging approximately 261 inhabitants/km², is among the highest in Cameroon. Several ethnic groups are present in the Bamboutos-Bakossi landscape scattered across 56 village communities in the Southwest, North West and West regions.

Income-generating activities include agriculture, livestock, fishing, NTFP collection, logging on the fuelwood, handicrafts, and petty trade. Concerning agriculture food crops include plantain, cocoyam, yams, groundnut, sweet and Irish potatoes, beans, cassava, maize, etc. Income is generated from cash crop (coffee), and perennials (particularly avocado, safou and kola) (ANNEX 2B).

The environment is conducive for cattle livestock production. The landscape is the leading basin for poultry farming in Cameroon (FEWS NET, 2021).

In the Bakossi-Bamboutos landscape, mining related activities are an important source of income. It takes the form of sand quarries (sand quarries of TCHOYOU, MEKOUÉ LEUH, etc), stone quarries (NTOUNGHA, DJINGHA, etc) and laterite quarries.

- Biophysical conditions

The landscape is essentially made up of hills, valleys, plateaus, and lowlands made up of more or swampy plains. The landscape includes, among others, the Bamboutos mountain range is the third highest mountain in the volcanic line of Cameroon after Mount Cameroon and Mount Oku (Gountié Dedzo et al., 2013).

Concerning the Bamboutos Mountains, the flanks are dominated by two types of soils: i) Closer to the hills, old, fine, friable volcanic soils of coal black color and very fertile; ii) Towards the foot of the mountains, ferralitic, lateritic soils, more or less gravelly, brown color, sometimes sandy clay. The lowlands are characterized by hydromorphic soils, rich in alluvium (ITTO, 2014).

The Bakossi-Bamboutos landscape is dominated by an herbaceous savannah (Pennisetum, Imperata, Huparatenia, Clotalaria) with shrubs and trees with a dominance of eucalyptus towards the summits, especially in the cultivation and livestock areas. However, eucalyptus populations have drastically decreased, giving way to agriculture. Along the numerous watercourses that originate at the top of the mountains, we can see gallery forests that wind from the top to the bottom of the mountains following the water flow route. Towards the foot of the mountains, there is an abundance of fruit trees and non-timber forest products (avocado, orange, guava, grapefruit,

safoutier, mango, lemon, canarium, kola, ...) and many other wild species in addition to food crops of all kinds.

The climate is characterised by two seasons: an 8-month long and rainy season (March to November) and a 4-month short and dry season (mid-November to mid-March). Temperatures in the area decrease as one moves towards the summits. Minimum vary between 12°C and 15°C, averages between 22°C and 24°C and maximum between 28°C and 30°C (ITTO, 2014). Rainfall is more abundant towards the peaks, with August and September being the rainiest months reaching peaks of over 330 mm/month.

The Bamboutos Mountains is covered by eucalyptus trees, which are generally aligned and in some places form hedgerows. Although the eucalyptus population has decreased, this dominance is justified by the multiple uses of this forestry species, notably in the delimitation of cultivation plots, the materialization of barriers to avoid agro-pastoral conflicts, use as windbreaks, use as construction wood, lumber, and firewood etc.

4.2. FINANCING IN THE PROJECT AREAS

This section provides an overview of ongoing and planned projects indicating areas of complementarity with the project under preparation indicated herein as the “IUCN project” (Table 6).

Table 6. Complementarity and lessons for upscaling of the project under preparation and relevant projects

Projects	Description	IUCN project alignment	Lessons for upscaling in IUCN project
Project for the Sustainable Management of Forests under the Authority of Cameroonian Councils: (GCP/CMR/033/GFF)	This project aims to reduce deforestation and forest degradation in order to improve biodiversity conservation, reduce emissions and increase carbon stocks and improve the living conditions of local communities. It will facilitate: - Sustainable management and conservation of biodiversity in communal forests; - Capacity building to strengthen biodiversity conservation and sustainable management in communal forests;	Sustainable Forest management and restoration - Improved governance systems for sustainable forest management - Strengthened sustainable forest management of PFAs - Increased restoration of degraded lands and forests in and around permanent forest areas to facilitate carbon sequestration, biodiversity	The GCP/CMR/033/GFF project focuses on a municipal council approach to reduce deforestation and forest degradation and the enhancement of livelihood of local communities. The IUCN project could consider identifying the municipalities included in the project and link some of the activities to these councils to enable and ensure sustainability. For example, the activities on developing council restoration action plans and capacity building on restoration in general

	- Capacity building on forest carbon management; and - Restoring ecosystems and increasing carbon stocks in communal forests. Dimako, Gari-Gombo and Yokadouma councils in the revision of their management plans, capacity building of the communal forestry units/members of the CPF and the characterization of biodiversity in these communal forests.	conservation, gender equality and well-being (agroforestry, improved energy systems for domestic uses, etc.) - Increased capacity of government institutions, CSO, councils and local populations on monitoring, reporting and verification of forest cover and carbon stocks	
Benue National Park (BNP) Management Support Project, Second Phase	The objective is to contribute to the restoration and protection of the biological resources of the BNP and its peripheral zone in a context of integrated management of the area, with a view to maintaining its biodiversity and contributing to local development. The specific objectives are as follows: - To contribute to the protection and monitoring of the BNP and its peripheral zone - To contribute to the reinforcement of the operational capacities of the Conservation Department. - To contribute to the sustainable development of the biological and	The UICN project completely aligns with the objectives of the BNP projects as it aims at sustainable management of PFA that includes PAs, restoration of degraded forest in and around PFAs, building capacity of relevant stakeholders on MRV on forest cover and carbon stock.	Although the BNP is a smaller scale with respect to the IUCN project under development, it may be important to consider the sustainable development of the biological and ecotourism resources in some of the PA and its peripheral zone in order to strengthen efforts towards securing and improving the livelihoods of the local populations.

	ecotourism resources of the PNB and its peripheral zone with a view to securing and improving the livelihoods of the local populations. - To promote the integrated management of the PNB according to the landscape approach.		
Forest and Environment Project GIZ 2020 to 2022	Objectives: Local actors benefit sustainably from Cameroon's environment and forest resources: -Promoting the sustainable use of forest resources and biodiversity in municipalities. -Developing value chains based on timber and non-timber forest products for the benefit of vulnerable local people; -Providing environmental education to increase levels of appreciation of natural resources, climate change mitigation and the environment; and -Improving general conditions for policy dialogue and valorisation of forest resources.	This project will promote the sustainable use of natural resources through developing Markets and supply chain transformation for selected NTFPs in the targeted project areas including the North and the East.	The IUCN project could build on the experience of the GIZ forest and environment program, working with council forest management, NTFP value chains, restoration, wood energy value chain etc.
Mintom Community Forestry Landscape Project Rainforest Alliance (Ongoing)	Objectives: Sustainable management of forest resources and limit expansion of agricultural activities into the Dja Reserve.	The IUCN project as well focus on reducing degradation in PFAs and improvement of livelihood of communities around	There is an opportunity for synergy between activities of the two projects around the Dja reserve.

		these PFAs. The project also seeks to build capacity of communities around PFA.	
Increasing local communities' resilience to climate change through youth entrepreneurship and integrated natural resources management IFAD PADFA II Adaptation Fund	The overall objective of the project is to increase local communities' resilience to climate change through resilient livelihoods and integrated natural resources management. The project will deliver this objective through three outcomes: 1. Climate proofed institutional frameworks and local development plans at regional and local level; 2. Ecosystems resilience to climate change is strengthened through monitoring and better knowledge of their status and vulnerability; and 3. Sustainable management of natural resources and ecosystems leading to climate resilient ecosystems, green jobs creation for youth and resilient livelihoods.	This project under development is in line with objective 2 and 3 of IFAD PADFA II project. It seeks to: build capacity of stakeholders including government institutions, CSOs, local communities and farmer's group, strengthen sustainable management of PFAs through, strengthen governance systems, the restoration of degraded lands in and around protected areas, improving livelihood of communities through developing market opportunities for NTFP value chains.	There is space for synergy between the activities of the IFAD and IUCN projects in the Sudano-Sahelien impact and intervention area especially related to the activities on resilience and livelihoods system support
TRIDOM II "Integrated and transboundary biodiversity conservation in the basins of the Republic of Cameroon" UNDP 2020-2026	The project objective is to strengthen the conservation of globally threatened species in Cameroon by improving biodiversity enforcement, resilience, and management. Outcome 2: Improved management effectiveness of PAs in forest landscapes (specifically Dja, Boumba Bek, Mangame, NGoyla and Nki)	The project under development completely aligns with outcome 2 and 3.2 of the UNDP project as it focuses on improving PFAs in forest landscapes in South of Cameroon (Dja, Boumba Bek, Mangame, NGoyla and Nki). Component 2 builds the capacity of actors including	There are areas of synergy between these two projects especially related to PA. The IUCN project could help valorise the mitigation outcome of the activities of this project.

	Outcome 3.2: Adoption of management practices and community centred initiatives in the forest interzone that support sustainable livelihoods, SLM and reduce wildlife crime.	local community around PFAs towards a community-based Forest management system.	
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5. CLIMATE RATIONALE – ADAPTATION

This section presents information that is relevant to justify the need for interventions that will contribute to adaptation outcomes and benefits. It presents past and future climate variability, the vulnerability and impacts including adaptation practices in the intervention areas. It goes further to highlight barriers to enhance the adaptive capacity of social-ecological systems.

5.1. PAST AND FUTURE CLIMATE VARIABILITY

This section presents the past and future climate trends with a focus on temperature and precipitation. For the future trends, a third parameter – soil moisture, is included in the analysis. It is a synthesis of the results found in the report on climate analysis and project climate rationale (ANNEX 23A).

5.1.1. SUDANO-SAHELIAN AEZ

ii) Past trends

The analysis of past climatic parameters within the project intervention area (Waza) in the Sudano-Sahelian AEZ reveals a fluctuation in temperature and precipitation over time. Overall, an increasing temperature trend and a decreasing precipitation trend for Waza is observed over the period of 1981-2020 (Figure 2).

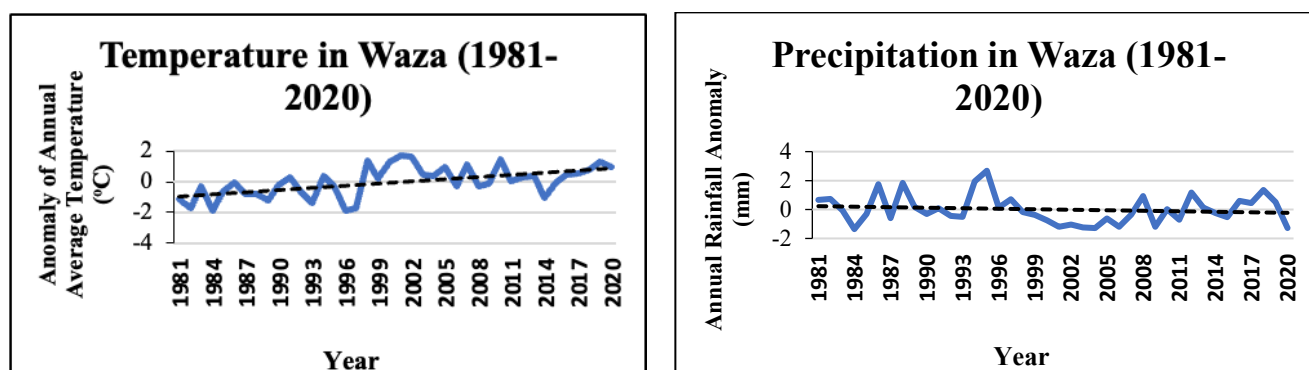


Figure 2. Analysis of past temperature and precipitation data of Waza

Analysis of precipitation around Maroua indicate that the area experienced a progressive decrease in rainfall amounts and a decrease in the number of rainy days per year. On a seasonal scale, the rain has progressively started earlier around the first half of May and ended earlier around the end of September and the beginning of October. In addition, the recorded rainfall amounts have gradually decreased during the rainy season, while they have increased during the dry season. In terms of temperature, the minimal temperatures have been increasing at a significantly higher rate when compared to the average and maximum temperatures (ONACC, 2018).

ii) Future trends

Compared to the baseline period of 1981-2010, the temperature for Waza is projected to increase under both RCP 4.5 and 8.5 across the three periods, with the changes for 2041-2070 and 2071-2100 under RCP 8.5 being large. Precipitation is projected to decrease under RCP 4.5 and increase under RCP 8.5. Pertaining to soil moisture, an increase is projected for 2011-2040 under RCP 8.5, while with the exception for the period 2041-2070 (RCP 8.5), the other time periods are projected to witness a reduction compared to the baseline (Table 7).

Table 7. Projected climate parameters for Waza

RCP 4.5	RCP 8.5
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Climate parameters	2011-2040	2041-2070	2071-2100	2011-2040	2041-2070	2071-2100
Temperature (°C)	1	2	2	1	3	5
Precipitation (%)	-0.27	-0.095	-3	2	6	7
Soil moisture (%)	-3	-5	-12	1	0	-4

The projected parameters of the protected areas located in the impact area in Sudano-Sahelian AEZ are presented in ANNEX 23 A – report on climate analysis and project climate rationale. The protected areas include Kalfou, Ma Mbed Mbed, Tchabal Mbabo, Vallée du Mbéré, Mozogo Gokoro, Kalamaloué, Faro, Bouba Ndjida, Bénoué.

5.1.2. BIMODAL RAINFOREST

i) Past trends

In terms of past annual trends for the period of 1950-2015, the amounts of precipitation received and the number of rainy days in the most northerly area of the ecological zone has gradually decreased. On a seasonal scale, past precipitation data reveal an overall decrease in the amount of precipitation and the number of rainy days throughout the year. The brief dry season is an exception in which past trends indicate increasing precipitation levels. Throughout the rest of the ecological zone, rainfall amounts tend to increase during the brief dry season and the lighter rainy season, while the long dry and rainy seasons are decreasing in overall precipitation (ONACC, 2018b).

About temperatures, past data from ONACC (2018b) between the years 1950-2015 reveal an increase in average maximum and minimum temperatures on an annual scale. On a seasonal scale, temperatures show an overall tendency to increase, both for the average maximum and minimum temperatures.

The analysis of past temperature and for the project's intervention area for the South-East humid forest AEZ is presented in Figure 5, which reveals a fluctuation in temperature and precipitation over time. Generally, an increasing temperature trend and a decreasing precipitation trend for is observed over the period of 1981-2020.

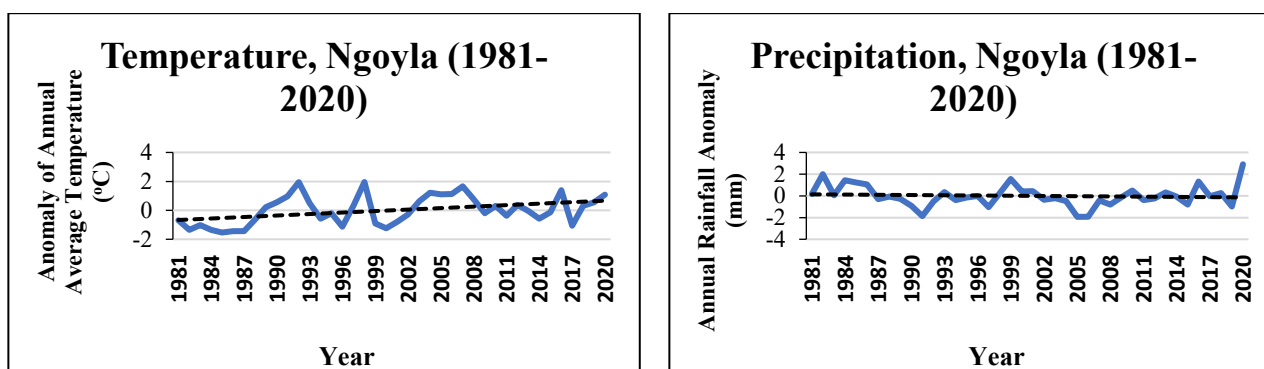


Figure 3. Analysis of past temperature and precipitation in the intervention area (1981-2020)

ii) Future trends

Regarding the 2030, 2060 and 2090 projections of climatic parameters, it appears that an increasingly hot climate is expected throughout the Eastern Region until 2090, while precipitation will vary considerably from one location to another. Generally, the average annual

precipitation is expected to decrease by 2-9mm by 2030, 4-9mm by 2060 and 8-14mm by 2090. Average annual temperatures are expected to increase by 0.8-1°C by 2030, 1.8-2.8°C by 2060, and 2.8-4.8°C by 2090 (ONACC, 2018b).

The outcome of the climate projections for the proposed intervention areas for the South-East humid forest zone are explained in the following section. The projections for the other PFAs in the impact area are available in ANNEX 23 A – report on climate analysis and project climate rationale.

Dja intervention site

Compared to the baseline, temperature and precipitation are projected to increase for both RCPs, with the exception of 2011-2040 under RCP 8.5. Aside from the period of 2041-2070 under RCP 4.5 with no projected change from the baseline, the soil moisture for the location is projected to reduce under both RCPs compared to the baseline (Table 8).

Table 8. Projected climate parameters Dja

Climatic parameter	RCP 4.5			RCP 8.5		
	2011-2040	2041-2070	2071-2100	2011-2040	2041-2070	2071-2100
Temperature (°C)	1	1	2	1	2	3
Precipitation (%)	1	3	4	-1	4	8
Soil moisture (%)	-1	0	-2	-1	-2	-3

Lobéké intervention site

The temperature for Lobéké is projected to increase under both RCP 4.5 and 8.5 compared to the baseline (1981-2010). In terms of precipitation, an increase is projected for 2041-2070 and 2071-2100 for RCP 8.5. Other periods are projected to witness a decrease compared to the baseline, apart from 2011-2040 under RCP 4.5 where no change was projected. Regarding soil moisture, a decrease is projected for both RCPs compared to the baseline (Table 9). Aside for the temperature change for 2071-2100 under RCP 8.5 which is large, all projected changes are considered small.

Table 9. Projected climate parameters Lobéké

Climatic parameter	RCP 4.5			RCP 8.5		
	2011-2040	2041-2070	2071-2100	2011-2040	2041-2070	2071-2100
Temperature (°C)	1	1	1	1	2	3
Precipitation (%)	0	-2	-1	-2	2	4
Soil moisture (%)	-2	-3	-3	-3	-2	-2

Ngoyla intervention site

While the temperature for Ngoyla is projected to increase from the baseline for both RCPs, the soil moisture is projected to decrease from the baseline. Compared to the baseline, the projections for precipitation revealed that it will remain unchanged under RCP 4.5 for the years 2041-2070 and 2071-2100; increase under RCP 8.5 for the years 2041-2070 and 2071-2100; and decrease for the period 2011-2040 under RCP 4.5 and 8.5 period (Table 10). Of the

projected changes, only the temperature change for 2071-2100 under RCP 8.5 is large while the others are small.

Table 10. Projected climate parameters for Ngoyla

Climatic parameter	RCP 4.5			RCP 8.5		
	2011-2040	2041-2070	2071-2100	2011-2040	2041-2070	2071-2100
Temperature (°C)	1	1	2	1	2	3
Precipitation (%)	-0.28	0	0	-1	2	8
Soil moisture (%)	-1	-4	-3	-2	-2	-1

Boumba Bek intervention site

Compared to the baseline, the temperature is projected to increase for both RCPs. Except for the period of 2041-2070 and 2071-2100 under RCP 8.5 which show a projected increase in precipitation, all other periods under both RCPs project a decrease in precipitation. Regarding soil moisture, a decrease is projected under both RCPs (Table 11).

Table 11. Projected climate parameters for Boumba-Bek

Climatic parameter	RCP 4.5			RCP 8.5		
	2011-2040	2041-2070	2071-2100	2011-2040	2041-2070	2071-2100
Temperature (°C)	1	1	1	1	2	3
Precipitation (%)	-0.47	-1	-0.11	-3	1	5
Soil moisture (%)	-3	-4	-5	-4	-4	-5

5.1.3. WESTERN HIGHLANDS

i) Past trends

The analysis of past climatic parameters within the intervention area (Bamboutos) for the Western Highland AEZ shows that the climate of Bamboutos has been changing over the past decades. The location has been experiencing a steady increase in temperature for the period of 1981-2020 (Figure 8). Overall, precipitation in this area has been experiencing a slight increasing trend for the period of 1981-2020 (Figure 4).

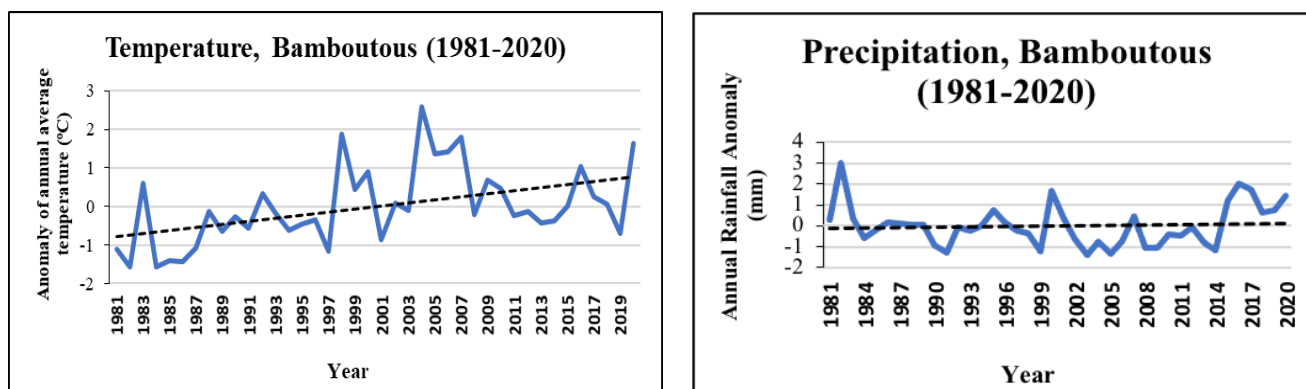


Figure 4. Analysis of past temperature and precipitation for Bamboutous (1981-2020)

ii) Future trends

The projections of the models of the average annual precipitation carried out by UNDP (2008), CSC (2013), and CSC & WUR (2013) indicate significant changes in the distribution of rainfall amounts within the Western Highlands. Forecasts show that during the months of the long-wet season (March to November), the A will experience progressively reduced rainfall of 12-14 mm between the months of March and May in 2030, 14-26 mm between the months of June and August in 2060, and 26-54 mm between the months of July and November in 2090. On an annual scale, the projections indicate a decrease in rainfall of 8 mm by 2030, 20 mm by 2060, and reach an annual reduction of 25 mm by 2090 (UNDP, 2008).

In terms of temperatures, a significant increase is projected in the Western Highlands regardless of any emission scenario, with very strong increases in temperature for high emission scenarios. In addition, an increase in temperature extremes is expected, and the number of cold days and nights is expected to decrease, while the number of hot days and nights is expected to increase by 2030, 2060 and 2090. Overall, the average annual temperature of this area is projected to increase by 1.1-1.4°C by 2030, 1.8-2.5°C by 2060, and 2.2-4.2°C by 2090 (UNDP, 2008).

The projections focusing on the protected areas in the impact area is presented in ANNEX 23 A – report on climate analysis and project climate rationale. These areas include: Santchou, Bayang-Mbo, Tofala Hills, Kagwene, Kilum Ijim, Rumpi Hills, Kimbi-Fungom, Korup, Takamanda. For the intervention area in and around Mount Bambotous, Temperatures and precipitation are projected to increase across three periods (2011-2040; 2041-2070; and 2071-2100) compared to the baseline (1981-2010). The soil moisture for the site is projected to reduce compared to the baseline. However, the changes in precipitation, temperature (except under RCP 8.5 for 2071-2100) and soil moisture are small (Table 12).

Table 12. Projected climate parameters for Bamboutous

Climatic parameter	RCP 4.5			RCP 8.5		
	2011-2040	2041-2070	2071-2100	2011-2040	2041-2070	2071-2100
Temperature (°C)	1	2	2.1	1	2	4
Precipitation (%)	2%	4%	2%	2%	2%	8%
Soil moisture (%)	-2%	-2%	-5%	-2%	-5%	-7%

5.2. CLIMATE CHANGE VULNERABILITY AND IMPACTS ON FOREST AND COMMUNITIES

This section presents the climate vulnerability and impacts in the three targeted intervention areas. It is a synthesis of the findings of the vulnerability analysis report – ANNEX 23B.

Climate driven events served as the entry point to assess the climate vulnerability and impacts in the project intervention sites. In Cameroon, the climate events identified are similar across the different agroecological, though their frequency, intensity and impacts are vary (MINEPDED, 2015; BM, 2017; BM, 2020). The climate events identified and their projected intensities for each target AEZ are presented in Table 13.

Table 13. Climatic events and their intensity according to agro-ecological zones

Climatic events	Soudano sahelian	Pluviometry bmodale	Hauts plateaux de l'Ouest
1) Increase in temperature	+++++	+++	++
2) Heat Waves	+++++	+++	++
3) Dust storms	++++	/	/
4) High winds	+++	+	++
5) Drought	++++	+	+
6) Rainfall variability	++++	+++	+++
7) Flooding	+++	+++	++
8) Erosion	+++	++	++
9) Landslides	++	++	+++

5.2.1. WAZA LANDSCAPE

The vulnerability and impacts of climate change are presented according to livelihood related sectors – agriculture, livestock, fisheries, forestry and wildlife.

i) Agriculture

The agriculture sector in the Sudano-Sahelian zone is particularly vulnerable to rainfall variability, drought and strong winds (Table 14). The various factors that make farmers vulnerable are the high loss of crops, the impoverishment of agricultural land and the high recurrence of climatic events (rainfall variability linked to the late or early arrival of rainy seasons, droughts, violent winds and floods). These factors, combined with limited access to climate information, high demographic and land pressure, low use of improved and adapted inputs, insufficient agricultural production materials and equipment (irrigation equipment) and insecurity that favours the phenomenon of internally displaced persons, exacerbate the vulnerability of agriculture to climate change.

Table 14. Perception of climate vulnerability of the agricultural sector in the Waza landscape

Climatic events	Exposure (0-5)	Sensitivity (0-5)	Vulnerability (0-10)	Level of vulnerability
Rainfall variability	4,2	4,4	8,6	Very strong
Heat waves	2	3,2	5,2	Moderate
Dust storms	0,7	0,8	1,5	Very Low
High winds	3,2	3,5	6,7	Strong
Drought	4,1	4,2	8,3	Very strong
Flooding	2,7	2,6	5,3	Moderate
Erosion/landslides	0,4	0,5	0,9	Very Low

In terms of impacts, the Waza area and its periphery, as in other agricultural areas of the country, agriculture depends largely on rainfall and is therefore very sensitive to climate rainfall variability. Rainfall variability disrupts the agricultural calendar this causes the loss of seedlings

and negative effects on the germination of certain species (maize, millet, sorghum, cowpeas, beans and peanuts). These and other related problems such as the instability of seasonal agricultural activities, land and soil degradation, the invasion of locusts and other insect pests results to significant reduction in agricultural production (MINEPDED, 2015; Djitie et al., 2017). Table 15 presents a synthesis of how stakeholders and communities describe climate change impacts of the different climate events on agriculture.

Table 15. Climate events and their impacts on agriculture in the Waza landscape

Climate events	Impacts
Increase in temperature	• Decrease in agricultural productivity and production • Decrease in water table • Increased evaporation and reduced soil moisture • Increased crop loss rate • Shortening of the vegetative cycle
Heat waves	• Drying and destruction of crops • Decreased productivity • Reduction and difficulty of human work
High winds	• - Destruction of farms
Dust storms	• Poor germination, reduced yields • Drying up of the crops • Reduction, interruption of human work
Variability of rainfall	• Decrease in rainfall and decrease in agricultural productivity and production • Disruption of the agricultural calendar • -Loss of livelihood and impoverishment • Crop flooding • Reduced yields of rainfed crops • Decline in net income from crops
Drought	• Drying out and destruction of crops • Reduced productivity • Shortage of drinking water • Reduction and hardship of human labor
Floods	• Crop destruction, soil leaching •
Landslides	• Destruction of crops, houses, property, infrastructure
Erosion	• Destruction of crops and soils • Destruction of infrastructure

ii) Livestock

The livestock sector in the Sudano-Sahelian AEZ is particularly vulnerable to drought and heat waves. The vulnerability of this sector is exacerbated by the extension of agricultural areas, the lack of knowledge about fodder production, the occupation of transhumance corridors due to migration and demographic pressure, absence of a micro zoning plan. Table 16 presents the level of vulnerability of the livestock sector to climate change in the Waza area.

Table 16. Perception of climate vulnerability of the livestock sector in the Waza landscape

Climatic events	Exposure(0-5)	Sensitivity (0-5)	Vulnérabilité (0-10)	Classe de vulnérabilité
Rainfall variability	2,75	2,75	5,5	Moderate
Heat waves	2,75	3,5	6,25	High
Dust storms	0,5	0,5	1	Very Low
High winds	1	0,5	1,5	Very Low
Drought	4,25	4,25	8,5	Very high
Flooding	2	3,5	5,5	Moderate
Erosion/landslides	0,75	1,25	2	Low

In terms of climate change impacts on livestock, it should be noted that livestock production is a very important activity for the populations in the Sudano-Sahelian AEZ. Droughts affect the availability of quality pasture, thus affects animal nutrition. The under-nutrition of animals that results from the lack of pasture, leads to the thinning, stunted growth, abortions, and increasing vulnerability to various diseases. Floods lead to the death of animals and the loss of income for farmers. The impacts of climate change on livestock are presented in Table 17.

Table 17. Perception of climate events and their impacts on livestock

Climate events	Impacts
Temperature increases	- Decreased livestock productivity - Decreased pasture - High mortality and morbidity of livestock - Increase in the number of livestock in the mountains
Heat waves	- Decrease in livestock productivity - Decrease in pastureland - High mortality and morbidity of livestock
Rainfall variability	- Decrease in water for livestock - Decrease in pastures
Drought	Increased burning, destruction of pasture
Flooding	Destruction of pasture and livestock
Erosion	Destruction of pasture and livestock

iii) Fishing

Fishing in the periphery of the Waza National Park is not common, it is carried out in the Zina council area. It is an activity that is carried out by farmers to support household income. The fishing practices undertaken in this area are harmful to the environment and human health. These include the construction of fishing canals that leads to the drying up of natural ponds, as well as fishing practices that use chemical products. Communities perceive the fishing activity as an activity that is vulnerable to heat waves and drought and other related climate events (Table 18).

Table 18. Perception of climate vulnerability of the fishing

Climatic events	Exposure (0-5)	Sensitivity (0-5)	Vulnerability (0-10)	Vulnerability Class
Rainfall variability	2,75	2,75	5,5	Moderate
Heat Waves	2,75	3,5	6,25	High
High winds	1	0,5	1,5	Very low
Droughts	4,25	4,25	8,5	Very high
Floods	2	3,5	5,5	Moderate

The fishing activity is traditional and climatic events such as rainfall variability, temperature increase and drought affect the fishing sector. The impacts identified in the literature and primary information from the field are mostly descriptive as presented in Table 19.

Table 19. Climatic events and possible impacts on fishing

Climatic events	Impacts
Increased temperature	• Loss of habitat for sensitive fish species • Increased plant evapotranspiration may decrease surface and groundwater availability • Changes in species composition • Decreased fisheries productivity - Depletion of fish stocks
Rainfall Variability	• Increase in species habitat • Changes in species diversity
Drought	• Draining of lakes and ponds or reservoirs • Destruction of fingerlings

iv) Forest and related ecosystems

This sector is a combination of forests, wildlife and silviculture practices. They are vulnerable in different degrees to climate induce events (Table 20).

Table 20. Perception on the vulnerability of forest and related ecosystems

Climate events	Exposure (0-5)	Sensitivity (0-5)	Vulnerability (0-10)	Vulnerability Category
Rainfall Variability	2	1	3	Low
Increase in temperature	3	1	4	Moderate
Dust storms	0,5	0,5	1	Very low
High winds	4	3	7	High
Drought	5	4	7	High
Flooding	0,5	1,25	1,75	Very low
Erosion/landslides	3	1	4	Moderate

5.2.2. DJA-LOBEKE LANDSCAPE

Climate change vulnerability and impacts are presented based on livelihoods sectors – agriculture, livestock, fisheries, forestry, and wildlife.

i) Agriculture

The agriculture sector of the bimodal rainforest is very vulnerable to high winds, heat waves, and temperature increase (Table 21). Factors like extreme poverty of the populations, lack of knowledge of the best adapted agricultural techniques, and the limited access to climatic information exacerbate the level of vulnerability.

Table 21: Level of the vulnerability of communities in the agriculture sector

Climatic events	Exposure (0-5)	Sensitivity (0-5)	Vulnerability (0-10)	Level of vulnerability
Rainfall variability	2,6	3	5,6	Moderate
Heat waves	3	3,5	6,5	Strong
High winds	3	3	6	Strong
Drought	1,5	1,5	3	Low
Flooding	0,5	1,25	1,75	Very Low
Erosion/landslides	1	1	2	Low

With respect to impacts, the bimodal rainforest experiences reduced yields caused by disruption of rainfall which in a long run could lead to food insecurity. There is also an increase in temperature which leads to the shortening of vegetative and early flowering cycles (RdC, 2021). Given that Agricultural activities occupy a very important part of the population a considerable decrease in yields will consequently cause a decrease in income. The impacts of climate change on agriculture have been listed in the table (22) below

Table 22: Climatic events and their impacts on agriculture in the Bimodal Rainforest Zone

Climate events	Impacts
Increase in temperature	• Decrease in productivity and agricultural production • Increased rate of crop loss • Shortened vegetative cycle • Early flowering • Pest proliferation
High winds	• Destruction of farms due to uprooting of trees and reduction of harvest
Rainfall variability	• Decrease in rainfall and decrease in agricultural productivity and production • Difficulty in accessing fields and markets for product sales • Loss of livelihoods and impoverishment of populations • Decline in soil fertility • Crop flooding • Reduced yields of rainfed crops • Decline in net income from crops
Drought	• Drying and destruction of crops • Decreased productivity • Reduction and drudgery of human work
Flooding	• Crop destruction, soil leaching
Landslides	• Crop destruction

Erosion	• Destruction of crops and soils • Destruction of infrastructures
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ii) Livestock

In the bimodal rainforest, the livestock activity is moderately vulnerable to climate change (the climactic event causes only minor disruption to the livestock sector). The level of vulnerability is presented in the table (23) below.

Table 23: Level of vulnerability of communities in the Livestock sector

Climate events	Exposure (0-5)	Sensitivity (0-5)	Vulnerability (0-10)	Level of vulnerability
Rainfall variability	1	1	2	Low
Heat waves	3	2,5	5,5	Moderate
High winds	1,25	1	2,25	Low
Drought	3	2,75	5,75	Moderate
Flooding	0,5	1,25	1,75	Very Low

Livestock production in the bimodal rainforest area is a traditional system. This system is impacted by climate change through diseases that lead to the loss of livestock. It contributes as a supplement not only to the food needs of the population but also their income. A summary of the impacts of climate change in the livestock sector is presented in Table (24) below

Table 24: Climate events and their impacts on livestock in the bimodal rainforest zone

Climatic events	Impacts
Increase in temperature	• Decrease in agricultural productivity and production • Decrease in pastures • High mortality and morbidity of livestock • Increase in the number of livestock in the mountains
Heat waves	• Decline in livestock productivity • Decrease in pastureland • High mortality and morbidity of livestock
Variability of rainfall	• Decreased water for livestock • Decrease of pastures • Proliferation of epizootics

iii) Fishing

The analysis of the vulnerability of fishing activity in the bimodal rainforest shows that fishing is highly vulnerable to drought, i.e., 85.71% (table 25) of the communities surveyed face moderate disturbance and there is a decrease in the fishery resource, reported by the population.

Table 25: Vulnerability of fisheries to climate change

Climate events	Exposure (0-5)	Sensitivity (0-5)	Vulnerability (0-10)	Level of vulnerability
Increase in temperature	2	3,75	5,75	Moderate

Variability of rainfall	4,25	2	6,25	Moderate
Drought	4	4	8	Strong
Flooding	3,25	2,75	6	Moderate
Erosion	2	1	3	Low

The fishing system around the parks in the bimodal rainforest is traditional. Climatic events such as rainfall variability, temperature increase, and drought have a strong impact on the fishing sector. The impacts identified are summarized in the table (26) below.

Table 26: Climatic events and their impacts on fishing

Climate Events		Impacts
Increase in temperature		• Loss of habitat for sensitive fish species • Increased plant evapotranspiration may decrease surface and groundwater availability • Changes in species composition • Decreased fisheries productivity • Depletion of fish stocks
Variability of rainfall		• Increase in species • Changes in species diversity and habitat
Drought		• Draining of lakes and ponds or reservoirs • Destruction of fingerlings

iv) Forest and related ecosystems

The forestry, silviculture and wildlife sectors are highly vulnerable to temperature increases and drought. Increased temperatures and drought disrupt the regeneration of certain plant species and can lead to the loss of biodiversity. The level of vulnerability of this forestry/silviculture and wildlife sector is presented in Table 27 below.

Table 27: Vulnerability of Forestry and Wildlife to Climate Change

Climate events	Exposure (0-5)	Sensitivity (0-5)	Vulnerability (0-10)	Level of vulnerability
Increase in temperature	3,75	2,75	6	Strong
Variation in rainfall intensity	2,75	1,75	4,5	Moderate
High winds	3	5	8	Strong
Drought	4	2,75	6,75	Strong
Flooding	2	1,5	3,5	Low
Landslides	1	1	2	Low
Erosion	2	3	6	Low

The bimodal rainforest has a great faunistic and floristic diversity which is affected by climatic events such as temperature increase, drought, erosion, and violent winds which lead to the disruption of tree growth and population dynamics of forest species. The impacts of climate change on forestry/silviculture/wildlife are listed in Table (28) below.

Table 28: Climate events and their impacts on forestry and wildlife

Climate events	Impacts
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Increase in temperature	• Increased aridity and loss of species habitat • Decrease in species • Unavailability of non-timber forest products • Reduced access to wood energy • Reduced livelihoods • Poverty and reduced income
Heat waves	• Water stress and decreased forest productivity • Increase in bush fires • Decrease in soil microfauna • Loss of biodiversity • Reduction of protected areas through deforestation
Variability of rainfall	• Probable increase in pests and parasites • Destruction of plants with low water tolerance • Fragmentation of habitats and destruction of ecosystems • Disruption of species dynamics and loss of some plant species • Disruption of the silvicultural calendar
High winds	• Destruction of trees (windfalls)
Drought	• Water deficit and reduction of biodiversity
Flooding	• Destruction of trees
Landslide	• Increase in land movement and destruction of plants
Erosion	• Loss of biodiversity

5.2.3. BAMBOUTOS-BAKOSSI LANDSCAPE

Climate change vulnerability and impacts are presented based on livelihoods sectors – agriculture, livestock, fisheries (small-scale or non-existent), forestry, and wildlife.

i) Agriculture

The agriculture sector in the western highland is highly vulnerable to drought and rainfall variability and both recorded percentages of 100% surveyed and 75% respectively from the community. The lack of climate information and awareness of irrigation exacerbates the vulnerability of communities. Table (29) below shows the level of the vulnerability.

Table 29: Level of vulnerability of agriculture to climate change

Climate events	Exposition (0-5)	Sensitivity (0-5)	Vulnerability (0-10)	Class of vulnerability
Rainfall variability	3,75	2,5	6,25	Strong
Drought	4,25	3,75	8	Very strong
Flooding	1	2		Low
Landslides	2	1	3	Low
Erosion	1	0,5	1,5	Very Low

The impacts faced by agriculture in the western highlands are increased invasions of insects and crop pests such as caterpillars on maize; crop damage due to extreme heat; planning problems due to unreliable forecasts; increased invasive species; decreased yields of irrigated crops; decreased effectiveness of herbicides and pesticides; increased erosion and water

stress. The impacts of climate change on agriculture in the western highlands are summarised in Table 30 below.

Table 30: Climate events and their impacts on agriculture

Climate events	Impacts
Increase in temperature	• Decrease in yields in the plains and lowlands • Increased insect attacks • Drying of field crops • Decreased water in hydro-agricultural dams • Increased risk of vegetation fires • Decreased availability of water resources
Rainfall variability	• Disruption of the agricultural calendar • Loss of seedlings • Decrease in rainfall and decrease in productivity and agricultural production • Difficulty in accessing fields and markets for produce • Loss of livelihoods and impoverishment • Increased rainfall intensity with land erosion • Crop flooding • Reduced yields of rainfed crops • Decline in income from crops
Drought	• Drying out and destruction of crops • Reduced productivity water shortage • Difficulty of human work
Flooding	• Destruction of crops, soil leaching
Landslides	• Destruction of crops, houses, property, infrastructure
Erosion	• Destruction of crops and soils

ii) Livestock

In the western highlands, livestock activity is very vulnerable to rainfall variability, drought, with 25% of the communities surveyed affected, and a low level of technical supervision of livestock farmers.

Table 31: Level of vulnerability of livestock to climate change

Climate events	Exposure (0-5)	Sensitivity (0-5)	Vulnerability (0-10)	Level of vulnerability
Increase in temperature	2	1	3	Very low
Rainfall variability	3,75	2,5	6,25	Strong
Drought	5	3,25	8,25	Very strong
Flooding	3	2	5	Moderate
Landslides	3,75	2	5,75	Moderate
Erosion	4	1,25	5,25	Moderate

In terms of impacts on livestock activity, there is a reduction of water resources, reduction of grazing land, and its colonization by species not consumed by livestock which pushes herders to look for new grazing land. Table (32) below summarizes the impacts of climate change on the livestock activity in the western highlands.

Table 32: Climate events and their impacts on livestock

Climate events	Impacts
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Increase in temperature and heat waves	• Decline in livestock productivity • Decrease in pastureland • High mortality and morbidity of livestock • Increase in the number of livestock in the mountains
Rainfall variability	• Decrease in water for livestock • Decrease in pastureland
Drought	• Increased risk of vegetation fires • Destruction of pastures
Flooding	• Destruction of pastures and loss of livestock
Landslides	• Destruction of pasture and livestock
Erosion	• Destruction of pasture and livestock

iii) Fishing

Fishing in the western highlands and its periphery is almost non-existent. Hence the vulnerability level is seen as low or negligible.

In terms of impacts, human pressure on natural resources and climate change, causes serious water shortages. The activity that is developing is fish farming. Consequently, the fishing/fish farming activities suffer from the impacts of climate change, as summarised in the table (33) below.

Table 33: Climate events and their impacts on fishing

Climatic events	Impacts
Increase in temperature	• Loss of habitat for sensitive fish species • Increased plant evapotranspiration may decrease surface and groundwater availability • Changes in species composition • Decreased fisheries productivity • Depletion of fish stocks
Rainfall variability	• Increased species habitat • Changes in species diversity
Drought	• Dewatering of lakes and ponds or reservoirs • Fingerling destruction
Flooding	• Destruction of ponds • Loss of species habitat and productive ponds • Decrease in fisheries resource
Landslides	• Destruction of ponds
Erosion	• Loss of species habitat and productive ponds • Silting of lakes and reservoirs

iv) Forest and related ecosystems

The forestry, silviculture, and wildlife are highly vulnerable to temperature increase, drought, erosion, and the fragility of the ecosystem, alongside demographic pressure, exacerbates the vulnerability.

Table 34: Vulnerability of Forestry and Wildlife to Climate Change

Climate events	Exposure (0-5)	Sensitivity (0-5)	Vulnerability (0-10)	Level of vulnerability
Increase in temperature	5	2,5	7,5	Strong
Heat waves	5	2,5	7,5	Strong
Variation in rainfall intensity	4,5	1,25	5,75	Moderate
High winds	3,5	2	5,5	Moderate
Drought	4	3	7	Strong
Flooding	2,5	2	4,5	Low
Landslides	2,5	1,25	3,75	Low
Erosion	3,5	3,25	6,75	Strong

The impacts of climate change on the forest ecosystems are decreasing rainfall, landslides, and erosion which lead to the loss of forests and biodiversity. The retention capacity of water is weakened by deforestation and degradation of watersheds, gallery forests, and raffia forests in lowlands. The impacts on the forestry, silviculture, and wildlife sector are summarized in Table (35) below.

Table 35: Climate events and their impacts on forestry and wildlife

Climatic events	Impacts
Increase in temperature	- Increased dryness and loss of species habitat - Reduced livelihoods - Decreased income
Heat waves	- Increased risk of bushfires - Decreased soil microfauna - Loss of biodiversity - Reduction of protected areas through deforestation
Rainfall variability	- Disruption of the silvicultural calendar - Destruction of plants with low water tolerance - Fragmentation of habitats and destruction of ecosystem
Drought	- Increased aridity and loss of species habitats - Increase in bush fires - Unavailability of non-timber forest products - Reduced accessibility to wood energy Loss of biodiversity
Flooding	Destruction of trees
Landslides	- Increased land movement and destruction of plants, loss of crops - Loss of biodiversity
Erosion	Destruction of plants, loss of crops, loss of biodiversity

5.3. WITHOUT-PROJECT SCENARIO

Cameroon's population, currently estimated at 28 million (2023) and projected to reach 42 million by 2050³, exerts rising pressure on land, forests, and water resources. With over 70%

³<https://population.un.org/dataportal/data/indicators/49/locations/120/start/1990/end/2030/bar/barvertical?df=77bb8851-3242-4b55-b16a-cc8c5219b266>

of people dependent on agriculture and forest resources for livelihoods, the country's natural capital is crucial for local subsistence and national development⁴. Yet, unsustainable land conversion, weak governance, and a changing climate have led to worsening poverty, food insecurity, and ecosystem degradation, especially in forest and highland regions. Without project intervention, communities in and around Permanent Forest Areas (PFAs)—notably the Waza (Sudano-Sahelian), Dja-Lobeke (Bimodal Rainforest), and Bakossi-Bamboutous (Western Highlands) landscapes—will face deepening livelihood insecurity, including declining agricultural productivity, livestock mortality, and fishery collapse, which will be exacerbated by climate change and poverty, driving further dependence on forest exploitation.

In Waza, the population is growing rapidly—from 4 million in 2000 to 9.3 million by 2025 (5.8% annual growth)—driving cropland expansion from 117,025 ha (2000) to 205,939 ha (2021), and accelerating loss of wet savannah ecosystems. Projected temperature increases of 1–4.8°C and annual rainfall declines of 2–14 mm, along with delayed onset and shorter wet seasons, intensify droughts—expected every two years—reducing vegetation cover by 30% and groundwater recharge by 15–20%. Reduced and erratic rainfall will push communities to clear additional forested areas in search of more productive agricultural land, further accelerating ecosystem degradation.

In the Bakossi-Bamboutous Highlands, with population densities reaching 400 inhabitants/km², forest decline from 574,148 ha (2000) to 558,644 ha (2021) has been accompanied by rainfall reductions of 8–25 mm by 2090 and temperature increases of 2.2–4.2°C, exacerbating soil erosion, landslides, and biodiversity loss.

In Dja-Lobeke, although 97.6% forest cover remains, population growth and agricultural expansion converted 25,709 ha of forest to cropland (2010–2021), increasing reliance on NTFPs and shifting cultivation. Average annual temperatures have already increased by 0.8–1°C (1950–2015) and are projected to rise by up to 4.8°C by 2090, while annual rainfall could decline by 2–14 mm, reducing soil moisture and increasing forest stress. Across the three landscapes, declining rainfall, delayed wet seasons, and rising temperatures are expected to intensify pressure on forests as communities seek higher yields, worsening vulnerability, food insecurity, and exposure to climate hazards for millions of people.

Nationwide, Cameroon has experienced significant forest cover loss, including within Permanent Forest Areas (PFAs), with a notable loss of 1.53 million hectares of tree cover between 2001 and 2020, including 47% in primary forests⁵. Annual forest cover loss is currently 0.12%; projections show that it may double by 2028 and triple by 2035. Projected temperature rises of 2–3°C by 2050 and erratic rainfall patterns—including delayed onset, shorter wet seasons, and intense downpours—will exacerbate soil degradation, declining soil moisture, and yield reductions of 20–25% in key crops (millet, sorghum, maize, and cowpea). Anticipated reductions in agricultural productivity will drive further expansion into forested areas, accelerating loss of non-timber forest products (NTFPs) and rangeland productivity, and deepening poverty for forest-dependent populations. Across the three landscapes, these dynamics are expected to directly and indirectly affect an estimated 2,300,000 people living around PFAs, exposing them to droughts, floods, and resource scarcity by mid-century. Without coordinated restoration, sustainable forest management, and livelihood diversification, ecosystem collapse will accelerate, carbon sequestration will decline, and

⁴Enoman, L.D. et al. 2024. Urban expansion and the loss of agricultural lands and forest cover in Limbe, Cameroon. Available [here](#).

⁵ <https://dicf.unepgrid.ch/cameroon/forest>

vulnerability will become entrenched, affecting Cameroon's long-term resilience and ability to meet national climate and development goals.

5.4. ADAPTATION OPTIONS/ACTIONS AND BENEFITS

This section presents the adaptation options/actions and benefits in the three targeted intervention areas. In Cameroon, the adaptive capacity of populations to climate change is low (Bele et al., 2011). The frequency and severity of climatic events ultimately undermine the adaptive capacity of populations in all agroecological zones (Bele et al., 2011). The adaptation options have been proposed based on a combination of information gathered during stakeholder consultations and literature as presented in the next sections.

5.4.1. WAZA LANDSCAPE

The adaptation options in the Waza landscape are presented in table 36

Table 36: Climate change adaptation option/actions and benefits in the Waza landscape

Climate events	Actions/options	Adaptation Benefits
Increase in temperature	• Systematic reforestation • Use of improved and more resistant varieties and seeds • Cereal conservation practices • Distribution, planting, and use of Moringa • Construction of dykes for rainwater retention	• Restoration of vegetation cover and carbon sequestration • Enhanced crop resilience and food security • Reduced post-harvest losses • Nutritional and medicinal benefits from Moringa • Improved water availability for agriculture
Heat Waves	• Living hedges and tree cover to protect crops	• Reduced heat stress on crops • Protection of soil and microclimate regulation
Dust storms	• Living hedges and tree cover to protect crops	• Windbreaks reduce soil erosion and crop damage • Improved air quality and visibility
Rainfall variability	• Modification of the agricultural calendar • Reforestation and construction of boreholes and wells • Improved and short cycle seeds • Use of drought-resistant varieties • Transhumance of livestock • Storage of agricultural residues for animal nutrition • Multiplication of fishing channels	• Improved farming practices aligning with rainfall patterns • Increased water access and reduced runoff • Reduced risk of crop failure • Sustained yields under dry conditions • Reduced deforestation and indoor air pollution • Livestock survival during dry spells • Reliable feed supply for animals • Diversified livelihoods and food sources

5.4.2. DJA-LOBEKE LANDSCAPE

The adaptation options in the Dja-Lobeke landscape are presented in table 37.

Table 37: Climate change adaptation option/action and benefits in the Dja-Lobeke

Climate events	Actions/options	Adaptation Benefits
Increase in Temperature and Heat Waves	• Use of improved seeds to counteract the decline in agricultural production • Fight against bushfires and heatwaves to avoid the destruction of plantations by clearing Agroforestry, introducing associated crops, and agricultural diversification • Creation of community forests	• Improved crop resilience and yields under heat stress • Reduced risk of plantation loss and soil degradation • Enhanced biodiversity and diversified income from NTFPs • Increased access to wood energy and ecosystem services such as water infiltration and protection of watersheds
Rainfall variability	• Modification of the agricultural calendar • Reforestation	• Improved farming activities aligned with rainfall patterns • Stabilization of microclimates and reduced runoff
Drought	• Displacement of livestock during prolonged drought	• Sustained livestock survival and productivity • Reduced pressure on depleted local resources
Flooding	• Use of impregnated mosquito nets • Diversification of livelihoods • Construction of dykes with sandbags	• Reduced incidence of vector-borne diseases • Increased household resilience and income security • Protection of homes and fields from floodwaters
Erosion	• Restoration of eroded land (backfilling)	• Recovery of productive land and prevention of further soil loss

5.4.3. BAKOSSI -BAMBOUTOS LANDSCAPE

Table 38: Climate change adaptation options/actions and adaptation benefits in the Bamboutous-Bakossi landscape

Climatic events	Actions/options	Adaptation Benefits
Increase in temperature	• Use of improved seeds to counteract the decline in agricultural production • Irrigation and creation of off-season nurseries • Reforestation	• Improved agricultural yields through drought-tolerant crops • Increased carbon stocks; gradual restoration of habitats

	• Fight against bush fires to avoid forage destruction • Creation of cereal processing units • Agroforestry, introduction of associated crops, agricultural diversification • Creation of community and communal forests	• Provision of wood energy and fodder and enhanced livelihood resilience • Increased energy sources such as firewood and household income from handicrafts, wine production, etc
Variation in rainfall intensity	• Change in agricultural calendar • Reforestation of riverbanks	• Reduced risk of crop failure • Stabilization of riverbanks and prevention of soil erosion and flooding
High winds	• Living hedges and tree cover to protect crops and homes	• Windbreaks reduce crop damage • Protection of infrastructure and homes • Enhanced microclimates for agriculture
Drought	• Transhumance to regions with pastoral potential (pasture and water) • Irrigation • Production of off-season crops	• Sustained livestock productivity • Improved water availability • Year-round food production and income diversification
Flooding	• Use of impregnated mosquito nets • Reforestation of river valleys • Diversification of the means of subsistence	• Reduced risk of waterborne diseases • Flood mitigation and soil retention benefits • Increased household resilience and food security
Landslides	• Reforestation of steep mountain slopes • Introduction of improved seeds and fast-growing varieties • Terrace crops • Living hedges to protect crops	• Stabilization of slopes and reduced erosion • Faster vegetation cover and soil retention • Increased agricultural productivity on slopes
Erosion	• Reforestation and shoreline protection • Construction of hedges • Terrace cultivation • Water control and restoration of eroded lands	• Reduced soil loss and improved fertility • Protection of farmland and infrastructure • Restoration of degraded ecosystems

5.5. CONSTRAINTS OR BARRIERS TO THE UPTAKE OF ADAPTATION ACTIONS

Adaptation measures can make people more resilient to climate change, however, they will face several barriers that may be political, technical, institutional, and legal. It should be noted that these barriers are the same for all three intervention sites. The barriers related to the implementation of adaptation options can be seen below as the aforementioned thematic:

Institutional and regulatory barriers

The institutional barriers identified for the three intervention sites are as follows:

- Poor governance that promotes pressure on the exploitation of natural resources (illegal felling of trees, poaching, carbonization, illegal fishing techniques).
- Non-compliance with regulations: some institutions have pointed out that, for example, the regulations on the limitation of fishing channels are not respected by the population.
- Insecurity, exacerbates the phenomenon of internal and external displacement, which puts pressure on resources.
- The lack of resources and understaffing that limit the deployment of agents in the field. MINADER, for example, explains that the distribution of improved seeds to cope with climate change is very limited and insufficient. MINFOF points out that resources (material, human) are very limited to meet the need for landscape restoration, which is necessary due to the pressure on forest resources (Waza area and its periphery).
- Land tenure insecurity and limited rights of access to land, as well as insufficient capacity for resource use, planning and monitoring.
- Any robust response to deforestation and forest degradation depends heavily on access to land and security of rights. Field visits to the project areas revealed that land access rights are based on haphazard and insecure practices.
- Fragmented approach to actions to combat climate change. Poor processing and dissemination of climate information.

Access to quality climate information is an essential element in decision-making and planning for adaptation and resilience. Weaknesses in the processing and dissemination of climate information are a barrier to the availability of warning systems. The climate information communication system is limited and needs to be improved in order to make the information usable and accessible at local and community level. Climatic information linked to the agricultural calendar currently made available by the ONACC is not accessible to people in remote rural areas due to

- i) of the communications channels used and therefore the population do not have access,
- ii) the language barrier, which makes it difficult for key users such as farmers to access and appropriate the information.

The weakness of the organisational and decision-making process for the early warning system limits the delivery of effective climate information services. Climate information is most useful when it is produced and understood following a dialogue between climatologists, local forecasters, intermediaries providing related support services and users such as farmers, livestock breeders, project and programme staff

Technical Barriers

The technical barriers identified for the three-intervention site were:

- Low access and technological mastery. In spite of the drought and climatic variability, the population does not have control over irrigation or the technologies that can promote irrigation.
- Difficulty in communicating with the communities due to the linguistic limits
- Poor mastery of restoration practices that are resilient in the face of climate change, resulting in poor execution of site restoration techniques

Socio-cultural barriers

The cultural obstacles identified in the implementation of adaptation options are those linked to the perception of climate change by communities living near protected areas, a very low level of education and community conflicts.

People's perception of climate change differs from one culture to another. They may favour adaptation to climate change. The perception of climate change in some communities is based

on superstition, so the solutions to late rains and drought are prayers and sacrifices (such as offerings to small children, animal sacrifices, etc.).

Inter-community conflicts are most often linked to the management of natural resources such as land, water, grazing, etc. There are conflicts between herders and farmers. Particular emphasis needs to be placed on the governance of land development plans.

Economic and financial barriers

The economic and financial barriers identified for the three intervention sites were:

- Insufficient or no financial means.
- Difficulties in mobilizing financial resources.
- Weakness or absence of budget allocated to climate change.
- The weak development of the agricultural value chain and non-timber forest products, as well as the isolation of the three landscapes, make market access at national, regional and international level complex. Weaknesses in the processing of agricultural products and non-timber forest products are linked to poor mastery of processing and insufficient resources to access innovative technologies.

6. CLIMATE RATIONALE – MITIGATION

This section provides an overview of land use change and forest cover loss, including their drivers, restoration potentials, actions to avoid carbon emissions from forest cover loss and actions to restore degraded lands for carbon sequestration. The mitigation potentials for both avoided deforestation and restoration activities are also presented (See ANNEX 22A for more information).

6.1. FOREST COVER AND LAND USE CHANGE

6.1.1. WAZA LANDSCAPE

The WAZA Landscape in the Sudano-Sahelian zone of Cameroon is an ecosystem with multiple potentials that contributes to the economic and social development of the riparian populations. Because of all its potential, the landscape is highly prized and subject to multiple pressures and threats that endanger the country's permanent forest estate.

6.1.1.1. Status of land use in the Waza landscape in 2000

In 2000, the Waza landscape is largely occupied by wet grassy savannahs (271,124.37 hectares), or 41.66% of the landscape. This wetland, which is located along the border with Chad, was classified as a RAMSAR site in 2012. Forests cover 247,541.58 hectares of the landscape, i.e. 38.04% of spatial occupancy. Grassland savannahs (72,502.29 hectares) constitute 11.14% of the spatial occupations. Cultivated areas or agricultural plantations, which are located in the southwestern part of the landscape (Figure 3), occupy 56,001.06 hectares, or 8.61% of the area. The other land uses are water areas and inhabited areas, which represent 0.45% and 0.10% of the landscape area respectively. Table 11 presents the land use statistics for the WAZA Landscape in 2000. Figure 5 shows the spatial distribution of the different land use categories in the WAZA landscape in 2000.

Table 39: Land use statistics in the Waza Landscape in 2000

Landcover	Area (2000)	%
Humid grassland savannah	271 124,37	41,66
Built up area	630,99	0,10

Cropland	56 001,06	8,61
Grassland	72 502,29	11,14
Forest	247 541,58	38,04
Water surface	2 956,05	0,45
Total	650 756,34	100

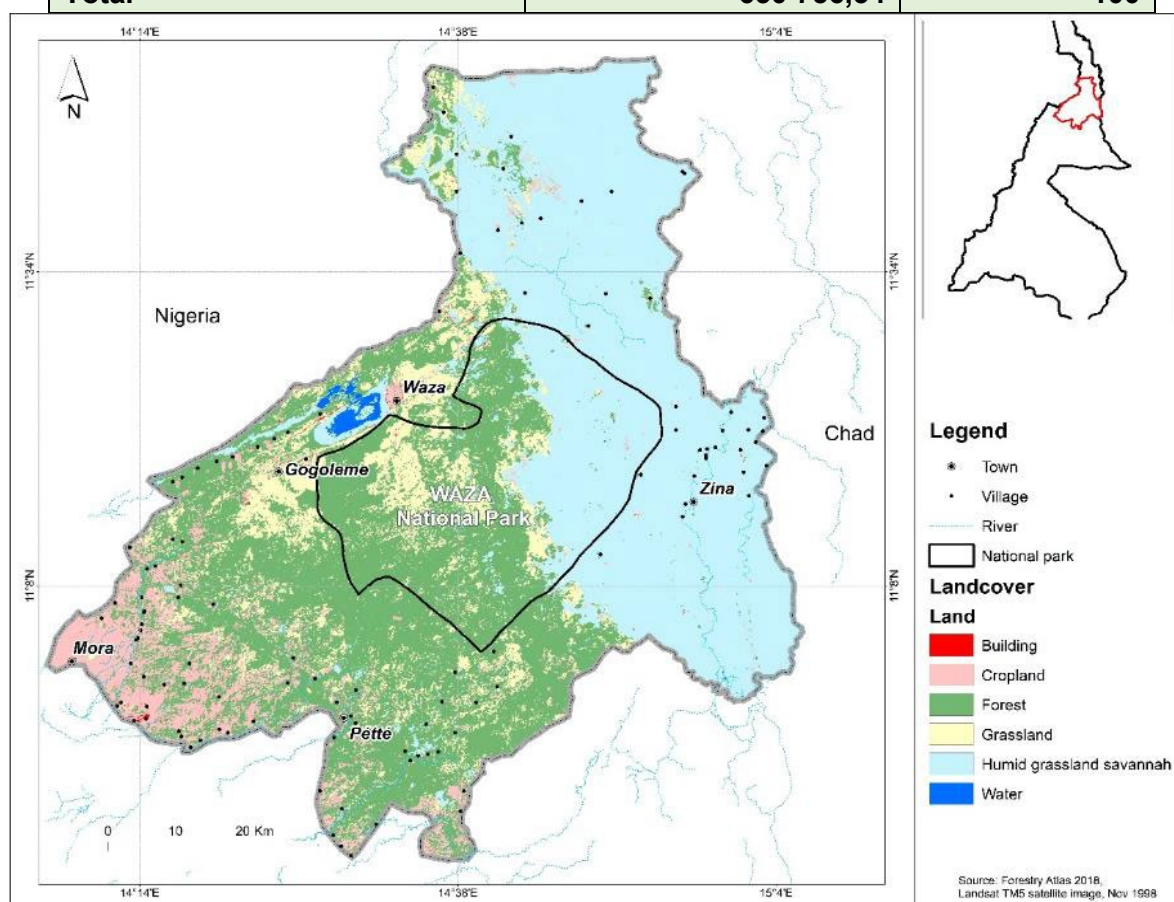


Figure 5: Land cover map of Waza landscape in 2000

6.1.1.2. Status of land use in the Waza landscape in 2010

In 2010, the physiognomy of the Waza landscape is still dominated by wet grassy savannahs on the one hand and forests on the other (Figure 9). Wet grassy savannahs occupied 41.17% of the landscape, or 267,907.86 hectares. Forests covered almost the entire landscape with a proportion of 23.64% (153,855.09 hectares). Cultivated land accounted for 18.42%, corresponding to 119 866.77 hectares of the landscape. Other land use categories such as inhabited areas, grassy savannahs and water areas represented 0.16%, 16.14% and 0.47% of the spatial occupations of the landscape in 2010 respectively (Table 12).

Table 40: Land use statistics in the Waza Landscape in 2010

Landcover	Area (2010)	%
Humid grassland savannah	267907.86	41.17
Built up area	1039.95	0.16
Cropland	119866.77	18.42

Grassland	105056.37	16.14
Forest	153855.09	23.64
Water surface	3030.3	0.47
Total	650 756.34	100.00

The spatialization of land use in the Waza landscape in 2010 is presented in the figure below.

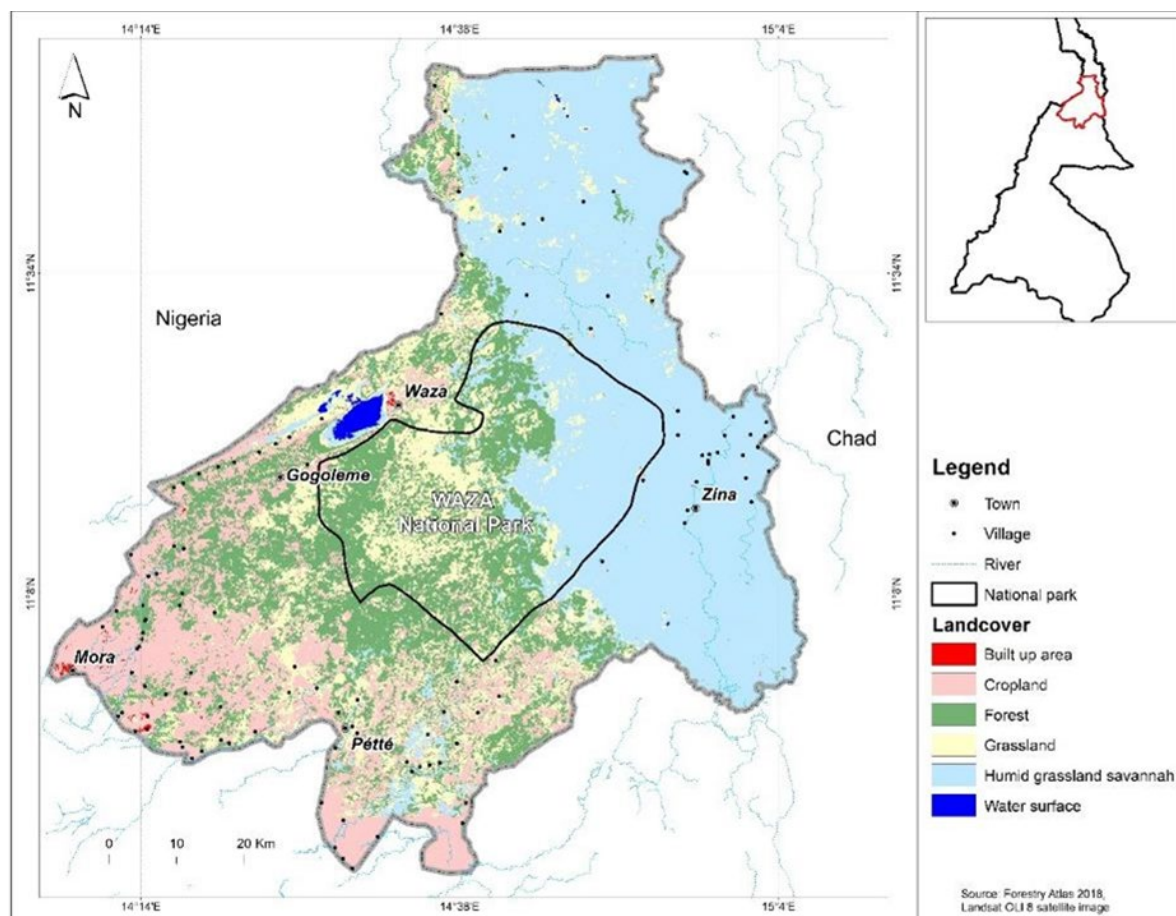


Figure 6: Land cover map of Waza landscape in 2010

6.1.1.3. Status of land use in the Waza landscape in 2021

In 2021, the Waza landscape is mainly made up of wet grassy savannahs and cultivated areas. Wet grassy savannahs occupy 236,204.55 hectares, or 36.30% of the landscape, compared to 32.27% (210,025.08 hectares) for cultivated land (millet/sorghum). Grassland savannahs represent 107,414.73 hectares, i.e. 16.51%, compared to 0.73% for housing areas (4,755.69 hectares), 13.65% for forests (88,811.28 hectares) and 0.54% for water bodies (3,545.01 hectares) (Table 13).

Table 41: Land use statistics in the Waza Landscape in 2021

Landcover	Area (2021)	%
Humid grassland savannah	236204.55	36.30
Built up area	4755.69	0.73
Cropland	210025.08	32.27
Grassland	107414.73	16.51
Forest	88811.28	13.65

Water surface	3545.01	0.54
Total	650756.34	100

The spatial distribution of the different land-use categories in the WAZA landscape in 2021 is presented in Figure 7.

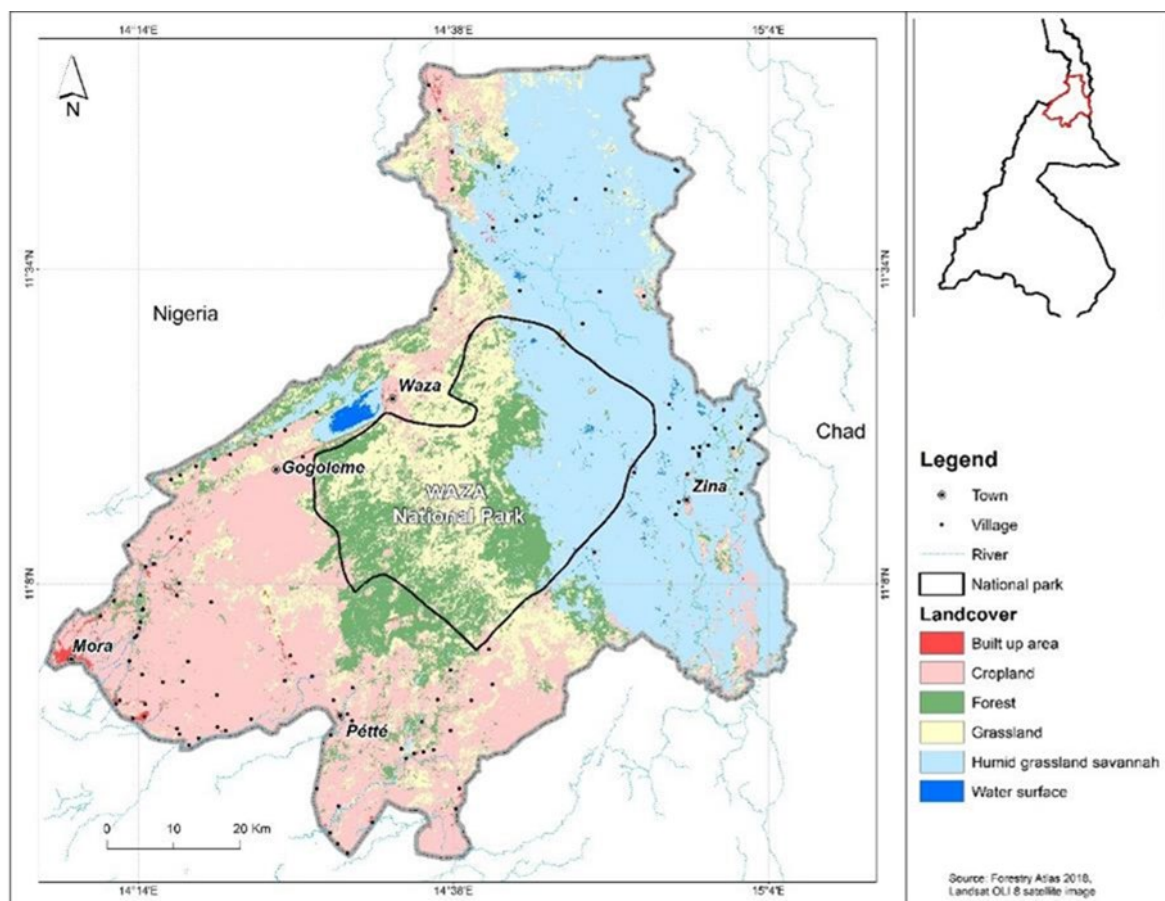


Figure 7: Land cover map of Waza landscape in 2021

6.1.1.4. Land-use change in the Waza landscape between 2000 and 2010

Table 14 presents the land cover transition matrix between 2000 and 2010. The diagonals of each matrix indicate the proportion of land use classes that showed persistence between 2000 and 2010. The off-diagonal entries represent land uses that showed transitions from one class to other classes over the study period. Between 2000 and 2010, the most spectacular land use category in terms of changes is cultivated land, which shows a significant increase at a relatively high rate, accounting for almost 18.37% of land consumption. This increase is at the expense of forest land, particularly in the south-east-western sectors. The January 2022 socio-economic surveys conducted in the Waza Landscape identified agriculture as a driver of forest land conversion. In addition, the most persistent classes are wet grassy savannah and water bodies.

Table 42: Areas in ha of land-use change in the Waza landscape between 2000 and 2010

Landcover

2010

		Humid grassland savannah	Built up area	Cropland	Grassland	Forest	Water surface	Total	%
2000	Humid grassland savannah	247642.11	64.98	2590.11	13900.23	6002.46	913.14	271113.03	41.6
	Built up area	0.9	630.99	0.6	0.82	0	0	633.31	0.1
	Cropland	2192.4	719.19	37571.4	6365.7	9133.02	9	55990.71	8.6
	Grassland	3850.2	63.45	16580.97	23930.1	28071.9	1.71	72498.33	11.1
	Forest	13581.63	103.86	62775.99	60412.14	110569.68	79.47	247522.77	38.0
	Water surface	568.71	42.59	24.12	322.38	13.41	2026.98	2998.19	0.4
	Total	267835.95	1625.06	119543.19	104931.37	153790.47	3030.3	650756.34	100
	%	41.16	0.25	18.37	16.12	23.63	0.47	100	

Table 42 shows the evolution of the different land use categories between 2000 and 2010. The land use class that has progressed the most is cultivated land, which has increased from 56,001.06 hectares in 2000 to 119,866.77 hectares in 2021, i.e. an increase of 63,865.71 hectares, corresponding to an annual rate of change of 6.34%. This expansion of cultivated land is explained by the galloping population explosion observed since the 2005 census. Residential areas have also increased dramatically. They have increased from 630.99 hectares in 2000 to 1039.95 hectares in 2010, i.e. an increase of 408.96 hectares corresponding to an annual rate of change of 4.16%. Forests, however, have declined dramatically. They fell from 247,541.58 hectares in 2000 to 153,855.09 hectares in 2010, a loss of 93,686.49 hectares, corresponding to an annual rate of change of 3.96%. Grassland savannahs increased from 72,502.29 hectares in 2000 to 105,056.37 hectares in 2010, i.e. an increase of 32,554.08 hectares, for an annual change rate of 3.09%. Wet savannahs are more or less stable with an annual rate of change of 0.10%.

Table 43: Evolution of the areas of the different categories over the period 2000 and 2010

Landcover	Area (2000)	Area (2010)	Surface variation	Rate
Humid grassland savannah	271124.37	267907.86	-3216.51	-0.10
Built up area	630.99	1039.95	408.96	4.16
Cropland	56001.06	119866.77	63865.71	6.34
Grassland	72502.29	105056.37	32554.08	3.09
Forest	247541.58	153855.09	-93686.49	-3.96
Water surface	2956.05	3030.3	74.25	0.21
Total	650756.34	650756.34		

The figure below shows the spatialization of deforestation hotspots between 2000 and 2010. During this period, 136,953.09 hectares of forest land were converted to non-forest land.

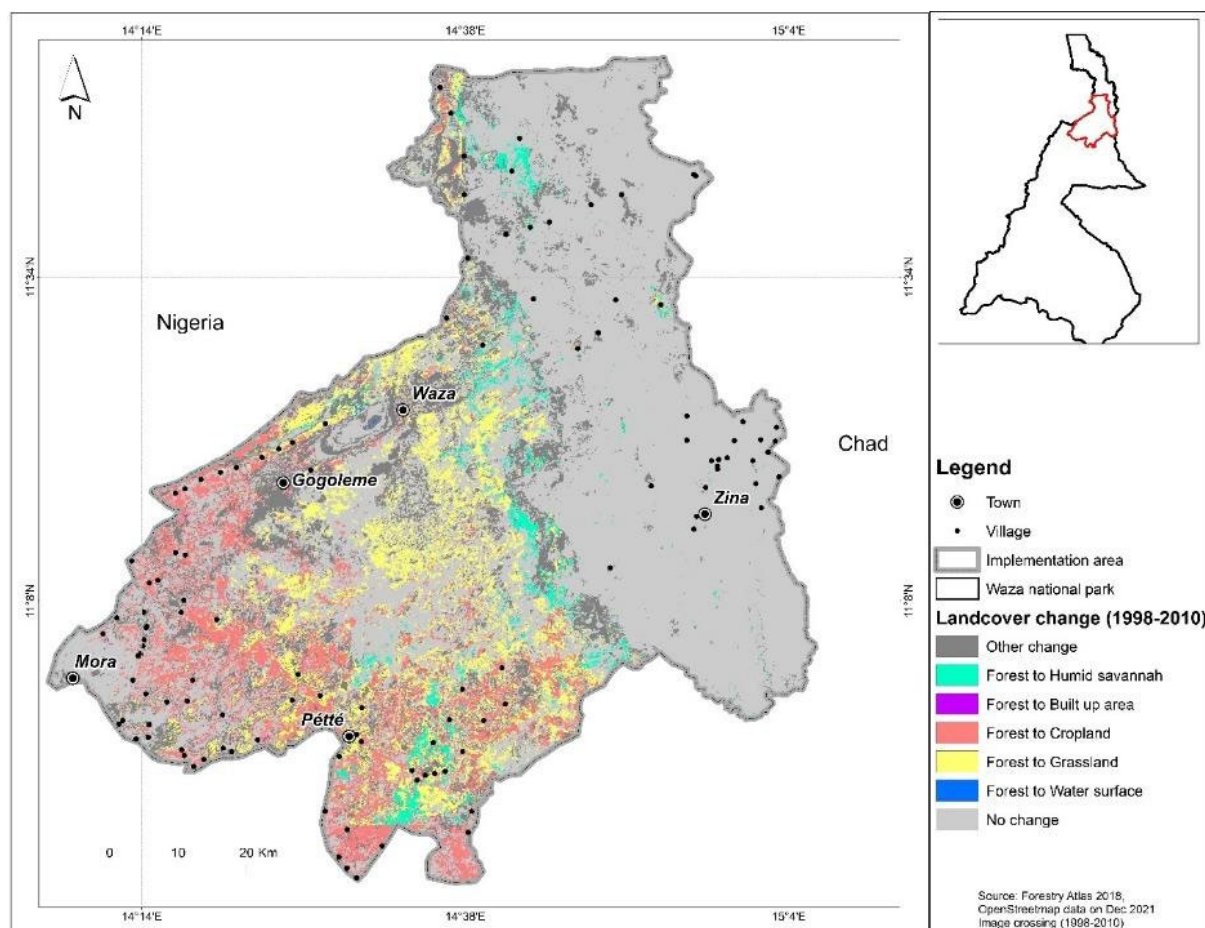


Figure 8: Conversion of forest to other land categories in the Waza landscape between 2000 and 2010

6.1.1.5. Land-use change in the Waza landscape between 2010 and 2021

The statistics in Table 44, derived from the cross-tabulation of the 2010 and 2021 land-use maps, show the overall persistence of three categories: grassy savannahs, water areas and wetlands, which have undergone some minor changes. Built-up areas, cultivated areas and forests show notable gains in surface area, with rates ranging from 5 ha/year to more than 13 ha/year across the Waza landscape (Table 16). The area under cultivation has increased significantly and at a relatively high rate, accounting for almost 32% of land consumption (Table 16). This increase is taking place at the expense of forest land, particularly in the south-east and far from inhabited areas. Thus, the area surrounding the WNP is the main area affected by this land-use change (Figure 13).

Table 44: Cross-tabulation of land use in 2010 (horizontal) and 2021 (vertical)

		2021							
Landcover		Humid grassland savannah	Built up area	Cropland	Grassland	Forest	Water surface	Total	%
2010	Humid grassland savannah	220741.65	270.45	17082.63	15102.99	12899.61	1765.62	267862.95	41.16
	Built up area	0.43	1029.57	9.95	0	0	0	1039.95	0.16

	Cropland	772.2	2640.69	94794.48	14713.74	6939.81	5.85	119866.77	18.42
	Grassland	10652.67	651.69	40575.51	33221.52	19932.66	22.32	105056.37	16.14
	Forest	2767.05	661.23	57131.1	44276.49	49013.46	5.76	153855.09	23.64
	Water surface	1257.3	44.91	2.16	19.53	5.85	1745.46	3075.21	0.47
	Total	236191.3	5298.54	209595.83	107334.27	88791.39	3545.01	650756.34	100
	%	36.29	0.81	32.21	16.49	13.64	0.54	100	

The evolution of the different categories of land use shows significant changes. This is the case, for example, for crops, which have increased from 119,866.77 hectares in 2010 to 210,025.08 hectares in 2021, i.e. an increase of 90,158.31 hectares, corresponding to an annual change rate of 5.10%. This expansion of cultivated land is explained by the galloping demographic explosion, coupled with the migration of certain populations who find refuge in the periphery of the PNW. However, the forests have regressed dramatically. They have fallen from 153,855.09 hectares in 2010 to 88,811.28 hectares in 2021, i.e. a loss of surface area of 6,043.81 hectares, corresponding to an annual rate of change of 5%. Grassland savannahs have increased from 105,056.37 ha in 2010 to 107,414.73 ha in 2021, i.e. an increase of 2,358.36 ha, for an annual rate of change of 0.20%. Wet savannahs have decreased by about 31 703.31 ha (1.14%). They have decreased from 267907.86 ha in 2010 to 236204.55 ha in 2021. Residential areas have almost doubled. They have increased from 1039.95 ha in 2010 to 4 755.69 ha in 2021, i.e. an increase of 3715.74 ha for an annual change rate of 13.82%. This increase in surface area is justified by the proliferation of new villages, the main cause of which is the growing insecurity in the Waza landscape (ANNEX 22A).

Table 45: Evolution of the areas of the different categories over the period 2010 and 2021

Landcover	Area (2010)	Area (2021)	Surface variation	Rate (%)
Humid grassland savannah	267907.86	236204.55	-31703.31	-1.14
Built up area	1039.95	4755.69	3715.74	13.82
Cropland	119866.77	210025.08	90158.31	5.10
Grassland	105056.37	107414.73	2358.36	0.20
Forest	153855.09	88811.28	-65043.81	-5
Water surface	3030.3	3545.01	514.71	1.43
Total	650756.34	650756.34		

Data from the cross-referencing of classified satellite images (2010-2021) has enabled the spatialization of hotspot areas in the Waza Landscape between 2010 and 2021. These deforestation hotspots are located in the south-western and north-western part of the landscape (Figure 9), and result in the conversion of forests to cropland, grassland and human settlements. During this period, 104,841.63 hectares of forest disappeared. The villages or localities that contributed to this loss of forest cover could be Mora, Gogolema, Lougouma, Waza, Petté, Dieguéré and Andirni, as they are located in the major deforestation areas.

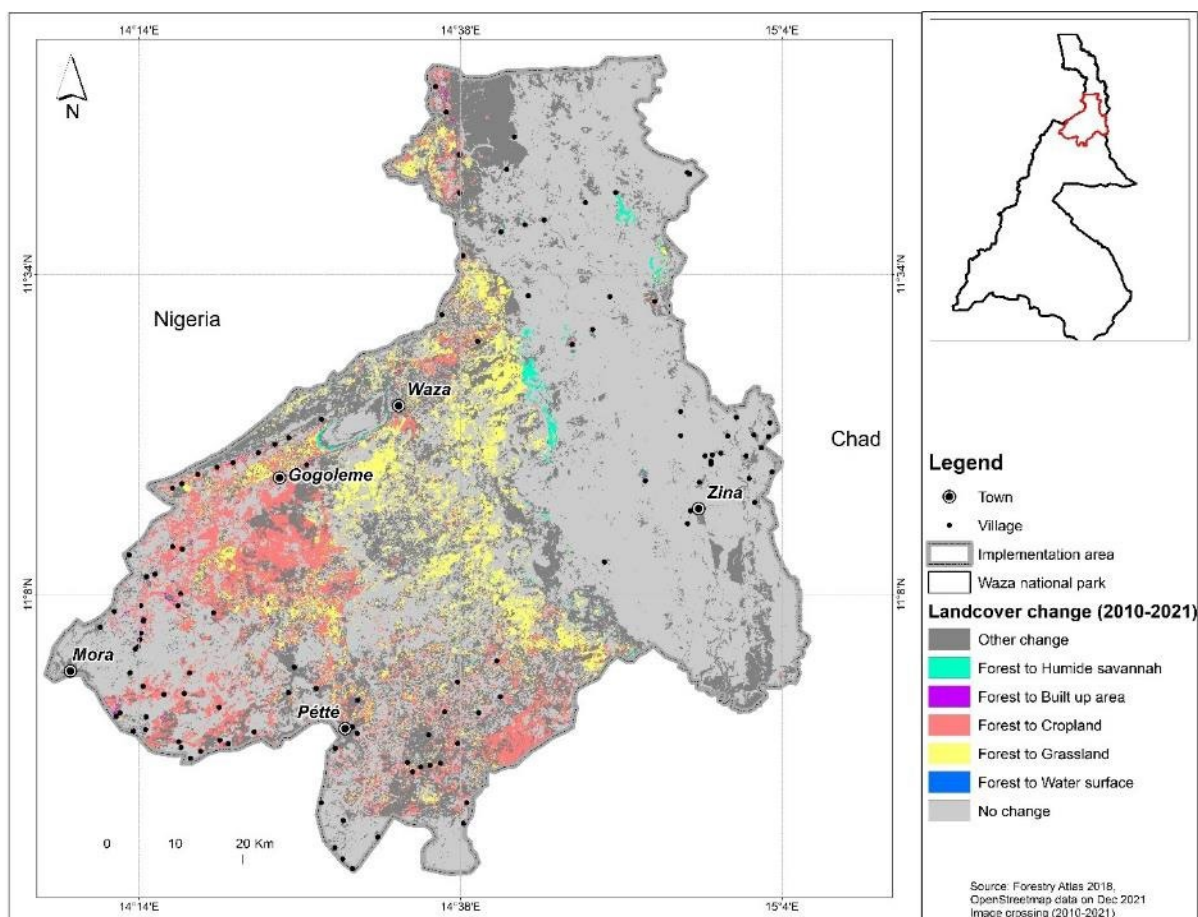


Figure 9: Conversion of forest to other land categories in the Waza landscape between 2010 and 2021

6.1.2. DJA-LOBEKE LANDSCAPE

The Dja-Lobéké landscape is covered by lowland dense rainforest. Plant formations are dominated by *Ulmaceae*, *Sterculiaceae* (Ayous, Kola, ...), *Meliaceae* (Sapelli, Sipo, Kossipo, ...). The most threatened plant species are *Autranella congoensis*, *Pericopsis alata*, *Diospyros crassiflora*, *Swartzia fistuloides*, *Khaya spp.* and *Entadrophragma spp.*

The land cover consists of dense evergreen moist forest with high density, dense evergreen moist forest with low density, dense evergreen moist forest with high density of forest gaps, dense moist forest with low density of forest gaps, old growth secondary forest with high density, temporarily flooded swamps, raphial swamps, cultivated land and housing areas.

6.1.2.1. Status of land use in the Dja-Lobeke Landscape in 2000

Table 47 and Figure 10 highlight the statistics and spatialization of land use in the Dja-Lobéké Landscape in 2000. During this period, this landscape was covered mostly by forests, i.e., 6,413,488.35 hectares (98.11%). Cultivated areas occupied 96,737.80 hectares (1.48%) of the area. Residential areas and water bodies occupied 7,757.68 hectares (0.12%) and 19,246.66 hectares (0.29%) respectively.

Table 46: Land-use statistics for the Dja-Lobéké Landscape in 2000

Landcover	Area (ha)	%
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Forest	6 413 488.35	98.11
Built up area	7 757.68	0.12
Cropland	96 737.80	1.48
Water surface	19 246.66	0.29
Total	6 537 230.49	100

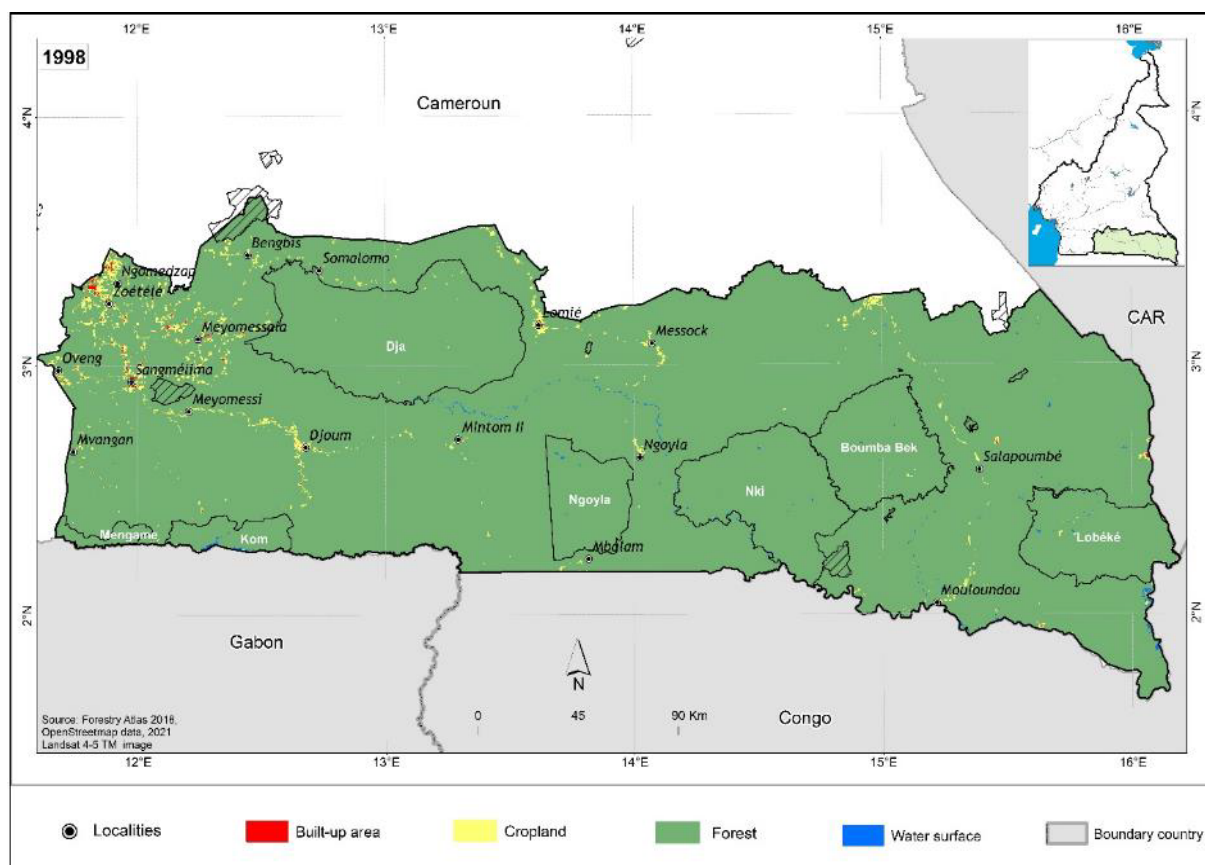


Figure 10 : Land use in the Ngoyla-Lobéké landscape in 2000

6.1.2.2. Status of land use in the Dja-Lobeke Landscape in 2010

In 2010, forests in the Dja-Lobéké Landscape represent 97.97%, or 6,404,769.29 hectares of forest. Crops occupy 103,952.91 hectares (1.59%). Residential areas and water bodies occupy 9042.62 hectares (0.14%) and 19,465.67 hectares (0.30%) respectively.

Table 47: Land-use statistics for the Dja-Lobéké Landscape in 2010

Landcover	Area (ha)	%
Forest	6 404 769.29	97.97
Built up area	9042.62	0.14
Cropland	103 952.91	1.59
Water surface	19 465.67	0.30
Total	6 537 230.49	100

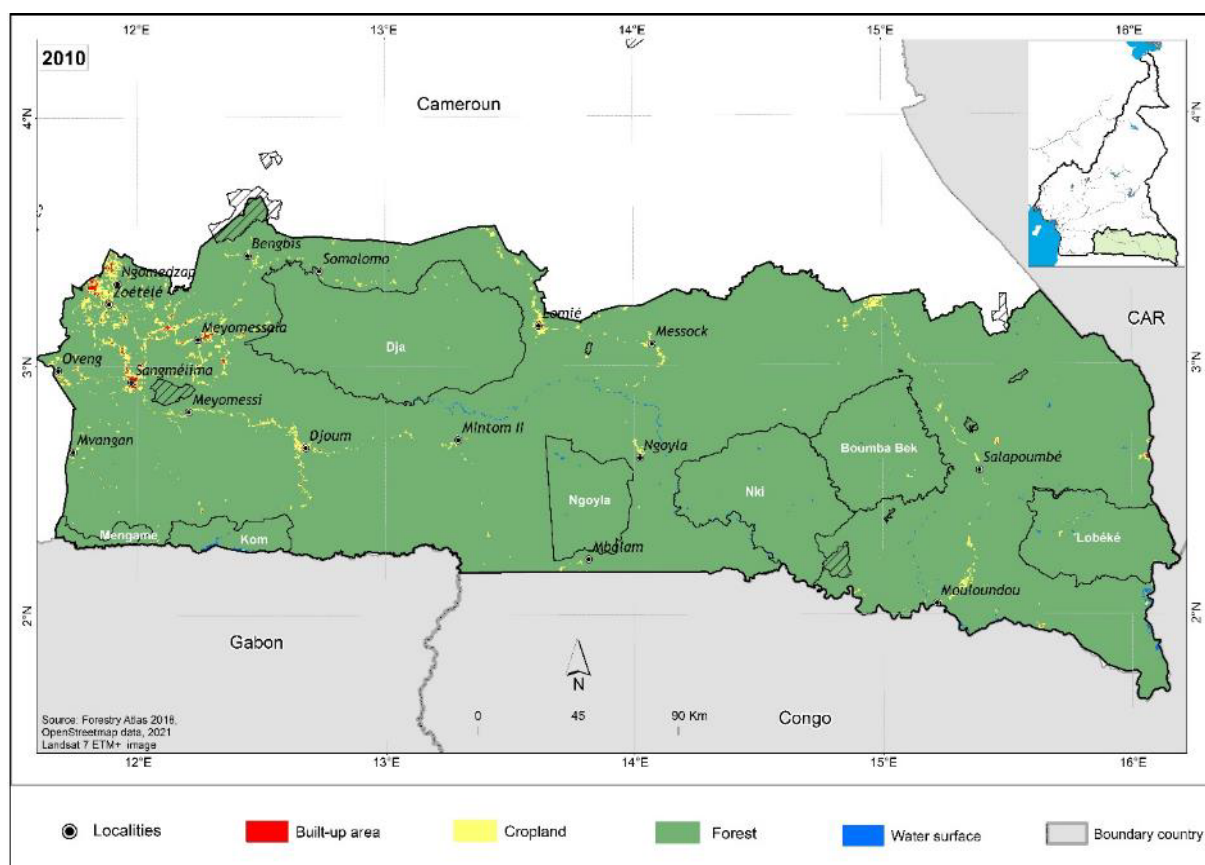


Figure 11: Land use in the Dja-Lobéké landscape in 2010

6.1.2.3. Status of land use in the Dja-Lobeke Landscape in 2021

In 2021, forests in the Dja-Lobéké landscape alone account for 97.64% (6,383,247.68 hectares), compared to 1.92% (125,484.05 hectares) of crops. Other types of land use, such as inhabited areas and water bodies, account for 0.14% (9,156.92 hectares) and 0.30% (19,341.85 hectares) respectively. Figure 13 and Table 49 present the statistics and spatialization of land use in the Dja et Lobéké landscape in 2021.

Table 48: Land-use statistics for the Dja-Lobéké Landscape in 2021

Landcover	Area (ha)	%
Forest	6 383 247.68	97,64
Built up area	9 156.92	0,14
Cropland	125 484.05	1,92
Water surface	19 341.85	0,30
Total	6 537 230.49	100

Figure 13 shows the distribution of land-use classes in the Ngoyla-Lobéké landscape in 2021.

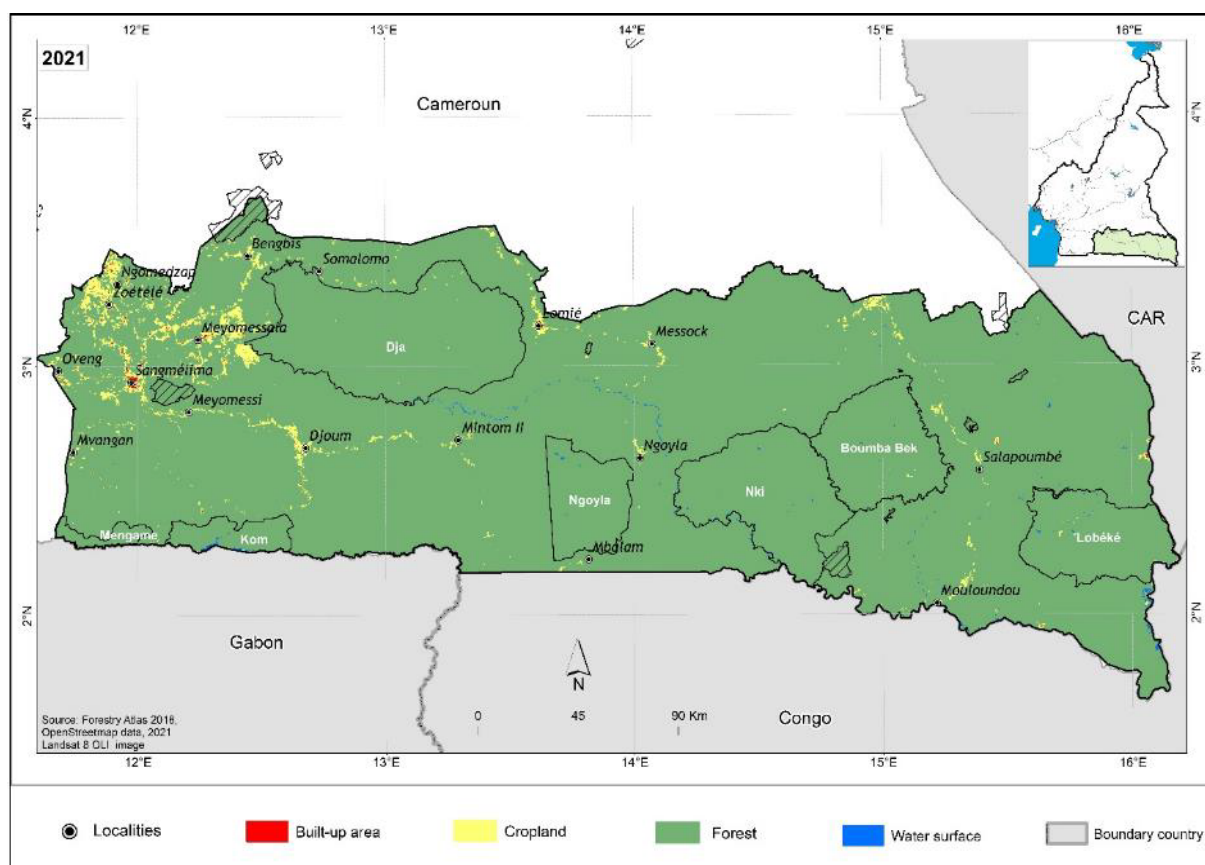


Figure 12: Land use in the Ngoyla-Lobéké landscape in 2021

6.1.2.4. Land use change in the Dja-Lobéké Landscape between 2000 and 2010

Table 50 presents the land cover transition matrix between 2000 and 2010. The diagonals of each matrix indicate the proportion of land use classes that showed persistence between 2000 and 2010. The off-diagonal entries represent land uses that showed transitions from one class to other classes over the study period. In 2000, cropland occupied 1.48% of the landscape, extending around roads and between forest concessions, protected areas and community forests. It increased from 96,737.80 hectares in 2000 to 103,952.91 hectares in 2010, an increase of 7,215.12 hectares between the two periods (ANNEX 22A). Forests are the main contributors to the expansion of new cultivated land (15,743.81 hectares). The decline in forests is attributed to agricultural expansion and the extension of inhabited areas. The January 2022 socio-economic surveys conducted in the landscape identified agriculture as the main driver of forest land conversion.

Table 49: Area in ha of land-use change in the Dja-Lobéké Landscape between 2000 and 2010

Land use class	Forest	Built up area	Cropland	Water	Total
Forest	6 395 974,08	1 684,80	15 743,81	85,67	6 413 488,36
Built up area	0	7 472,12	0	0	7 472,12
Cropland	8 795,21	285,56	87 923,55	19,04	97 023,36

Water surface	0	0	0	19 246.66	19 246.66
Total	6 404 769.29	9 442.48	103 667.36	19 351.37	6 537 230.50
%	97.97	0.14	1.59	0.30	

Figure 14 illustrates the main deforestation hotspots in the Dja-Lobéké Landscape between 2000 and 2010. These areas are located more in the northwestern part of the landscape.

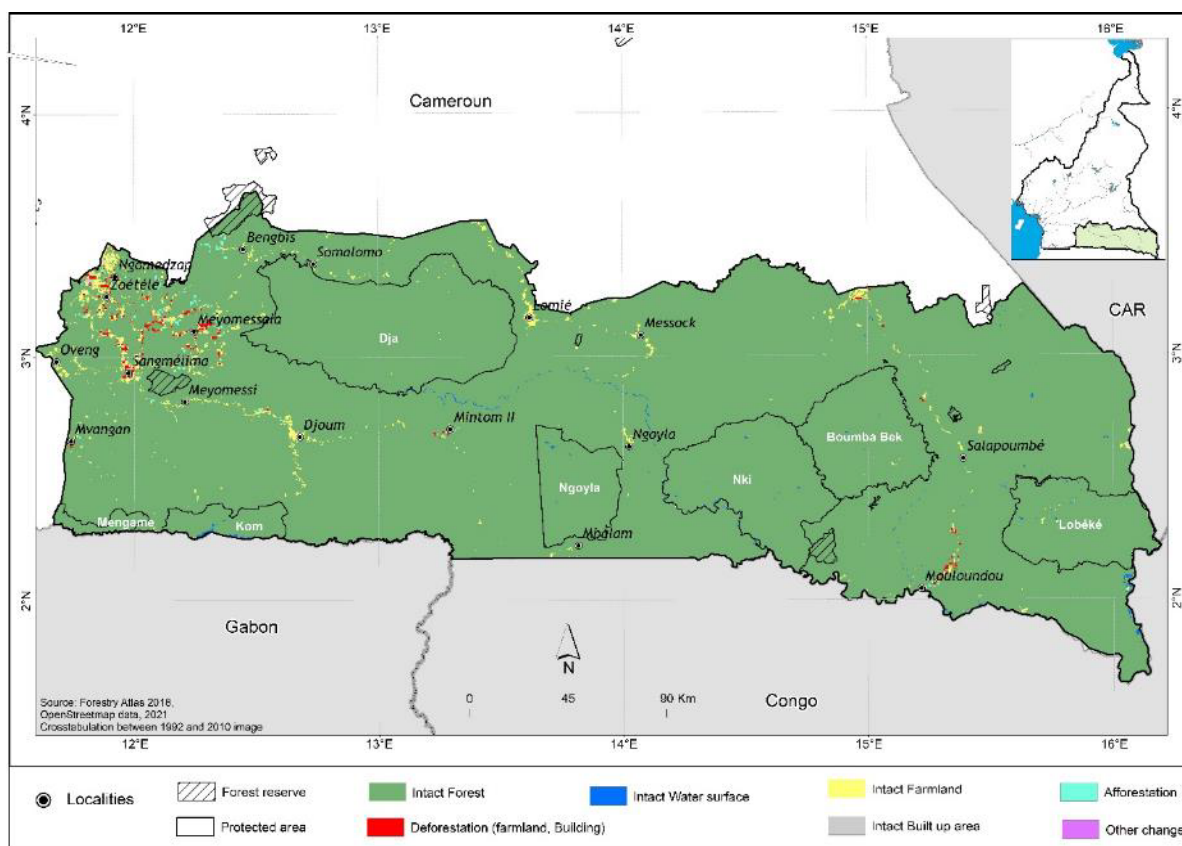


Figure 13: Conversion of forest to other land categories in the Dja-Lobéké Landscape between 2000 and 2010

6.1.2.5. Land-use change in the Dja-Lobéké Landscape between 2010 and 2021

Over the period 2010 to 2021, cultivated land continued to expand to 1.92% of the landscape. Forests remain the main contributors (25,709.81 hectares) to the newly added cropland. These significant increases in cropland have contributed to varying degrees of deforestation coupled with rapid population growth.

Table 50: Areas in ha of land-use change in the Dja-Lobéké Landscape between 2010 and 2021

Land use class	Forest	Built up area	Cropland	Water	Total
Forest	6 379 088.03	152.30	25 709.81	0	6 404 950.14
Built up area	0.00	8 890.40	0	0	8 890.40

Cropland	4 159.64	85.67	99793.27	0	104 038.58
Water surface	0	0	9.52	19 341.85	19 351.37
Total	6 383 247.67	9 128.36	125 512.60	19 341.85	6 537 230.48
%	97.64	0.14	1.92	0.30	

Figure 15 illustrates the main deforestation hotspots in the Dja-Lobéké Landscape between 2010 and 2021. These areas are located more in the northwestern part of the landscape and mainly concern the localities of Sangmélima, Méyomessala and Djoum.

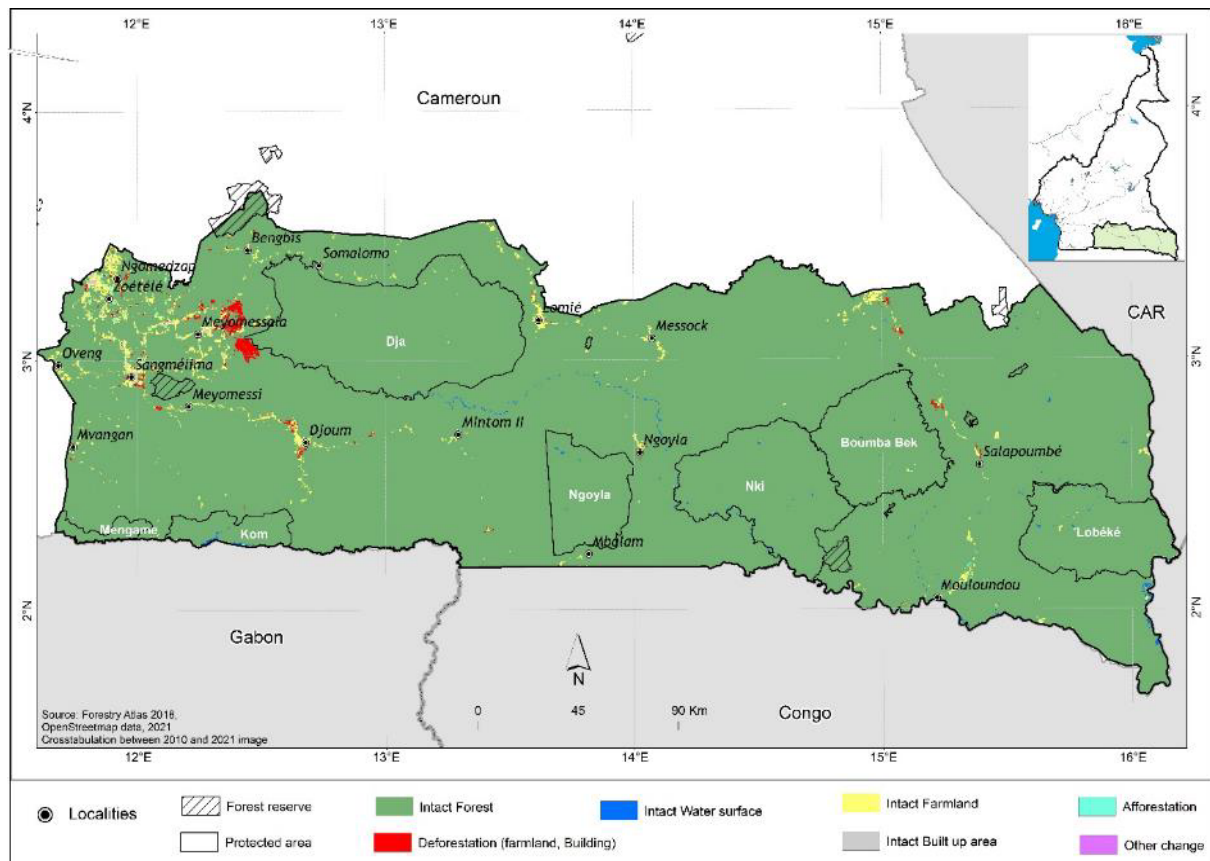


Figure 14: Conversion of forest to other land categories in the Dja-Lobéké Landscape between 2010 and 2021

6.1.3. BAKOSSI-BAMBOTOUS LANDSCAPE

The Bamboutos-Bakossi landscape is covered by high altitude evergreen rainforest dominated by *Allophylus bullatus* (Sapindaceae), *Bambusa spp.* (Poaceae), *Bersama abyssinica* (Melianthaceae), *Bridelia speciosa* (Euphorbiaceae), *Clausena anisata* (Rutaceae), *Ficus spp.* Most of these forest formations are located between 200 and 800 m altitude, with rainfall of 2000 to 3000 mm. These forests have been subject to intensive human intervention for several decades. The landscape also abounds in tree/shrub savannahs composed of floristic species such as *Entada a.* and *combretum sp.* and grasslands that are largely composed of *sporobolus a.* species and extensive *Kikuyu* grass.

6.1.3.1. Status of land use in the Bamboutos-Bakossi landscape in 2000

Table 53 presents the statistics by land use type in the Bamboutos-Bakossi Landscape in 2000. During this period, forests predominated, representing 574,148.79 hectares, or 81.51% of the landscape area. Crop-grassland mosaics are estimated at 97,615.89 hectares (13.86%), while cultivated areas represent 28,173.6 hectares (4%). Built-up areas and water areas occupy 0.53% (3762.63 hectares) and 0.10% (711.81 hectares) of the area respectively.

Table 51: Land-use statistics for the Baboutos-Bakossi Landscape in 2000

Category	Area (ha)	%
Forest	574148.79	81.51
Mosaic crops and Grassland	97615.89	13.86
Cropland	28173.6	4.00
Built up area	3762.63	0.53
Water surface	711.81	0.10
Total	704412.72	100

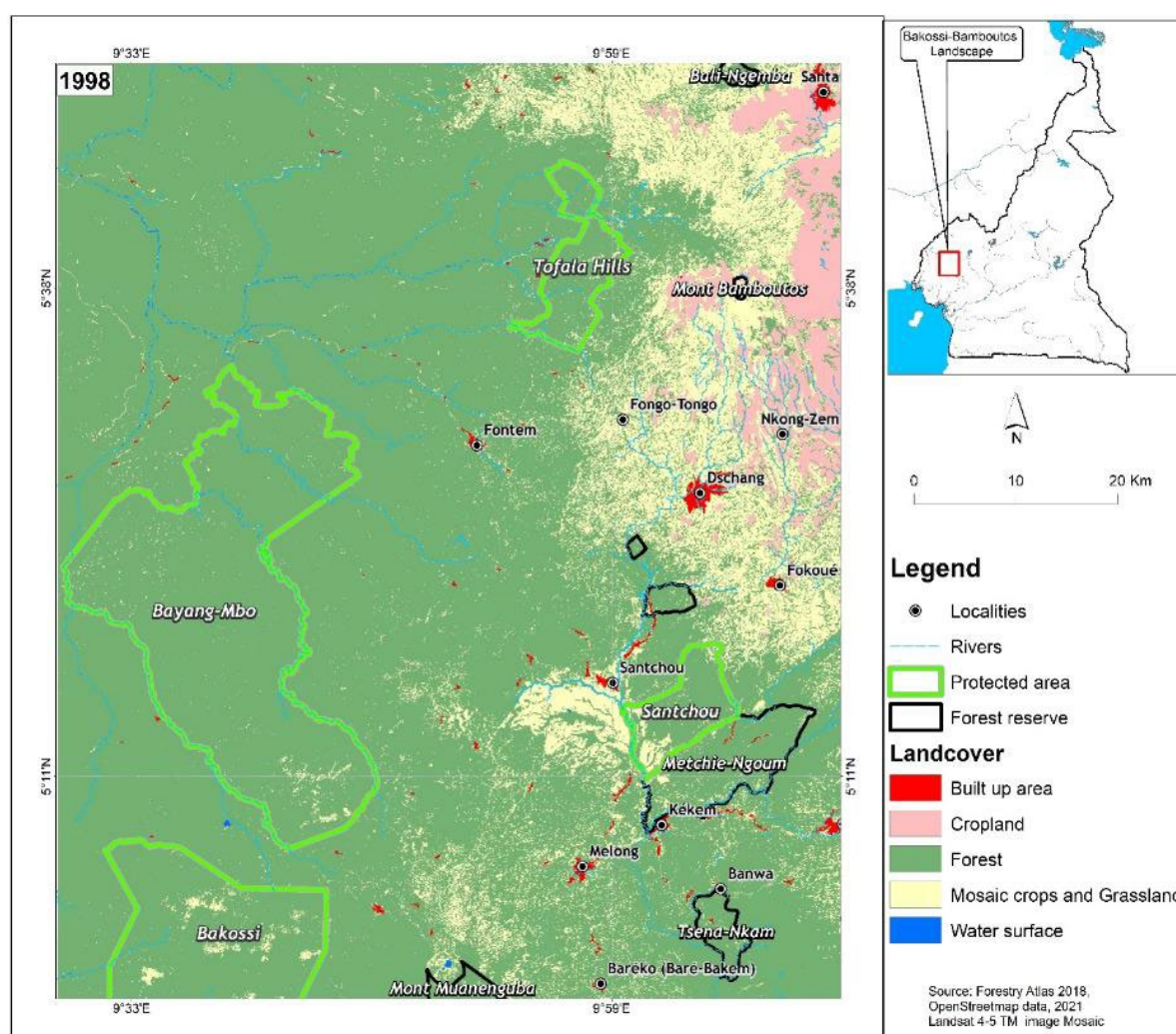


Figure 15: Land use status in the Bamboutos-Bakossi Landscape in 2000

6.1.3.2. Status of land use in the Bamboutos-Bakossi landscape in 2010

The Bamboutos-Bakossi landscape in 2010 is still largely occupied by forests, which account for 571,720.68 hectares, corresponding to 81.16% of the landscape's spatial occupancy. They are still followed by crop-grassland mosaics, which occupy 99,220.77 hectares, or 14.09%. Cultivated areas represent 28 315.35 hectares (4.02%). Other types of land use such as residential areas and water areas cover 0.55% (3850.74 ha) and 0.19% (1305.18 ha) respectively.

Table 52: Land-use statistics for the Bamboutos-Bakossi Landscape in 2010

Category	Area	%
Forest	571720.68	81.16
Mosaic crops and Grassland	99220.77	14.09
Cropland	28315.35	4.02
Built up area	3850.74	0.55
Water surface	1305.18	0.19
Total	704412.72	100

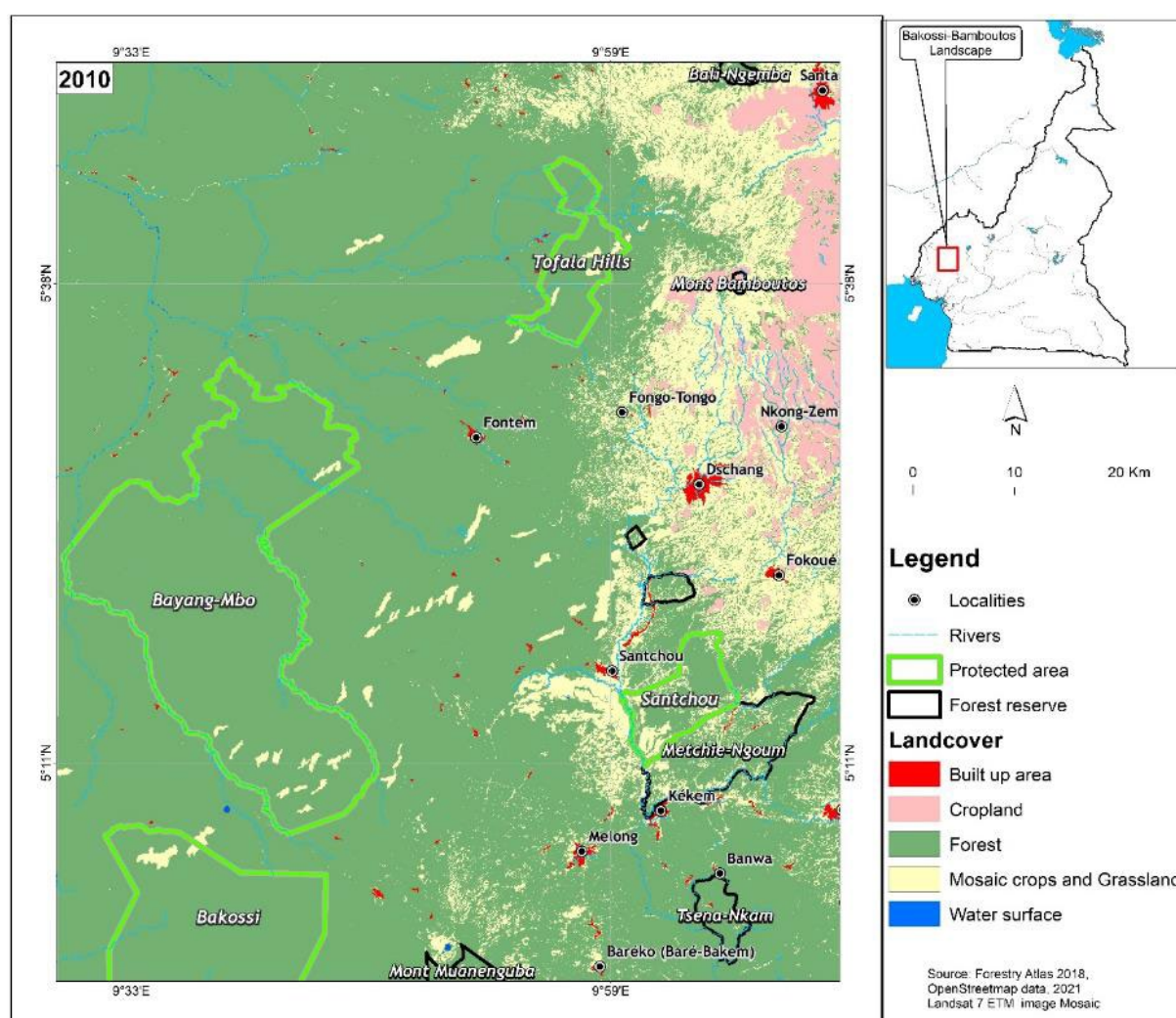


Figure 16: Land use in the Bamboutos-Bakossi landscape in 2010

6.1.3.3. Status of land use in the Bamboutos-Bakossi Landscape in 2021

In 2021, forests in the Bamboutos-Bakossi Landscape occupy 79.37% (55,9073.69 ha), compared to 13.22% (9,3097.98 ha) for the crop-grassland mosaic. Cultivated areas occupy 6.49%, representing 45726.31 ha of the landscape. Other types of land use such as residential areas and water areas cover 0.82% (5806.26 ha) and 0.10% (708.48 ha) respectively.

Table 53: Land use statistics for the Bamboutos-Bakossi Landscape in 2021

Category	Area (ha)	%
Forest	559073.69	79.37
Mosaic crops and Grassland	93097.98	13.22
Cropland	45726.31	6.49
Built up area	5806.26	0.82
Water surface	708.48	0.10
Total	704412.72	100

Figure 17 shows distribution of land-use classes in the Bamboutos-Bakossi landscape in 2021

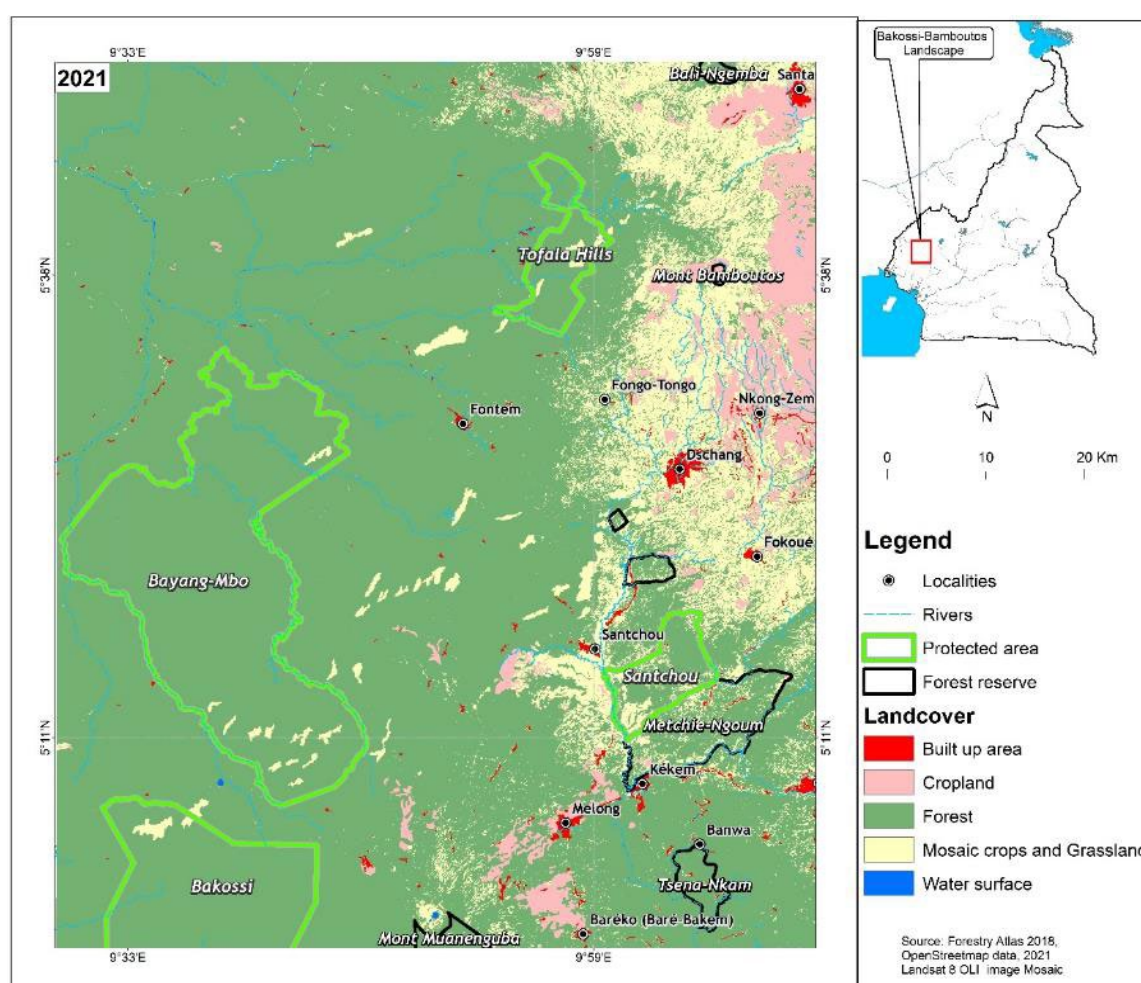


Figure 18: Land use in the Bamboutos-Bakossi landscape in 2021

6.1.3.4. Land-use change in the Bamboutos Mountains landscape between 2000 and 2010

The statistics recorded in Table 56, from the cross-tabulation of the 2000 and 2010 land use maps, show the land use changes in the different land use types. From this table, we observe about 30884.62 hectares of forest converted to crop-grassland mosaic, 1346.5 hectares for crops, 302.94 for built-up areas and 300.33 hectares for water areas. In addition to forest conversions, there were also about 3,535.36 hectares of crop-savanna mosaic converted to forest and 1,130.4 hectares of crop converted to forest (ANNEX 22A). During this period, the different land-use classes remained the same overall.

Table 54: Cross-tabulation of land use in 2000 (horizontal) and 2010 (vertical)

		2010						
Landcover classes		Forest	Mosaic crops and grassland	Cropland	Built up area	Water surface	Total	%
2000	Forest	539322.21	30884.62	1346.5	302.94	300.33	572156.6	81.22
	Mosaic crops and grassland	32535.36	64061.01	2353.95	238.41	32.04	99220.77	14.09
	Cropland	1130.4	1316.745	25809.795	58.23	0.18	28315.35	4.02
	Built up area	0.82	0.95	0.53	3411.08	1.44	3414.82	0.48
	Water surface	891	35.82	0.27	0.27	377.82	1305.18	0.19
	Total	573879.79	96299.145	29511.045	4010.93	711.81	704412.72	100
	%	81.47	13.67	4.19	0.57	0.10	100	

However, the state of land use between 2000 and 2010 nevertheless shows an increase in crop-savanna mosaics and cultivated land. They increased by 1,604.88 hectares for an annual rate of change of 0.15% and 141.75 hectares for an annual change of 0.05%/year respectively. The main contributor is the forest class which reduced its area by about 2428.11 hectares, corresponding to an annual rate of change of 0.04% (Table 57).

Table 55: Evolution of the areas of the different categories over the period 2000 and 2010

Landcover	Area (2000)	Area (2010)	Variation	Rate
Forest	574148.79	571720.68	-2428.11	-0.04
Mosaic crops and grassland	97615.89	99220.77	1604.88	0.15
Cropland	28173.6	28315.35	141.75	0.05
Built up area	3762.63	3850.74	88.11	0.21
Water surface	711.81	1305.18	593.37	5.51
Total	704412.72	704412.72		

6.1.3.5. Land-use change in the Bamboutos Mountains landscape between 2010 and 2021

The cross-tabulation matrix shows that the most important transition between 2010 and 2021 in the Bamboutos-Bakossi Landscape is the conversion of forest areas to cropland, which represents nearly 27210.35 hectares of the landscape. The percentage of forest land occupation decreased from 81.51% (574184.79 hectares) in 2010 to 79.31% (558644.2 hectares) in 2021 (ANNEX 22A).

Table 56: Cross-tabulation of land use in 2010 (horizontal) and 2021 (vertical)

		2021					
Landcover classes		Fores t	Mosaic crops and grasslan d	Croplan d	Built up area	Wat er surface	Total
2010	Forest	546426.7	11646.09	15564.26	507.69	40.05	574184.79
	Mosaic crops and grassland	11735.46	80123.83	4558.5	1421.55	39.87	97879.21
	Cropland	422.37	1303.38	26032.86	414.63	0.36	28173.6
	Built up area	0	0.47	0	3462.03	0.81	3463.31
	Water surface	59.67	24.21	0.18	0.36	627.39	711.81
	Total	558644.2	93097.98	46155.8	5806.26	708.48	704412.72
	%	79.31	13.22	6.55	0.82	0.10	100

During the period 2010-2021, forests and crop-grassland mosaic suffered the greatest loss, respectively 12646.99 hectares (0.20%/year) and 6122.79 hectares (0.58%/year) of total land cover. Cultivated land recorded the largest gain, i.e. 4.36% of land cover, corresponding to 17410.96 hectares during this period (Table 58). The major localities that contributed to the loss of forests between 2010 and 2021 include: Dschang, Mbouda, Nkong-Zem, Santa, Fontem, Melong, Santchou and Fongo-Tongo.

Table 57: Evolution of the areas of the different categories over the period 2010 and 2021

Landcover	Area (2010)	Area (2021)	Variation	Rate
Forest	571720.68	559073.69	-12646.99	-0.20
Mosaic crops and grassland	99220.77	93097.98	-6122.79	-0.58
Cropland	28315.35	45726.31	17410.96	4.36
Built up area	3850.74	5806.26	1955.52	3.73
Water surface	1305.18	708.48	-596.70	-5.55
Total	704412.72	704412.72		

6.2. DIRECT AND INDIRECT DRIVERS OF DD

6.2.1. WAZA LANDSCAPE

Historically, deforestation and forest degradation have been very high in the far north in general and in the Waza landscape in particular. The MINEPDED (2017) study shows that there is a significant loss of woodland formations.

The results obtained from the Communal Development Plan (PNDP, 2010)²³ report that the principal economic activity of the Waza communities is small holder agricultural crops: cereals (rainfed sorghum, small millet, muskuwari, maize groundnuts, okra, Guinea sorrel, voandzou, sesame, rice and pulses) sesame, rice and pulses). The most important crops being cereals (rainfed sorghum, pearl millet, muskuwaari and vegetables). Cattle, sheep, goat, pig and poultry farming supplement farm income. According to statistics from the Municipality, cattle numbers are estimated at 5,000 head, goats 7860 head, sheep 5451 head and poultry 8700 head (PNDP, 2010)²⁴. Tumenta et al. (2021)²⁵ reports livestock grazing as the most frequently encountered human activity in the park, followed by bushfires set out by herdsman to regenerate pasture for their cattle and goats/sheep, as they grazed everywhere along the floodplains of the Waza National Park. Scholte et al (2022)²⁶ further report that about 2500 pastoralists, with an estimated 35000 cattle sought refuge in Waza National Park, on the west of the floodplain. These being the Musgun fishers and the Shuwa Arab pastoralists from the logone floodplain in Cameroon. According to Jiagho & Banoho. (2021)²⁷,

anthropogenic factors, natural factors, bio-ecological factors and political-institutional factors are the main groups of drivers of deforestation and forest degradation in the Waza landscape. Based on analyses of satellite images, forest loss in the Waza Landscape was estimated at 93686.49 hectares between 1998-2010 and 65043.81 hectares between 2010-2021. Overall, between 1998 and 2021, forests have experienced a significant loss of 158730.3 ha, resulting in an estimated annual deforestation rate of 4.46% each year. The NDS30 also plans to increase national cotton production to 600,000 tonnes by 2026 and to one million tonnes by 2030. This increase will require a demand for fertile land if no action to improve and settle farmers is envisaged.

Table 58: Categories of drivers of deforestation and degradation, agents and key value chains involved, and surface areas under threat

Category of drivers	Category of agents	Deforestation or Degradation	Principal value chain	Size of contiguous areas (hectare)	Affected surface area
Forestry	Small and large producers, refugees, households, (for cooking bill, soy, braising fish/meat, burning bricks, drying fish)	Degradation leading to deforestation	Wood energy; Charcoal (carbonization)	Above 100	Approx. 50 ha per year
Food agriculture	Small-scale producer	Deforestation (by bush fires)	millet/sorghum, onion, rice, corn,	Less than 1	About 4,200 ha per year

Permanent agriculture	Medium-sized producers	Deforestation	Cotton	Between 2 and 100	Approximately 1500 ha per year
Livestock	Small producer, Breeder, Transhumant herder, foreign herders	Degradation	Cattle and sheep/pasture	Between 1 and 2	About 700 ha per year
Hunting	Traditional hunter	Degradation	Bush or fodder fires	From 1 to 10 ha	About 5 ha

6.2.1.1. Direct drivers of deforestation

The main driver of deforestation in the Waza Landscape is agriculture, which can be divided into two types: cash crop and food crop.

- Agriculture

Maize, groundnuts, rice, onions, beans, and millet/sorghum are identified as the main crops impacting forests in the Waza Landscape. These crops are grown not only on areas formerly occupied by agricultural practices, but also on woodland and floodplain. In the Waza Landscape, it is clear that the conquest of new land is eating into the area of the WNP, especially on the periphery of the park. Cultivated land has increased from 117,025 ha in 1998 to 205,939 ha in 2021. Agriculture in the WAZA Landscape is subdivided into cash or perennial crops and food crops.

Cash crops

Cotton cultivation has in decades been the engine of development and the factor of economic stability in this region of Cameroon (Devèze 2006, Levrat 1984). Even though it is one of the sectors that attacks the forest cover, it does not represent the main threat. In fact, between 2000 and 2015, the agricultural areas dedicated to cotton have decreased. Nevertheless, SODECOTON continues to supervise producers (Roupsard 2005). The cotton sector is in the midst of crisis, with production falling from 220,844 tonnes in 2005/2006 to some 125,000 tonnes in 2009/2010. Moreover, the cotton sector, which has about 313,000 producers in 2004, has only 100,000 in 2010. Similarly, the cultivated area falls from 231,993 ha in 2005/2006 to 133,000 ha in 2008/2009 (Manyacka 2013). Farmers are increasingly turning to more profitable food crops. The Rural Sector Development Strategy (RSDS) document foresees a doubling of production from 250,000t to 600,000t of seeds between 2020 and 2030 (MINADER 2020).

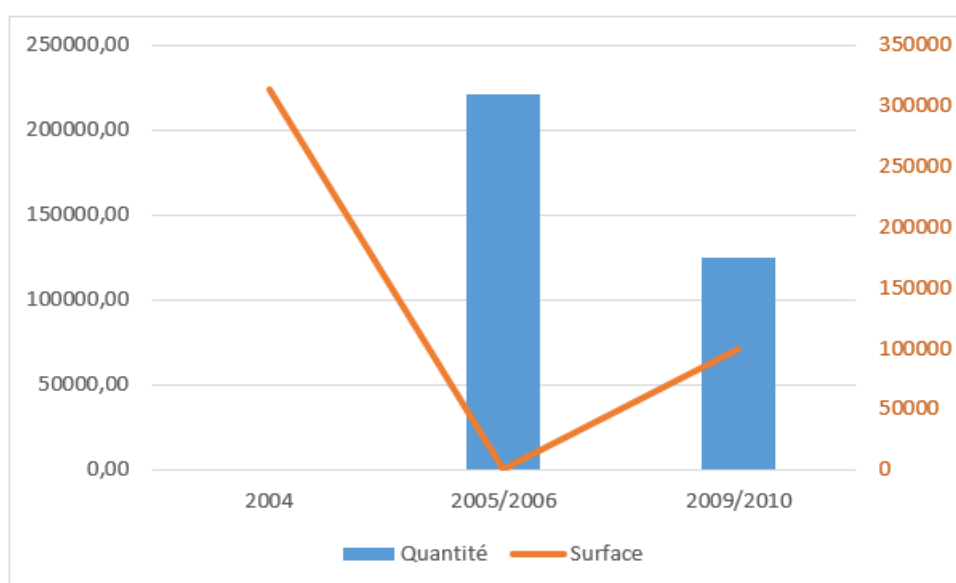


Figure 19: Evolution of cotton production in the Waza landscape

The system of supervision and purchase of cotton by SODECOTON does not encourage farmers to make transactions with SODECOTON (200F/kg), but rather to refer to neighbouring Nigeria where the price per kilogram is higher (500F/kg). Furthermore, the calculation of the opportunity cost of cotton cultivation shows that the net present value does not encourage risk-taking in cotton cultivation. This implies a constant decrease in the agricultural area devoted to cotton cultivation, to the benefit of millet and sorghum. In the whole of Cameroon's cotton zone, there has been a net decrease in the area under cotton (Manyacka 2013, Taïda 2017).

Food crops

Food crops include several species. Some, such as rice and millet/sorghum, are integrated into culinary customs, while others, such as maize and beans, are intended for sale on the national and regional markets. Here we focus on millet/sorghum and onions.

Millet/sorghum

Millet/sorghum is the main source of income for the local population. The cotton farmers have abandoned cash crops (cotton) to devote themselves to this more profitable crop. Sorghum/millet is the most profitable crop (900 kg/ha for sorghum and millet) and offers a high opportunity cost ratio (Jiagho 2018). This crop, which is managed by farmers' organisations, is not only the most economically profitable but also forms part of the stable food base (photo 3). Figure 20 shows the evolution of millet/sorghum production in the Waza Landscape for the period 2020-2021, and projections for 2025 and 2030. The trends show a clear increase every 5 years.

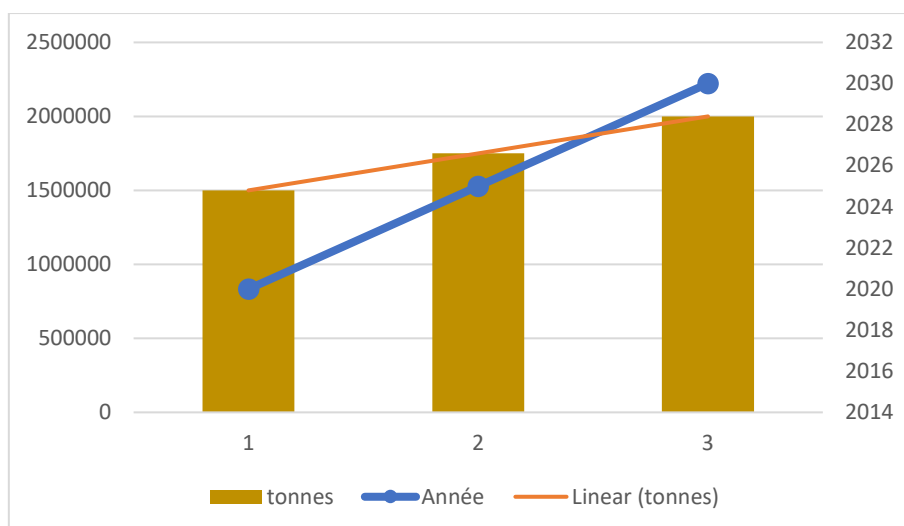


Figure 20: Evolution of millet/sorghum production in the Waza landscape

Millet/sorghum is the historical crop par excellence of Northern Cameroon, and has become an integral part of the dietary habits of the people of Northern Cameroon (Seignobos 2005). It is the most produced and consumed crop in the Northern Cameroon (Adamaoua, North and Far North). This sector is so important that Garine (2002) speaks of a millet civilisation. National millet/sorghum production is mainly carried out in ZAE 1 with about 95% of national production. The SRHR document foresees an improvement in production from 1,500,000 tonnes in 2020 to 1,750,000 tonnes in 2025 and 2,000,000 tonnes in 2030 (MINADER 2020). This improvement in production will contribute in some way to the loss of biomass. Annual demand is around 2,000 tonnes on average per year, as this crop is the main source of nutrition in the Far North and is also used to produce beer and poultry feed (MINEPDED, 2017).

Due to competition from more remunerative crops such as cotton and maize, millet/sorghum is increasingly being pushed to less favourable areas (mountain slopes, land at risk, flood zones, interfluvies of the 'Mayos') (MINADER 2020). Figure 21 presents the annual yields of the main crops in the Waza landscape. It shows that red millet, onions and maize are the crops with the highest yields, ranging from 5 to 20 million.

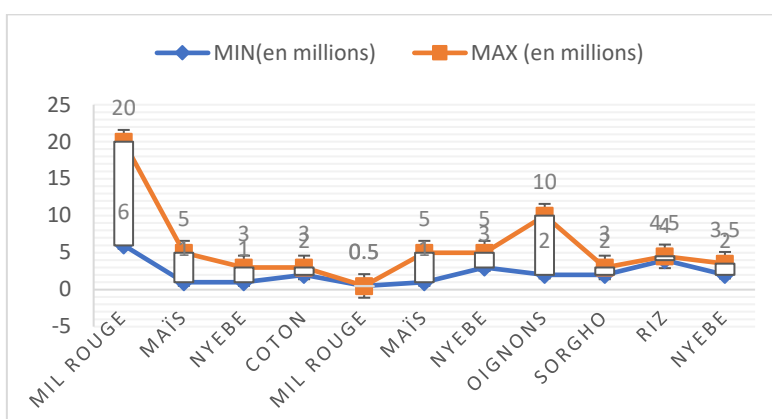


Figure 21: Rendement annuel des principales cultures dans les villages consultés

Onions

The profitability of onion cultivation has led to a conversion of several farmers in recent years. Farmers in the localities of Pétté and Mora mainly, and in other villages around the WNP are

increasingly involved in onion cultivation (photo 4). Average production varies between 7.9 t/ha and 11 t/ha.

But the introduction of high-productivity varieties could bring hope to farmers. For example, the Chagari variety (50.48 t/ha) and the Goumadi variety (49.24 t/ha) are proposed as the most promising (Sakatai, Folefack, and Vandi 2021).

Farmers' organisations support new producers and the supply chain is organised around producers, traders and transporters, and has developed considerably in recent years. Important new production areas have appeared around the WNP, despite the fact that these crops were confined to flood-prone areas: other types of land use such as forest relics are being reclaimed.

6.2.1.2. Direct drivers of forest Degradation

In the Waza landscape, livestock rearing, and the installation of fishing canals are the main activities that contribute to forest degradation.

- **Bushfires**

Bushfires contribute to deforestation in some cases; in other cases, they contribute to forest degradation. People living in the vicinity of the WNP set fires in areas of interest without any prior coordination of these activities. Farmers claim that fires are used for agricultural and hunting operations. Herders set fires voluntarily at the beginning of the dry season (early November) to accelerate the regrowth of new grass. The late fires set by farmers are frowned upon and actually contribute to degradation and are quite devastating to the forest relics around the WNP. Indeed, in 2010, some 15-18 ha of forest land burned within the WNP as a result of fire set by riparian communities near the park entrance (IUCN 2011).

In addition, off-season fires set by forestry officials after the first rains to protect sensitive forests destroy roughly equivalent areas. One of the impacts of uncontrolled fires is the loss of plant resources reducing their availability for human needs and ecosystem balance. Bushfires also lead to the loss of biomass in savannah trees. Uncontrolled fires set by hunters and farmers are the most devastating, unlike those set by herders to regenerate their pastures (Jiagho 2018). Although the practice of forest fires is recognised as necessary for the maintenance of savannahs, it is nevertheless necessary to monitor and supervise the practice rigorously (Tabopda 2008). The influence of forest fires on the intra- and inter-annual dynamics of vegetation cover is considerable (Tabopda 2012).

- **Wood energy and charcoal supply**

To date, there has been a marked increase in charcoal burning, which is endangering the forests in the Waza landscape. Charcoal makers, mainly IDPs, refugees and some local communities, use *Balanites aegyptiaca* or wild date palm to produce charcoal because of its high density in the landscape. People interviewed in the villages say that the wood harvested supplies the towns of Maroua, Mora and Kousseri. The charcoal produced is marketed in neighbouring countries such as Chad and Nigeria where a 100kg bag costs 15,000 CFA francs. As for wood energy, on average, a household harvests 1 bundle of wood per day, containing about 25 branches. This wood (photo 1) is used not only for domestic cooking, but also for burning bricks (figure 22) or for smoking fish. When this wood is not used, it is sold for 300 FCFA per bundle.



Figure 22: Sale of fuelwood on the roadside in the village of Ndiguina and bags of charcoal impounded by the Mora forestry administration

The Far North of Cameroon is one of the regions most affected by the challenges of access to wood energy. The exploitation of forests for fuelwood, slash-and-burn agriculture and grazing are the vectors of the degradation of forest ecosystems and deforestation, especially in peri-urban areas. Indeed, 95% of households in the Far North region of Cameroon are supplied with wood energy. More than 75% of Cameroon's population still relies on wood fuels for cooking, and many small businesses use fuelwood and charcoal as their main source of energy for activities such as baking, tea processing or brick making.

In 2003, a significant proportion of the supply to the regional capital Maroua came from the localities around the WNP. For example Pétte 8.8% or 261.3 m³, Bogo 7.5% or 221.2 m³, Mora 2% or 58 m³. In addition, 12% of the wood from the WNP goes to Kousseri (Madi, Huub, and Sali 2003). The report concludes that in 2022, if nothing is done (BAU scenario), the balance between supply and demand for wood energy and service wood will be very unbalanced. A potential supply of 1,030,111m³/year compared to a consumption of 1.859 million m³ of wood, i.e. an annual deficit of 829,439m³ (MINFOF 2014).

- Livestock

The creation of pastures, transhumance corridors and the demand for fodder or food have a significant influence on the vegetation cover. The total area of pasture in 1974 was 7 million ha for 160,000 head of cattle, and this area, which includes hardened land where pastoral resources are negligible, would be reduced to 3.5 million ha for 1.3 million head of cattle. The main species are cattle, goats, sheep and anine. Figure 15 below shows an estimated proportion of each of these domestic species. In addition, tree pruning and grazing maintenance through early bushfires reduce biomass and weaken the soil. Indeed, the lack of fodder during dry periods causes herders to focus on edible trees. Stakeholders consulted in the WNP confirm the incursions of herders during transhumance or during the long dry seasons. Thus, transhumant herding and livestock encroachment within the WNP is a serious problem. Figure 23 shows the comparative evolution of pasture area and cattle numbers.

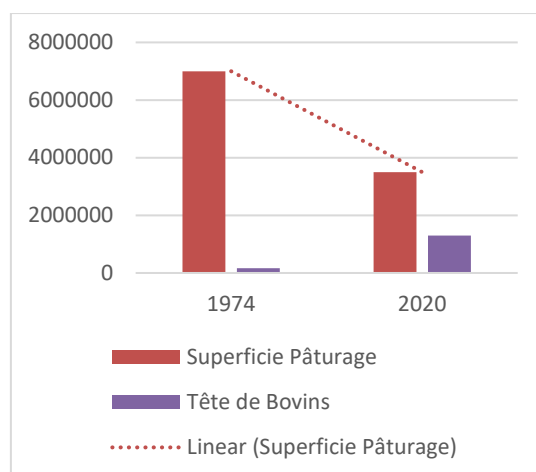


Figure 23: Comparative evolution of pasture area and cattle numbers: 1974 and 2020

The pastures, under the impact of early fires, regenerate and produce shrubs that are most often resistant to recurrent fires. The trend shows that grazed areas are decreasing over the years in favour of savannah tree areas (figure 24). These fires, recommended by grazing experts, help the vegetation to regenerate quickly when they are controlled. Bushfires are used as a management method in agro-pastoral landscapes and are a factor in forest degradation. The use of firebreaks during these operations clearly shows a desire to manage fodder resources. The extensive and transhumant system is a production system that has the greatest impact on the landscape (MINEPDED 2017). In contrast, the intensive system is more recommended. The increasing livestock load on pastures contributes to soil degradation (Cessat 1998).



Figure 24: Transhumance movement in the peripheral zone of the WNP

- Hunting

Traditional hunting or poaching activities in the WNP contribute greatly to the degradation of the forest cover. Hunters use fire to stalk animals, and this method of hunting causes considerable loss of forest cover. This situation from 2008 continues around the WNP to the present day as incursions into the woodlands produce catastrophic results. Mammal and monitor hunting is most practiced by non-Muslims, mainly of the animist persuasion. Sport hunting on safari does not impact on degradation as it is controlled.

- Fishing canals

The installation of fishing canals is a significant cause of forest degradation in the landscape. The installation of these fishing canals (Zina, Logouma, Diégueré, Zouang) constitutes a real obstacle for transhumance. These fishing canals are estimated at more than 8,000 between 2000 and 2014 to date in the large humid savannah that borders the WNP. The percentage of these canals quadrupled from 1986 to 2006 due to the decrease in rainfall and the demographic pressure of populations in search of space for rice-growing extensions (Jiagho 2018). The Ramsar site, which constitutes the large wetland of the landscape, is subject to unsustainable fishing that develops to the detriment of biodiversity conservation and sustainable land management. Indeed, this unsustainable fishery is characterized by the installation of fishing canals up to 2 m deep and 600 m long, whose purpose is to retain fish after the flooding period. As these canals constitute an obstacle to the passage of herds, the herders are obliged to move towards the WNP to carry out their transhumance movements, during which they prune trees and remove tree bark, which contributes to the degradation of the forests. Photo 6 illustrates an example of a fishing channel installed in the Zouang village close to the WNP.

6.2.1.3. Indirect drivers of deforestation

The destruction of forest cover is indirectly linked to demography, infrastructure, migration, and insecurity in the Waza area. Stakeholder consultations indicated that market demand, demographic pressure, insecurity, and internal migration were indirect drivers of deforestation in the area. Insecurity linked to Boko Haram, internally displaced people, Chadian and Nigerian refugees represented the indirect drivers of deforestation.

Consultation results indicated that the influx of refugees around Waza Park was one of the indirect causes of deforestation. These refugees create new fields, cut wood for energy (use and sale on roads and in towns) or for charcoal production. In addition, the demand for forest resources from Chad represents a major threat to forest conservation in the Far-North in general and for the Waza area in particular because of its proximity. The demand from Chad is increasing because of the tightening of Chadian laws on forest harvesting in the 2000s. In the Waza landscape, IDPs and refugees depended solely on the exploitation of forest resources for income.

Demographically, the average annual population growth rate is 5.8 % and is among the highest in the country. Its population increased from 4 million in 2000 to almost 6 million in 2010 and projections foresee 9.3 million inhabitants in 2025 (MINEPDED, 2017). The population of the Far North region represents 17.9 % of the country's total population, making it the second most populous region in the country after the Centre. The average density is 108 inhabitants/km². The demography has experienced an increase due to migration caused by conflicts. Most of the population of the Far North (for example 95 % of the urban population) use wood as its main source of domestic energy (MINFOF 2014). Demographic pressure is also increasing demand for food and agriculture land. The population growth in the 7 councils around the WNP increases the need for firewood, charcoal and food, and the demand for natural resources in general (Jiagho, 2016).

The change in land use over the last twenty years is observable in cropland, wet savannah, and wooded savannah. The conversion matrix shows an increase in cultivated land at the expense of wet savannah, tree, and shrub savannah. Cultivated land increased from 117,025 ha in 2000 to 205,939 ha in 2021 and wet savannahs decreased from 196,035 ha to 158,084 ha for the same period. On the other hand, wooded savannahs have decreased from 25.81% in 2000 to 11.89% in 2021. These areas covered by forest according to the Cameroonian definition will disappear in the long term. For these areas considered around the WNP, there is an increase in the occupation of land considered as non-forest. Removal (degradation) is in the periphery, particularly in the villages of Waza and Loungouma (ANNEX 22A).

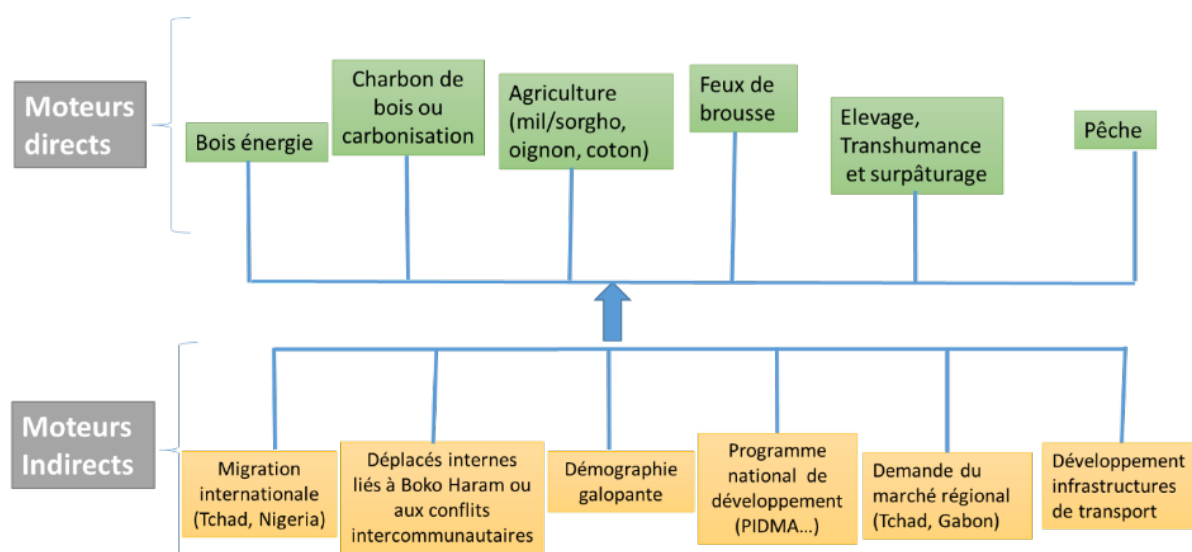


Figure 25: Synthesis of direct and indirect drivers of deforestation and degradation around the WNP

6.2.2. DJA-LOBEKE LANDSCAPE

Table 62 provides a synthesis linking categories of drivers of deforestation and degradation, agents and key value chains involved, and surface areas under threat in the Dja-Lobeke landscape.

Table 59: Categories of drivers of deforestation and degradation, agents and key value chains involved, and surface areas under threat

Category of drivers	Category of agents	Deforestation or Degradation	Principal value chain	Size of contiguous areas (hectare)	Affected surface area
Small-scale agriculture	Small-scale producer	Deforestation	Cassava, plantain, oil palm	Less than 1	About 15,000 ha per year
	Small-scale producer	Deforestation		Between 1 and 2	About 3,700 ha per year
Medium-scale agriculture	Medium-sized producers	Deforestation	Plantain, oil palm, rubber tree, pineapple	Between 2 and 100	About 475 ha per year
Agri-business	Large producers	Deforestation	Rubber tree, Oil palm,	Above 100	About 95 ha per year
Forestry exploitation	Illegal	Deforestation/degradation	Wood logs/boards	About 10 ha	About 1000ha/year
	Industrial	degradation	Wood logs/boards	2500 ha	//
	Artisanal	Deforestation/degradation	Wood logs/boards	1000ha	
Mining	Artisanal	Deforestation	Gold/diamond	Between 1 and 50 ha	

	Industrial/mechanized	Deforestation	Gold/diamond	Between 5 and 100 ha	
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6.2.2.1. Direct drivers of deforestation

The direct drivers of deforestation in the Dja-Lobéké landscape ranked in order of importance are industrial and slash-and-burn agriculture, mining, and bush fires. The main agents of deforestation are households farming, urban elites, agro-industrialists, and small-scale miners. This corroborates with this study³¹ that report that in the Dja-Lobeke, timber exploitation and safari hunting are a concern, as well as poaching for bushmeat, exotic animals, and ivory. Illegal fishing or bird poaching is a major problem and every year thousands of African gray parrots are caught and exported illegally, and the growing local population is dependent upon local resources³². Hunting was reported by Yisu et al. (2020)³³ as pressures in the Lobeke National Park (LNP), as it constitutes an indirect cause of forest degradation. Hunters use bushfire in hunting and poaching in and around the LNP. Furthermore, pressure on forest resources is caused by the interaction of macroeconomic policies, market demand and monetary policy (Dkamela, 2011, Yitegesus et al. 2016)³⁴. National, regional, and international demand for timber is increasing significantly. At the regional level, transactions are dominated by flows to Chad, Gabon, Equatorial Guinea, and Nigeria, while the arrival of Chinese companies has created new market destinations and increased the volumes of timber (MINEPDED, 2016)³⁵. For example, the value of Cameroon's timber exports to China doubled from USD 100 to 200 million from 2006 to 2012 (Weng et al., 2014)³⁶. There is increasing demand for palm oil in countries (China, India, and other emerging Asian countries), where palm oil is widely used as cooking oil. Currently, global demand exceeds supply, a trend that is expected to continue (Hoyle and Levang, 2012)³⁷.

- Agriculture

Cash crop agriculture

The Dja-Lobéké landscape is home to agro-industries and small- and medium-scale cash crop producers (Figure 16). A large proportion of deforestation in this area is due to cash crops such as cocoa, rubber and oil palm. Agricultural activities around the major cities and satellite towns have a significant impact on the deforestation process. Cocoa is largely the leading speculation influencing deforestation (Onsgsabien et al. 2019, Oishi 2012). The development of agro-industrial plantations (rubber, oil palm, banana) in Cameroon is more important than in other countries in the Congo Basin (Hourticq et al. 2013). More recently, the government in its SND30 plans to triple national production by 2030 from 600,000 tonnes before 2025 to 1,200,000 tonnes by 2030 (MINEPAT 2021).

Cocoa

Stakeholders in the field consider cocoa to be the main source of deforestation. In the majority of the populations surveyed, each of them owns cocoa plots of between 1 ha and 3 ha in size. Each household in this landscape may clear an average of 2 ha of forest in the course of its life for the creation of cocoa plantations (Figure 21). A significant proportion of the men interviewed in the focus groups claim to enlarge their cocoa plot by at least 1000 m² each year. However, landlocked villages such as Legoué and Kika are less inclined to develop plantations or increase their plots. Cocoa farms have an average surface area of 1-5 ha, with minimums of 1 ha and maximums of up to 10 ha (during exploitation). The labour force is essentially family-based with an average production of 4 to 8 bags per hectare.

This situation is the result of the increase in the price of cocoa over the last few decades, which has accelerated the withdrawal of urban elites and civil servants from the cultivation of this crop. People's wealth are now measured in terms of the number of plots of land or the area they own. New plantations are opened under the impetus of urban dwellers who appropriate plantations to ensure a supplementary income, a pension or a land bank.

Agricultural practices around cocoa depend largely on the type of plantation. Small plantations without shade destroy 80-90% of the forest cover, whereas small plantations with shade retain 70-80% of the trees. The trees retained are mainly fruit trees (avocado, mango, NTFPs (djansang, Bush mango), the trees of economic importance are Sapelli, Ayous and cheese tree.

The area cultivated for cocoa in Cameroon has increased from 250,000 hectares (MINADER, 2019) to about 670,000 hectares in 2014. Projections show that in a few years to come, it could be more than 900,000 ha of cocoa land. Cocoa represents about 19% of the total value of the country's exports and is the second most important export product after oil. It employs over 600,000 cocoa farming families. Almost 8 million people live directly or indirectly from the cocoa economy (Jagoret, 2012). Recent study by Lescuyer et al (2020) confirms these data. In particular, they state that small farmers own 2.5 ha, medium farmers 12 ha and big farmers 25 ha.

The growth of the cocoa area contributes largely to forest degradation rather than deforestation and is therefore not detected by remote sensing. But it still reduces forest carbon stocks considerably (Klarer, 2014). New cocoa varieties that can grow under shade clearly contribute to reducing the impact on forests. Overall, Cameroon plans to increase production by 308,851 tonnes, which would require deforestation of about 205,900 ha over ten years.

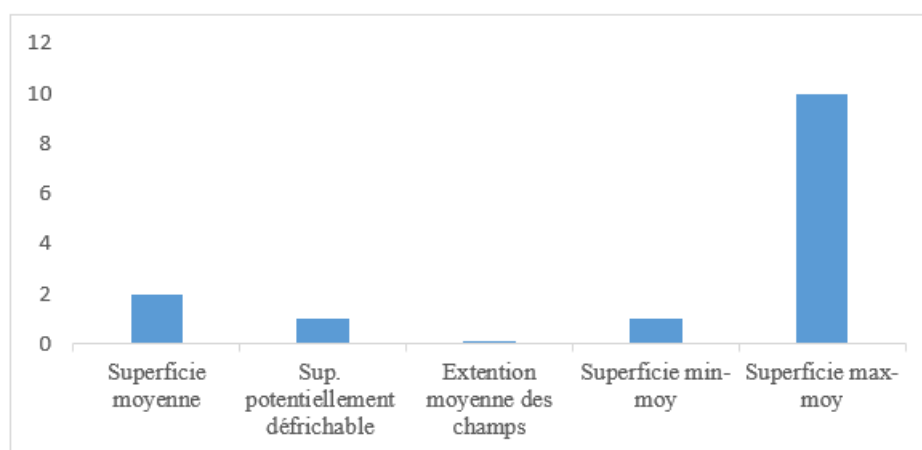


Figure 26: Data on cocoa farm area per household

Oil palm

Oil palm plantations are not very present in the Boumba and Ngoko departments, but, are more visible on the Lomié-Mballam-Djoum axis. While the average size of plots around Djoum is around 1 ha, plots are smaller for domestic consumption, less than 500m² in the south-east.

The share of oil palm in the landscape economy is quite small. The more productive Tenera variety is the most planted with the support of technical and financial partners. The expansion of oil palm requires clear-cutting of forests, recovery of useful wood, and finally the burning of woody residues for the creation of nurseries or direct planting.

It should be noted that urban elites continue to monopolise the most fertile areas. This was already confirmed by (Nkongho et al. 2014). In 2008, oil palm trees alone occupied 136,180 ha of previously forested land, and the demand for more land for palm plantations continues, putting concrete pressure on the forests (Nnah et al., 2014). The government continues to sign agroforestry concession contracts. For the next 5 years' hundreds of thousands of hectares of land are being negotiated and some contracts have already been signed between the Cameroon government and investors interested in oil palm. The SDSR-PNIA 2020-2030

document foresees an increase of 413,003 tonnes or 103,250 ha of forest to be cut down, and the SND30 envisages doubling the current production by 2027.

Rubber

In the Dja-Lobéké landscape, very few large plantations have developed, but those that have had more impact (SudCam Hevéa, a subsidiary of the Halcyon Agri group) have razed thousands of hectares since the 2010s. To the west and south-east of the Dja reserve (a UNESCO World Heritage site), some 15,000 hectares of forest have been cleared for rubber cultivation. This incursion into this part of the forest prevents the ecological continuum, but also reduces biodiversity.

Results from WRI data (2021) show that the most deforestation is occurring in non-permanent forests (community forest and agro zone). Overall, small-scale producers with less than 1 ha are the most important agents (Figure 16). According to the SDSR-PNIA 2020 document, which forecasts a growth of 40,000 tons by 2030, an additional deforestation of about 20,000 ha is expected in ten years.

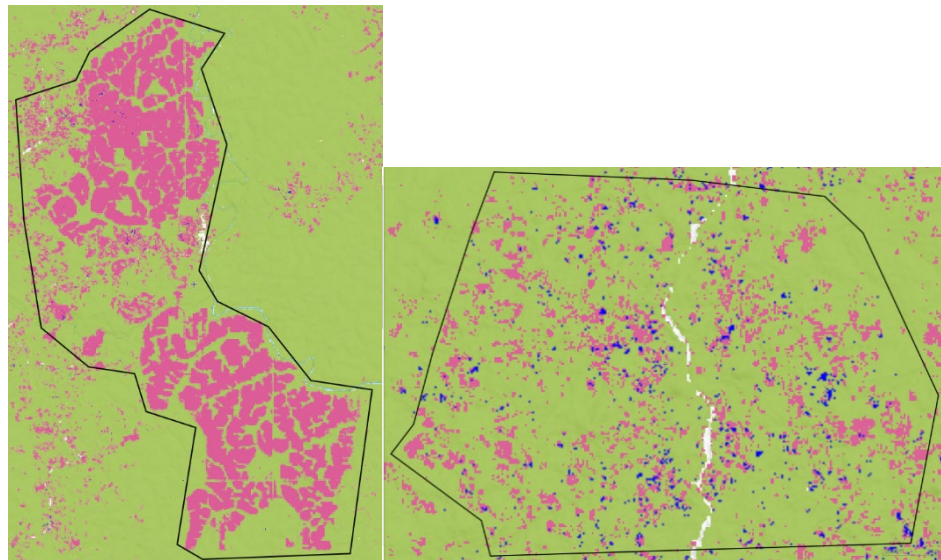


Figure 27: Rubber plantation (31730 ha) around Sangmelima Vs small plantations around Yokadouma (WRI, 2021)

The cultivation of pineapples requires the clear-cutting of trees, as they are light plants. Rapid urbanisation is giving rise to city dwellers who are rushing to take over the peri-urban area. This rush also concerns pineapple cultivation, which has developed rapidly on the outskirts of Yaoundé, Douala, Nkongsamba and Bertoua all located in the Bimodal forest region. After the great drop in cocoa and coffee production in the 1990s and early 2000s due to the fall in their prices at the international market, pineapple cultivation has taken over and are attracting more and more investors and therefore constitute another direct driver of deforestation in the Bimodal forest area. The crisis at the end of the 1980s was at the origin of the development of this crop. Today, despite the recovery of cocoa and coffee production since the end of the 2000s and the beginning of the 2010s, pineapple cultivation continues to grow year in year out compared to cocoa cultivation, which seems to have stagnated in the southern plateau of Cameroon (MINEPDED, 2017). The government plans to double pineapple production by 2035, with the area under pineapple increasing from 4,487 ha in 2013 to 9,818 ha in 2035.

- Agriculture - *food crops*

Small-scale shifting cultivation linked to subsistence agriculture has been identified as one of the main drivers of deforestation and degradation in the Dja-Lobéké landscape. MINEPDED (2017) advocates that conversions of less than one ha represent almost 65% of conversions and those between 1 and 2 ha are 15%.

Cassava

About 29% of households practice this crop. In addition to being of major importance in culinary habits, the income from cassava is significant. Producers own between 0.5 and 1.2 ha, and most of the production is sold on the local market as by-products. Pure cassava cultivation is practised on a small scale, in association with beans, cocoyam, macabo and maize. The new areas cleared for cassava cultivation show an advance over the forest in the Dja-Lobéké landscape. The derivatives (cassava-based bread flour, starch, garri, cossettes, bobolo or myondo, etc.) of cassava provide an important source of income, undoubtedly encouraging them to look for new forest areas to clear. This crop is of industrial interest for its starch and bioethanol. The exponential growth in the price of wheat flour has increased interest in cassava as a substitute.

The SDSR- PNIA 2020-2030 document envisages the development of the food crop sectors and plans to increase from 5,492,522 tonnes in 2020 to 10 million tonnes in 2030. The area planted from 2013 to 2035 is expected to increase from 281,250 ha to 346,463 ha. Cassava has shifted from a family crop to a commercial crop because of the profitability and labour required. Since this crop does not grow under shade, it needs light to develop. If an average of 40 tonnes/ha is expected, this would mean opening up an additional 112,687 ha of forest. The PIDMA, PDVRTP and all other sectoral policies and initiatives represent a potential for the development of the cassava sector. The area planted from 2013 to 2035 is expected to increase from 281,250 ha to 346,463 ha. Cassava has evolved from a family crop to a commercial crop because of the profitability and labour required. Since this crop does not grow under shade, it needs light to develop.

Plantain

Plantain is part of the dietary habits of the people of the sub-region and the ever-increasing demand for it could help to increase the demand for cultivable land. Moreover, this crop was one of the first to be planted when the forests were opened. In the Dja-Lobéké landscape, plantations occupy an average area of 2.2 ha. Production per harvest season varies between 700 and 1000 bunches on average. Plantain mobilises around 650,000 t of production, from 2013 to 2035 the plantain area will increase from 250,000 ha to 695,685 ha (MINADER, 2020).

- **Industrial mining**

With the arrival of the Chinese, mining has exploded in recent years in the bimodal forest zone, notably: diamond mining and gold mining. These mining activities have negative impacts on the forest ecosystems. Ngoyla-Mintom is a case in point (Anyu and Moki 2013). Artisanal mining and related activities in the Ngoyla-Mintom forest massif have negative environmental impacts, such as the destruction of fragile forest ecosystems, particularly swamps, the diversion, sedimentation and pollution of small waterways, and the destruction of soils.

The increase in mining permits in protected areas, FMUs and communal forests poses a threat to permanent forests and has contributed to the increase in the rate of DD. Deforestation of varying degrees is possible during the establishment of camps as well as during exploitation activities. The main actors are increasingly Asian (Malaysia, China) as they have significant technical and financial resources and carry out excavations and watershed stripping. Forestry machines strip the soil, causing the elimination of the forest and, in turn, the carbon stocks. In addition to industrial mining encroaching on forests, artisanal mining also contributes to degradation.

6.2.2.2. Direct drivers of degradation

- Logging

In the Dja-Lobéké Landscape, the degradation process is more or less linked to the governance of permanent forests, notably the four protected areas and the surrounding Communal Forests: with an Annual Cutting Area (AAC) of 5,000 ha to be exploited per year and per Forest Management Unit (FMU); the volume of timber exploited is 20,000m³/ FMU. Already in 2017, Cerutti et al. 2017 estimate the volume of timber harvested per year and per AAC at 1503 m³ , and 20,508 m³/year for FMUs.



Figure 28: Logging truck with logs on the Dja River ferry

- Artisanal mining

Artisanal mining increased after the economic crises of the 1990s. Unemployed young people mobilized and organized themselves into cooperatives. Their capacity to harm the forests increased tenfold with the purchase of motor pumps and mats. However, most of the logging takes place along watercourses. The disturbances, however important, degrade the forests along the rivers. Prohibited chemicals (mercury, cyanide) pollute biodiversity and land near rivers. Most of this artisanal exploitation is illegal. Practices such as clearing primary forests, building dams, constructing camps and drilling wells contribute to forest degradation.

6.2.2.3. Indirect drivers of deforestation

Results from field consultations indicate that cross-border migration related to the civil war in Central African Republic, large development projects, and urbanisation are indirect drivers of deforestation in the Dja-Lobéké landscape.

The Dja-Lobéké landscape is a victim of its resources. Most of the deforestation is outside the area. National, and international market demand for timber, cash crops (cocoa, rubber, oil palm) and mining products drive DD. Pressure on forest resources is caused by the interaction of macroeconomic policies, market demand and monetary policies (Dkamela, 2011). National, regional, and international demand for timber is increasing significantly. At the regional level, transactions are dominated by flows to Chad, Gabon, Equatorial Guinea, and Nigeria, while the arrival of Chinese companies has created new market destinations and increased the volumes of timber (MINEPDED, 2016). For example, the value of Cameroon's timber exports to China doubled from USD 100 to 200 million from 2006 to 2012 (Weng et al., 2014). There is increasing demand for palm oil in countries (China, India, and other emerging Asian countries), where palm oil is widely used as cooking oil. Currently, global demand exceeds supply, a trend that is expected to continue (Hoyle and Levang, 2012).

The political instability of the Central African Republic (CAR) and the sociological proximity of cross-border populations have favoured the settlement of Central African refugees along border towns. The settlement of refugees in the towns of Kentzou, Yokadouma, Ndélélé,

Garigombo, Garoua Boulai and Meiganga has triggered new demands for forests related resources.

6.2.3. BAKOSSI-BAMBOUTOUS

Table 63 provides a synthesis linking categories of drivers of deforestation and degradation, agents and key value chains involved, and surface areas under threat in the Bakossi-Bamboutos landscape.

The results of Ewane et al. (2021)²⁹ corroborates the findings of this study that farmland, tea plantation, eucalyptus plantation and built-up areas increased by 16,799.8 ha (69%), 1009.6 ha (84%), 3757 ha (94%) and 3385.5 ha (97%), respectively, from 1980 to 2018. Agriculture, settlement, and grazing land expansion are the key drivers of the LULCC. In Bakossi-Bamboutos landscape, Tchékoté et al. (2018)³⁰ refer to the complexity of land appropriation and the end of the land to describe this scarcity of cultivable land and the re-conquest of the hills. Indeed, the scarcity of arable land contributes directly and indirectly to deforestation and even the degradation of forest relics. Analysis based on satellite images shows the evolution of agricultural areas. Annex 22B report analysis of land use change show that between 2000 and 2010, the agricultural area increased from 28173.6 ha to 28315.35 ha; from 2010 to 2021, the agricultural area almost doubled from 28315.35 ha to 45726.31 ha.

Table 60: Categories of drivers of deforestation and degradation, agents and key value chains involved, and surface areas under threat

Category of drivers	Catégorie d'agent	Deforestation or Degradation	Principal value chain	Size of contiguous areas (hectare)	Affected surface area
Agriculture	Small producers	Deforestation	Market gardening (carrot, cabbage, bell pepper...), corn,	Less than 1	About 1,560 ha per year
	Small-scale producers	Deforestation	Food processor	Between 1 and 2	About 250 ha per year
	Medium-sized producers	Deforestation	Food and market gardening	Between 2 and 100	About 450 ha per year
	Large-scale producers	Deforestation	tea	Above 1,660 ha	
Livestock,	Small ruminant rearers, Cattle rearers	Degradation	bovine livestock		
Wood energy	Small producer, collector	Degradation /deforestation	Charcoal, Firewood		A few hectares

6.2.3.1. Direct drivers of deforestation

- Agriculture

Food and vegetable farming

In the highlands of West Cameroon, the race for land has become a major concern. For a long time, people have colonised the slopes of Mount Bamboutos, becoming farmers and herders. The use they have made of this nature is at the origin of the sequential mosaics of degradation. All that exists in this landscape in terms of vegetation cover corresponds to relics of ancient forests. This landscape represents one of the most important granaries in the West and South-West Regions of Cameroon. Indeed, it supplies all the towns in Cameroon and neighbouring countries with market garden produce (cabbage, beetroot, potatoes, carrots, leeks, peppers, tomatoes). The main activity, agriculture, contributes to the loss of forest cover.

The forest relics of the Bamboutos-Bakossi landscape are influenced by agriculture, livestock and human settlements (Ewane et al. 2021). In Bafou, Tchékoté, Melachio, and Siyapdje (2018) refer to the complexity of land appropriation and the end of the land to describe this scarcity of cultivable land and the re-conquest of the hills.

Indeed, the scarcity of arable land contributes directly and indirectly to deforestation and even the degradation of forest relics. Analysis based on satellite images shows the evolution of agricultural areas. Between 2000 and 2010, the agricultural area increased from 28173.6 ha to 28315.35 ha; from 2010 to 2021, the agricultural area almost doubled from 28315.35 ha to 45726.31 ha. This reflects a strong pressure on the forest relics.

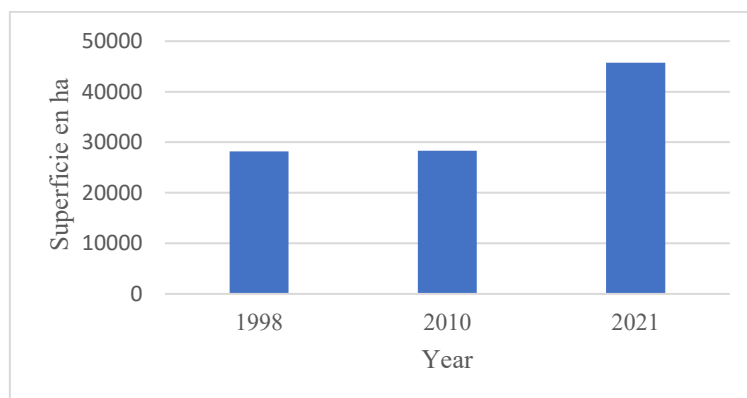


Figure 29: Change in agricultural area in the Bamboutos-Bakossi landscape between 2000, 2010 and 2021

Land use in mountain areas can be dominated by human production activities when adjacent communities depend solely on mountain resources for their livelihoods. A significant conversion and thus reduction of forest and grassland areas to agricultural land and built-up areas is observed between 1980 and 2018. Market gardening has been the main cause of deforestation in recent decades (Photo 10). Despite the intensity of agriculture on the slopes of the Bamboutos Mountains, communities face a multitude of social, economic and institutional challenges (Toh et al. 2018).

Potatoes

The localities around the Bamboutos-Bakossi landscape are the main potato-producing areas and produce a significant share of the national production. Potatoes, one of the main food crops, are grown in the mountainous areas and in the irrigated lowlands. MINADER promises to double production in this area from 395,961 tonnes in 2020 to 900,000 tonnes in 2030. The culinary habits of the Menoua Sub division revolve around potatoes, with an estimated consumption of 4-10kg/inhabitant/year. The Ndzihi basin in Bafou produces 6 t/ha. The National Project for the Improvement of Vegetable Production, which aims to improve the productivity of market gardens (Figure 30).



Figure 30: Packing of potato bags at M'mouck Aghong in Wabané

Cash crop

The Cameroon Tea Estate (CTE) in Djutsitsa is the only agro-industry in the Bamboutos-Bakossi landscape. This structure is highly criticised by local stakeholders following expropriation in a context of land tensions. Indeed, this agro-industrial concession of 1,660 ha accused of land grabbing promotes its model of autonomy through the production of wood energy for drying tea leaves (Photo 14). Eucalyptus plantations are available in the concession to supply the drying plant.

- Wood energy

The supply of energy wood to the towns of Dschang, Mbouda and Bafoussam represents a threat to the forest ecosystems in and around the Mount Bamboutos Reserve. Wood is harvested from forest relics or planted forests (Eucalyptus forest). Thus, if we refer to the harvesting process, the sawing of mainly eucalyptus for timber produces woody debris (photo 15) which is mainly used for firewood.

Indeed, between 1998 and 2021, the area of forest decreased from 574148.79 ha to 15075.1 ha in 2021, which represents a deforestation rate of 0.12%. Since 1998, the rate of occupation of the Bamboutos-Bakossi landscape for cultivation has increased from 17.86% to 19.71% of the total area. This pressure on the forests is explained by a galloping increase in the population in this landscape as a result of the socio-political crisis in the North-West and South-West Regions. The main quantities of wood energy exploited (mainly eucalyptus sp) are from these planted forests.

6.2.3.2. Direct drivers of degradation

- Livestock

The environment is conducive to livestock farming: cattle, sheep, goats and poultry. In recent decades, a process of land grabbing by elites who position themselves as livestock farmers has been observed. The degradation of the forest reserve has been accelerated over the past half century by the cattle breeding of the Mbororo people. Indeed, the forest areas have become scarcer due to the pressure of farmers but also due to the pressure of Mbororo herders who carry out their activities on the summits.

The investment of urban elites in the livestock sector is thus increasing pressure on forest relics. Bush fires on pastures, which are considered by the herders as elements of regeneration, have a bad image in the eyes of their farming neighbours. Nevertheless, there is a sustainable cohabitation between forest relics and animal grazing (photos 16 and 17).

Visits to the pastures on the edge of the Bamboutos reserve show sustainable management processes on the whole.

- Bushfires

In the Mbororo settlements of Tsopeua, the herders claim to use bushfires to regenerate the pastures. These fires allow them at the end of the dry season to burn the grassy relics allowing the regeneration of the grass. These uncontrolled fires in most cases contribute to the loss of a significant proportion of the forest cover but also disturb the ecosystem balance for the tree savannahs

6.2.3.3. Indirect drivers of deforestation

Overall, in the Bamboutos-Bakossi landscape, deforestation is linked to state development policies, correlated with the population boom and national and sub-regional market demand.

On the economic level. National and sub-regional market demand is one of the primary indirect causes of DD. The Bamboutos Mountains provide the bulk of the market garden produce for the major cities of Cameroon and neighbouring countries such as Gabon and Equatorial Guinea. The various PIDMA or market gardening development programmes are at the origin of the development of new speculation. The cities of Douala and Yaoundé absorb most of the production of Mount Bamboutos. Land pressure has greatly intensified land transactions in the Mount Bamboutos reserve (Nzoffou et al. 2019), increasing the pressure on the resource.

On the security front. The conflict in the English-speaking people in the North-West and South-West regions poses a definite threat to the forests due to the massive displacement of people from the conflict regions towards the periphery of the Mount Bamboutos reserve. Suspicions towards our teams during investigations in this area have given the impression that the previously untouched forest relics are in danger.

Demographically, the population growth leads to an increase in the need for agricultural products and wood, which often results in an increase in the area under cultivation to the detriment of the forest, or in the degradation of the forest due to the increase in wood harvesting. The average population density on the slopes of the Bamboutos Mountains is estimated at 400 inhabitants per km². The area has five towns with more than 50,000 inhabitants: Kumbo in the Bui Division, Bamenda in the Mezam Division, Dschang in the Menoua Division and Bafoussam in the Mifi Division (MINEPDED, 2017).

6.3. ACTIONS TO REDUCE DEFORESTATION IN AND AROUND PFAs

6.3.1. WAZA LANDSCAPE

In relation to the drivers of DD options proposed will allow for a sustainable supply of fuelwood and charcoal, but also those that will enhance sustainable agriculture, livestock and hunting. In addition, cross-cutting options that address the indirect drivers are proposed.

The proposed options to reduce deforestation include:

- Reforestation and restoration of degraded areas in the WNP,
- Community forest restoration,
- Creation of alternative sources of wood energy
- Promotion of sustainable agricultural practices
- Relocation of the camps of internally displaced persons,
- Fodder production for livestock
- Demarcation of transhumance tracks
- Rehabilitation of degraded pasture lands

- Reforestation of flood-prone areas with fruit trees (mango, guava, acacia, lemon and balanites)
- Training in fish farming and creation of fishponds
- The creation of new reforestation areas
- Promotion of improved cook stoves for households but also for restaurants
- Revision of management plans and microzoning
- DJA-LOBEKE Environmental education on forest laws and forest management tools
- Diversification of income generating activities
- Enhancement of stakeholder consultations on land use planning issues to avoid overlapping interests (between park management, small farming households, herders etc)

6.3.2. DJA-LOBEKE

To reduce pressure on PFAs in the Dja-Lobeke landscape the following actions should be considered:

- Promotion of sustainable forest management practices in production forests (reduced impact logging, controlled felling, forest certification etc)
- Support alternative income generating activities to reduce pressure on forest resources
- Promotion of sustainable agriculture practices
- Enhancement of sectoral/stakeholder consultations on land use planning issues to manage and avoid overlapping interests (e.g., between agriculture, forestry, mining etc)
- Rehabilitation of degraded land and forest following mining activities

6.3.3. BAKOSSI-BAMBOUTOS LANDSCAPE

Relevant actions to address deforestation and forest degradation in the Bakossi-Bamboutous landscape include:

- Enhancement of stakeholder consultations on land use planning issues to avoid overlapping interests (between agribusiness, smallholders, farming households, herders etc)
- Restoration of degraded areas,
- Promotion of alternative income generating activities to reduce pressure on forest resources
- Promotion of sustainable management of pastoral areas and capacity building on the production of fodder

6.4. FOREST LANDSCAPE RESTORATION POTENTIALS

6.4.1. WAZA LANDSCAPE

The dynamics in the Waza landscape have significantly contributed to the extensive deforestation. Forest loss is estimated at 93686.49 hectares between 2000-2010 and 65043.81 hectares between 2010-2021. Overall, between 2000 and 2021, forests have experienced a significant loss of 158730.3 ha, resulting in an estimated annual deforestation rate of 4.46% each year. These deforestation hotspots are located in the south-western and north-western part of the landscape (Figure 13), and result in the conversion of forests to cropland, grassland and human settlements (ANNEX 22A). The villages or localities that contributed to this loss of forest cover could be Mora, Gogolema, Lougouma, Waza, Petté, Dieguéré and Andirni, as they are located in the major deforestation areas.

The potential restoration areas of the Waza invention site are shown in the figure below; with almost 65043.81 hectares of degraded land to be restored (ANNEX 24).

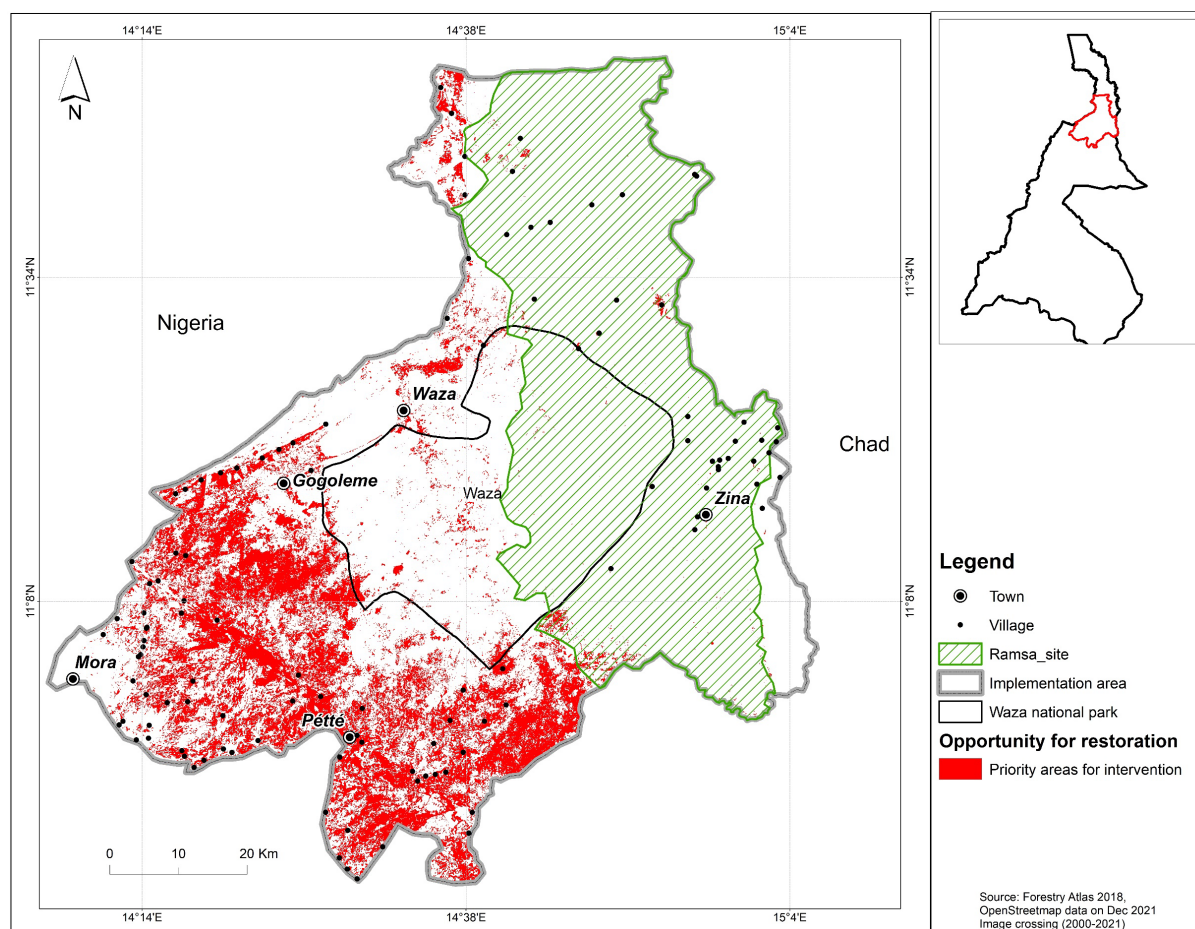


Figure 31 : Map of priority areas for intervention in Waza landscape

6.4.2. DJA-LOBEKE LANDSCAPE

Analysis of satellite images shows that the most important transition between 2000 and 2021 in the Dja-Lobéké landscape is the conversion of forest land to cropland (30,240.67 ha). This regressive trend of forest land to anthropogenic activities is also noted by numerous studies in other parts of the country's southeastern forests (WRI, 2019, Temgoua et al., 2018; Zapfack et al., 2013, Tanougong, 2019) and worldwide (De Wasseige, 2014, Lambin et al., 2003). The reduction in forest land is therefore thought to be due to the population explosion, which pushes people to look for new agricultural land in order to compensate for the lower yields caused by a short fallow period. However, deforestation in the Dja-Lobéké landscape is more or less low. Of the 6,413,488.35 hectares of forest in 2000, 30,240.67 hectares were deforested between 2000 and 2021, which represents an annual deforestation rate of 0.2%, or 5.8% in 29 years (Table 33). This low rate of deforestation is explained by the fact that this area is rich in exceptional biodiversity and is the subject of increased conservation by the Cameroonian government and other NGOs such as the WWF. However, it should be noted that this low annual rate of deforestation in this area could change in a context where agricultural yields are lower and by the granting of forest land by certain partners. This is the case, for example, with the SUDCAM rubber plantation on the outskirts of the Dja Wildlife Reserve, which could contribute to fragmenting wildlife habitats and thus breaking the ecological connectivity in this area. The potential for restoration of degraded land in this landscape is 30,240.67 hectares, for more details see ANNEX 24.

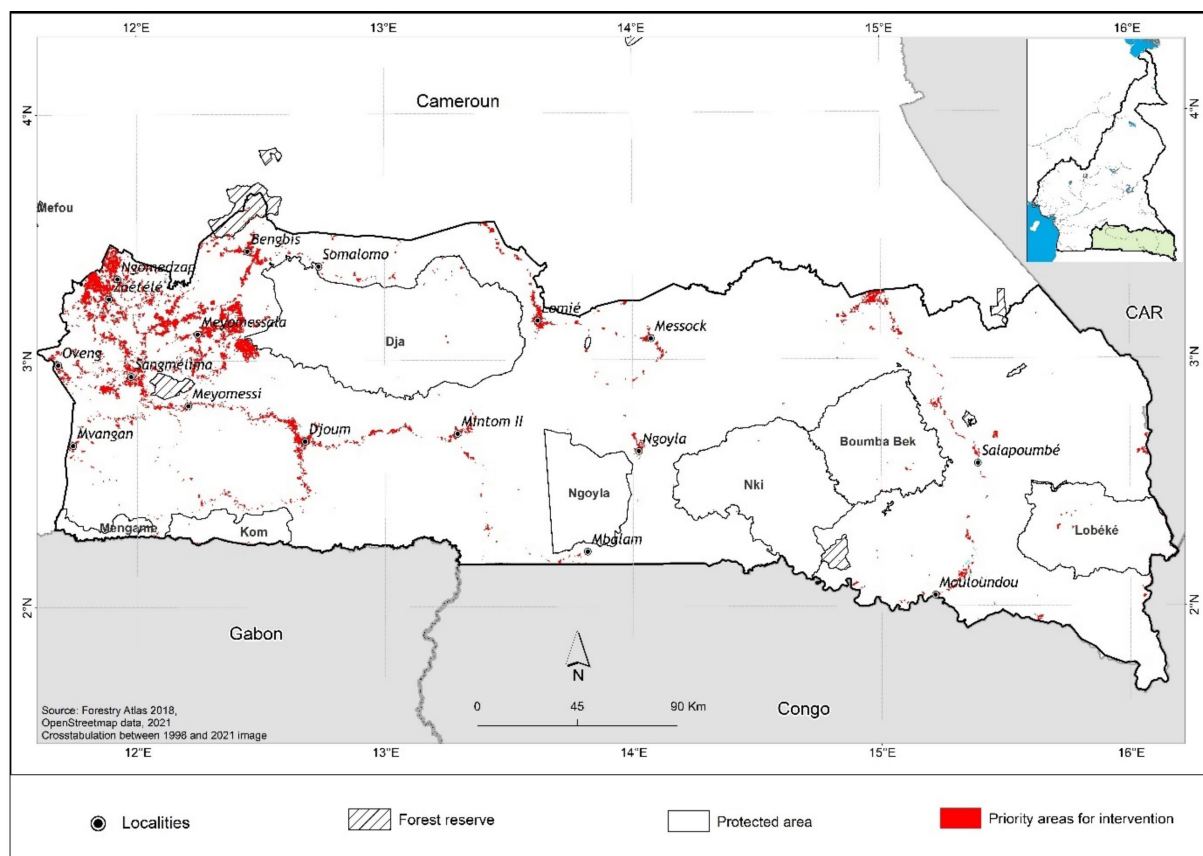


Figure 32: Map of priority areas for restoration in Dja-Lobeke landscape

6.4.3. BAKOSSI-BAMBOUTOS LANDSCAPE

Deforestation in the Bamboutos-Bakossi Landscape is as significant as that observed in the Waza zone. Out of 574148.79 hectares of forest in 2000, 15075.1 hectares were deforested between 2000 and 2021, which represents a deforestation rate of 0.12% (Table 26). Generally speaking, the conversion of forests into other types of land use is driven by a number of factors, including climate and human activities. Since 2000, the rate of occupation of the Bamboutos-Bakossi landscape for cultivation has increased from 17.86% to 19.71% of the total area. This pressure on the forests is explained by a galloping increase in population in this landscape. Consultations with key stakeholders in the area have indeed confirmed that agriculture is the main cause of deforestation in this landscape. The restoration potential in

the Bamboutos-Bakossi intervention site is 15075.1 hectares (See ANNEX 24 for more information).

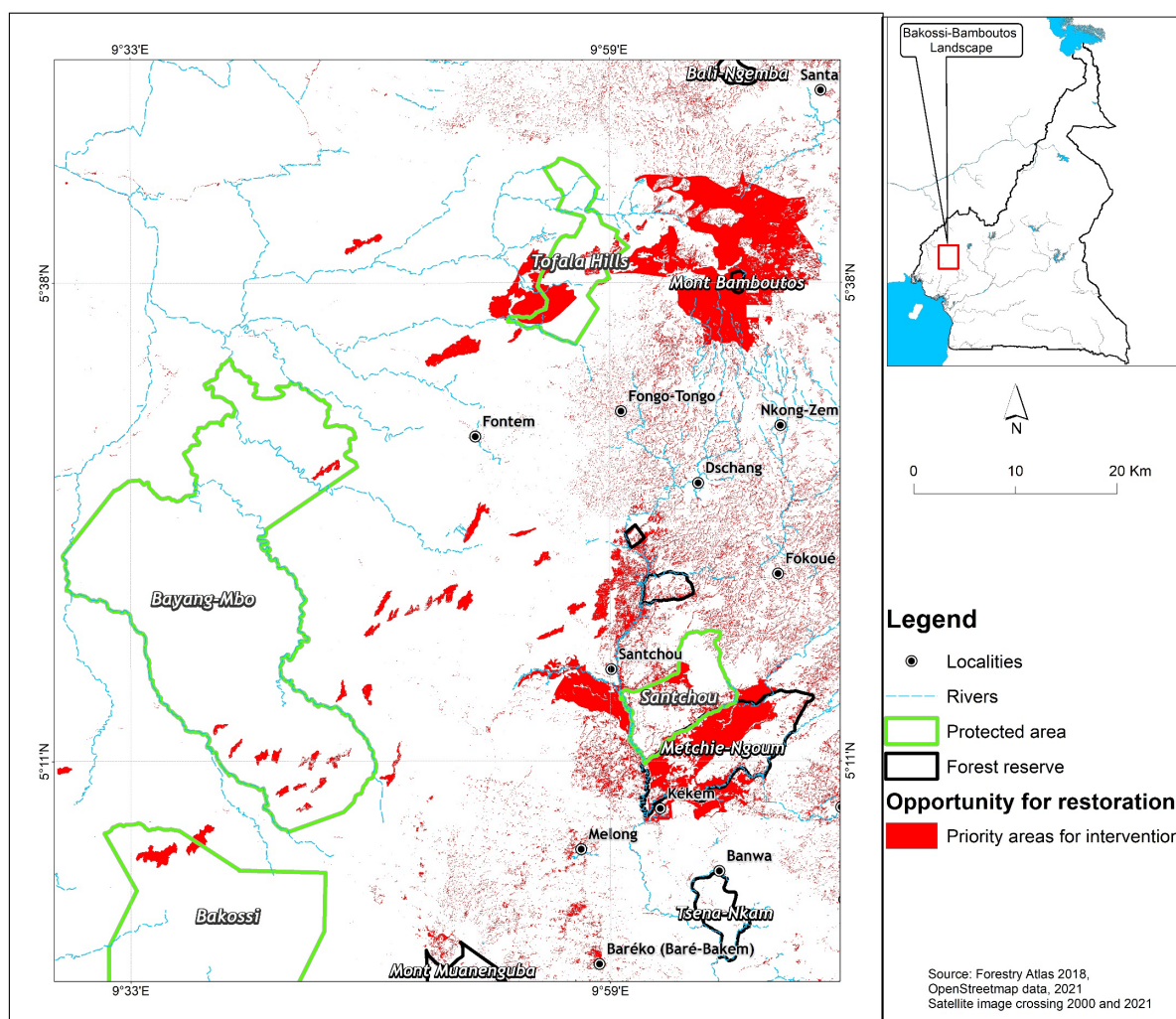


Figure 33: Map of priority areas for restoration in the Bamboutos-Bakossi landscape

6.5. ACTIONS TO ENHANCE FOREST LANDSCAPE RESTORATION IN AND AROUND PFAs

The ROAM assessment identified suitable activities and targeted areas for restoration in the three landscapes. Species identified for restoration are found in ANNEX 24.

6.5.1. WAZA LANDSCAPE

In the Waza landscape the restoration activities identified include:

- Assisted natural regeneration and agroforestry on agricultural lands;
- Reforestation on individual private plots of fallow land or on cultivated land, protected areas, community, and communal forests.
- Anti-erosion practices on agro-pastoral plots and on hillsides;
- Improvement of agro-pastoral production systems and access to fodder;
- Sustainable and participatory management of natural resources ;
- Promotion of organic farming techniques (composting, organic manure, crop association/rotation); and
- Protection of existing natural forests on hillsides and in shrub steppes.

Table 61: Main intervention opportunities in Waza intervention site

Restoration options	Target intervention areas
Assisted natural regeneration and Agroforestry	Agricultural lands
Fertility restoration	Agricultural lands
Reforestation	Mountains and hills
	National parks
	Community and communal forest
Protection and restoration of watershed	Buffer zones around water bodies and riparian forests
Anti-erosion measures	Agricultural lands
Improvement of agropastoral production	Pastureland

Table 62: Intervention opportunities Dja-Lobeke intervention site

Restoration options	Target intervention area
Cocoa Agroforestry	Agricultural lands
Reforestation	Mountains and hills

Table 63: Intervention opportunities in Mount Bamboutos intervention site

Restoration options	Target intervention area
Avocado Agroforestry	Agricultural lands
Reforestation	Mountains and hills
	Forest reserves
Protection and restoration of watershed	Buffer zones around water bodies and riparian forests
Anti-erosive measures	Agricultural lands

Restoration activities are expected to generate several benefits to the local communities and the environment. For example:

- Agriculture yields will improve through the association of crops with fertilizing plants (straw crops);
- The promotion of agroforestry and Assisted Natural Regeneration on agricultural land should see a gradual improvement in agricultural yields, increase in carbon stocks and eventually provide wood energy for local populations;
- Simple anti-erosion measures such as stone barriers, grass strips, and stone wedges could provide ecosystem services such as reducing erosion, improving soil fertility, and improving infiltration and retention of rainwater;
- Other options such as reforestation and protection of community areas, and improvement of pastures can generate long-term goods and services such fuelwood, improvement in water infiltration and protection of watersheds against water erosion, fodder for animals, carbon sequestration etc.

The different species relevant for restoration are presented in Table 67, including the ecosystem goods and services that they can generate.

Table 64: Major Species for the restoration in the Waza landscape

Nb	Common Name	Scientific Name	Vernacular Name	Ecosystemic Services
1.	Egyptian Mimosa	<i>Acacia nilotica</i>	Gabdé	Firewood, timber, soil fertilization, fodder, hedgerows
2.	Senegal's gum tree	<i>Acacia senegal</i>	Pattugelhi	Firewood, soil fertilization, fodder, shading
3.	Whitebark Acacia	<i>Acacia seyal</i>	Mboulbi	Firewood, fodder
4.	Siberianna	<i>Acacia sieberiana</i>	Alloukidanéhi or dandaneh	Firewood, soil fertilization, fodder
5.	Acacia with round apple	<i>Faidherbia albida</i>	Tchaski	Firewood, soil fertilization, fodder, shading
6.	Dattier desert	<i>Balanites aegyptiaca</i>	tanned	Food, firewood, lumber, medicinal, fodder, charcoal, timber
7.	Bayahonde	<i>Prosopis juliflora</i>	-	Firewood, timber, soil fertilization, fodder
8.	Bamboo	<i>Oxytenanthera abyssinica</i>	Kewé	Non-Timber products

6.5.2. DJA-LOBEKE LANDSCAPE

Agroforestry and particularly, Cocoa agroforestry seems to be the main restoration option for degraded landscapes in the area. The cocoa agroforestry system involves the integration of other plants especially fruit trees in cocoa farms. The fruit trees are of value to local populations, and some include avocado, safoutier, ndo'o (*Irvingia gabonensis*), Moabi (*Baillonela toxisperma*) and Djansang (*Ricinodendron heudelotii*). Agroforestry systems have the potentials to contribute to both the socio-economic well-being of households and carbon sequestration.

Other restorations options include reforestation and protection of degraded areas in PFAs. The reforestation and protection of PFAs should help preserve or increase carbon stocks and contribute to the preservation of biodiversity. The different species relevant for restoration are presented in Table 69, including the ecosystem goods and services that they can generate.

Table 65: Surface areas and carbon potentials for each restoration option in Dja-Lobeke landscape

Table 66: Major Species for the restoration in the South – East humid forest landscape

Nb	Common Name	Scientific Name	Vernacular Name	Ecosystemic Services
1.	Mango/ mangue sauvage	<i>Irvingia gabonensis</i>	Ndo'o	Food, seed used for medicine, Firewood, power supply, shading
2.	Bitter Kola	<i>Garcina cola</i>	Onié	Firewood, food, medicinal plant, shading
3.	Safou	<i>Dacryodes edulis</i>	Nsé	Firewood, power supply, shading

4.	Ndjansang	<i>Ricinodendron heudelotii</i>	Ndjansang	NTFP fruits, kitchen oil, medicinal plant, wood for arts
5.	Bamboo	<i>Oxytenanthera abyssinica</i>	Esong tanhain	Non-Timber products
6.	Ebony	<i>Diospyros crassiflora</i>		Timber, NTFP

6.5.3. BAKOSSI-BAMBOUTOS LANDSCAPE

The main restoration activities identified in this landscape include agroforestry and reforestation. These activities will be able to provide goods and services that will contribute to agriculture productivity, income of farming households, fuelwood, water conservation, biodiversity conservation, carbons sequestration. The different species identified for restoration in this landscape are presented in Table 72.

Table 67: Major Species for the restoration in the Bamboutos landscape

Nb	Common Name	Scientific Name	Vernacular Name	Ecosystemic Services
1.	Avocatier	<i>Persea Americana</i>	Pea	Food, medicine, Firewood, shading
2.	Raphia	<i>Raphia spp.</i>	Bamboo	Firewood, Wine, power supply, shading, Handicraft, water body protection
3.	Safou	<i>Dacryodes edulis</i>	Nzo'o	Non-Timber products
4.	Bamboo	<i>Oxytenanthera abyssinica</i>	Lefouok	Non-Timber products, Handicraft, water body protection
5.	Eucalyptus	<i>Eucalyptus spp.</i>	Eucalyptus	Timber and service wood, firewood

6.6. BARRIERS TO THE UPTAKE OF RESTORATION ACTIVITIES

Despite the biophysical and financial potentials, the adoption of these restoration practices is constrained by several factors that are alike across the three landscapes.

Table 68: Barriers and corrective measures to enhance the uptake of restoration practices

Main barriers	Proposed corrective actions
Reluctance of small-scale farmers to engage in restoration due to loss of income during the first years of investment in restoration activities	Establish incentives, including payments for environmental services. For example, access to credit or in-kind benefits (including access to land, markets, or production inputs) could be offered to stimulate the adoption.
Institutional environment not attractive for tree planting	The definition of an attractive incentive framework for forest plantations will make it possible to remove barriers to the forest plantation initiative. Technical assistance could be guaranteed to forest plantation promoters in the development and implementation of their management plans. Consideration should be given to the inclusion of private plantations in Payments for Environmental Services (PES)
Property constraints	Ensure that the land tenure status of an area is clarified prior to any restoration, and then adopt restoration approaches that are compatible with local customary rights (voluntary individual approach) or investment in areas with secure legal status belonging to the community (community forests), local councils (council forests) or the State (protected areas, FMUs, etc.)
Poor knowledge of the legal and regulatory framework by the population.	- Raise awareness among local populations about the law, particularly the law prohibiting the harvesting of woody resources in watersheds - Strengthen the human and financial capacities of stakeholders
Ecological conditions not conducive to restoration (threats from bush fires and animals)	- Identified appropriate approach to protect and monitor restored areas

Market conditions (cities exert strong pressure on land with ever-increasing demand for agricultural and forestry products)	- Development of alternative sources to wood energy such as solar energy, - Promotion of domestic gas - Energy efficiency programs such as improved stoves - Support to farmers to improve agricultural yields - Development of the neem value chain - Exploration of the REDD+ process (PES) - Development and promotion of ecotourism
Institutional conditions (roles and responsibilities of different actors not yet clarified, insufficient coordination between stakeholders)	- The need to clarify the roles and responsibilities of actors - Development of simple, fluid, and inclusive institutional arrangements for better coordination of interventions ensuring the effective involvement of all stakeholders.
Inadequate financial means	- Development of an investment plan - Capacity building of project proponents on resource mobilization
Low technical capacity of local populations	-Capacity building of local people on restoration, including the establishment and management of nurseries, monitoring of seedlings, protection of seedlings, etc. - Capacity building on simple soil restoration techniques - Development of a Monitoring and Reporting System - Development of a communication plan

6.7. BARRIERS TO THE UPTAKE OF ACTIONS TO REDUCE DD

The capacity of stakeholders exploiting and managing PFAs, including communities leaving around PFAs, to implement actions to reduce DD is constraint by several factors.

6.7.1. WAZA LANDSCAPE

In the Waza landscape the barriers identified include:

- Lack of motivation to embrace innovation and alternatives;
- Conflicts between farmers, herders, and fishers;
- Lack of community buy-in;
- Lack of financial and technical capacity;
- Insufficient development of water points or artificial ponds;
- Limited access to technology;
- Insufficient resources (technical, financial, material) for the WNP management; and
- Increasing insecurity in the area.

6.7.2. DJA-LOBEKE LANDSCAPE

Barriers to the implementation of actions to reduce deforestation and forest degradation include:

- Inadequate of coordination and collaboration between land use sectors;
- Lack of financial and economic motivation to implement SFM practices in production forest management;
- Lack of technical capacity to implement SFM practices in production forest management;
- Limited integration of climate change in the management plans of PFAs;
- Insufficient human and financial resources for protected area management in the landscape.

6.7.3. BAMBOUTOS-BAKOSSI LANDSCAPE

In the Bamboutos-Bakossi area the barriers are linked to:

- Decreasing forests size;
- Inadequate financial resources to invest in improve agriculture techniques;
- Inadequate financial resources to invest in alternative income generating activities;
- Lack of land use planning in the landscape;
- The lack of effective collaboration between the local institutions;
- Land and tenure insecurity
- Inadequate infrastructure in rural communities;

6.8. EMISSION REDUCTION/SEQUESTRATION POTENTIAL

The SPEFOCE project delivers climate mitigation through two complementary and additive accounting components covering non-overlapping activity areas across the three landscapes. The first is an enhanced sequestration component, covering agroforestry on existing cropland, reforestation of community forests, restoration of council forest reserves and park areas, and restoration of riparian forests and buffers, implemented across 10,008 ha in seven annual cohorts with a 20-year accounting horizon. The second is an avoided emissions component covering sustainable forest management (SFM) governance activities across 50,000 ha of designated permanent

forest area. The specific location of these intervention areas within each landscape will be confirmed through participatory land use planning at project inception.

Biomass increment parameters are sourced from peer-reviewed literature specific to each activity type, climate zone, and species group, as documented in Annex 22. All estimates use the LOW (conservative) end of the uncertainty range for external reporting, reflecting a 20% deduction applied to central estimates. Attribution factors are differentiated by component: 0.85 for the sequestration component, reflecting the complexity of landscape carbon dynamics, and 1.0 for the avoided emissions component, reflecting the direct and bounded causal link between SFM governance and the reduction in deforestation, with leakage separately deducted.

6.8.1. WAZA LANDSCAPE

Activity 1 — Parkland agroforestry on cropland (1,020 ha, USD 1,000/ha) RF at 20 years (AGB + BGB net, after baseline): approximately 29 tCO₂e/ha, derived from Luedeling and Neufeldt (2012) for Sahelian parkland agroforestry with *Prosopis*, *Faidherbia*, and *Acacia* spp. Establishment of scattered multipurpose trees on existing agricultural plots sequesters carbon in above- and below-ground woody biomass and improves soil organic matter through increased litter and reduced disturbance, without displacing food crop production.

Activity 2 — Community forest reforestation (516 ha, USD 900/ha) RF at 20 years: approximately 94 tCO₂e/ha (Poulsen et al. 2013, AGB recovery rate for Central African dry woodland). Enrichment planting and protection of community forest compartments transitions degraded stands from low-growth baseline to early-stage secondary woodland, with BGB included via IPCC Tier 1 root-to-shoot ratios.

Activity 3 — Park and degraded forest reserve restoration (210 ha, USD 900/ha) RF at 20 years: approximately 94 tCO₂e/ha (as above). Restoration of degraded compartments within and adjacent to Waza National Park stabilises the forest carbon stock and reduces fire pressure, while supporting wildlife habitat connectivity.

Activity 4 — Riparian forest and buffer restoration (207 ha, USD 700/ha) RF at 20 years: approximately 94 tCO₂e/ha (as above). Riparian buffer restoration reduces bank erosion, protects water sources, and provides corridor connectivity between forest patches in the Sudano-Sahelian landscape.

Activity 5 — SFM governance (20,000 ha, USD 100/ha) Emission factor: 257.8 tCO₂/ha cleared (Cameroon proposed FRL, Table 24, Forêt Sèche). Annual avoided emissions: 5,913 ha/yr historical deforestation rate applied to the 20,000 ha governance area. Improved management plans, community patrolling, fire management, and enforcement reduce access to and pressure on forest areas, preventing deforestation that would otherwise occur at the historical landscape rate. A Year 1 ramp-up factor of 0.50 is applied to reflect governance establishment time.

34

6.8.2. DJA-LOBEKE LANDSCAPE

Activity 1 — Shaded cocoa agroforestry (748 ha, USD 1,200/ha) RF at 20 years: approximately 254 tCO₂e/ha (shade tree component only), derived from Norgrove and Hauser (2013) for shaded cocoa systems in Cameroon. Introduction of multipurpose shade trees (*Irvingia gabonensis*, *Dacryodes edulis*, *Garcinia cola*) into existing smallholder cocoa stands adds a woody carbon increment attributable to the shade tree component only.

Activity 2 — Community and council forest restoration (1,618 ha, USD 800/ha) RF at 20 years: approximately 177 tCO₂e/ha (Poulsen et al. 2013, post-logging recovery rate for Central African humid forest). Assisted regeneration and enrichment planting in degraded community and council forest compartments accelerates biomass recovery and stabilises soil carbon under the humid rainforest climate.

Activity 3 — Park and forest reserve restoration (706 ha, USD 750/ha) RF at 20 years: approximately 177 tCO₂e/ha (as above). Restoration of degraded compartments within the Dja Biosphere Reserve and adjacent reserves stabilises core conservation areas and supports biodiversity co-benefits alongside carbon sequestration.

Activity 4 — Riparian bamboo buffer restoration (1,063 ha, USD 550/ha) RF at 20 years: approximately 100 tCO₂e/ha (Nfornekah et al. 2021, *Oxytenanthera abyssinica* AGC stocks, Cameroon). Riparian bamboo buffers protect watercourses, reduce bank erosion, and provide rapidly established carbon stocks along riparian corridors in the humid lowland context.

Activity 5 — SFM governance (15,000 ha, USD 150/ha) Emission factor: 474.7 tCO₂/ha cleared (Cameroon proposed FRL, Table 24, Forêt dense humide). Annual avoided emissions: 1,957 ha/yr historical deforestation rate applied to the 15,000 ha governance area. The large intact forest matrix of the Dja-Lobéké landscape provides a high per-hectare carbon stock, making governance of even a relatively small annual deforestation rate significant in absolute emissions terms.

Dja-Lobéké results (LOW estimate): 7-year combined mitigation potential 25,959 tCO₂e (AE: 10,216 tCO₂e; sequestration: 15,743 tCO₂e). 20-year combined: 268,748 tCO₂e (AE: 10,216 tCO₂e; sequestration: 258,532 tCO₂e).

6.8.3. 35BAKOSSI-BAMBOUTOS LANDSCAPE

Activity 1 — Avocado/safou agroforestry (333 ha, USD 2,000/ha) RF at 20 years: approximately 59 tCO₂e/ha, derived from Takimoto et al. (2008) for moist highland agroforestry systems in sub-Saharan Africa (upper end of range applied given BB highland productivity). Establishment of *Persea americana* (avocado), *Dacryodes edulis* (safou), and associated species on degraded smallholder agricultural land introduces above- and below-ground carbon stocks alongside livelihood benefits from fruit production.

Activity 2 — Forest reserve and montane hill restoration (750 ha, USD 1,100/ha) RF at 20 years: approximately 235 tCO₂e/ha (Githiru et al. 2023, AGB recovery in tropical montane secondary forest, East Africa). Restoration of degraded montane forest compartments through enrichment planting, access control, and fire management reverses biomass decline and supports the Western Highlands biodiversity hotspot.

Activity 3 — Riparian bamboo buffer restoration (2,837 ha, USD 400/ha) RF at 20 years: approximately 205 tCO₂e/ha (Kaam et al. 2024, *Phyllostachys aurea* AGC stocks, Western Highlands of Cameroon). Riparian bamboo buffers in the highland context protect rivers and water bodies from erosion, support rapid carbon accumulation in areas of high agricultural pressure, and provide non-timber forest products to local communities.

Activity 4 — SFM governance (15,000 ha, USD 200/ha) Emission factor: 427.6 tCO₂/ha cleared (Cameroon proposed FRL, Table 24, Forêt Plantée). Annual avoided emissions: 1,150 ha/yr historical deforestation rate applied to the 15,000 ha governance area. The highland context carries higher governance costs per hectare, reflecting the more demanding terrain and enforcement conditions, while the per-hectare carbon stock remains substantial.

Bakossi-Bamboutos results (LOW estimate): 7-year combined mitigation potential 92,057 tCO₂e (AE: 61,747 tCO₂e; sequestration: 30,310 tCO₂e). 20-year combined: 566,862 tCO₂e (AE: 61,747 tCO₂e; sequestration: 505,115 tCO₂e).

36

6.8.4. TOTAL MITIGATION POTENTIAL OF THE PROJECT

Combining both components across all three landscapes, the project delivers a seven-year mitigation potential of 1,642,165 tCO₂e (LOW estimate), comprising 1,589,313 tCO₂e from the avoided emissions component and 52,851 tCO₂e from the enhanced sequestration component. Over the 20-year mitigation lifetime, the combined portfolio mitigation potential reaches 2,467,777 tCO₂e (LOW estimate), with the sequestration component growing to 878,464 tCO₂e as established cohorts accumulate biomass beyond Year 7.

Combined mitigation potential by landscape and component (LOW estimate, tCO₂e).

<i>Landscape</i>	<i>Avoided emissions (SFM governance)</i>	<i>Enhanced sequestration</i>	<i>7-yr combined</i>	<i>20-yr combined</i>
Waza	1,517,350	6,799	1,524,149	1,632,166
Dja-Lobéké	10,216	15,743	25,959	268,748
Bakossi-Bamboutos	61,747	30,310	92,057	566,862
Portfolio total	1,589,313	52,851	1,642,165	2,467,777

Emission factors for the avoided emissions component are drawn from Cameroon's proposed Forest Reference Level submitted to the UNFCCC in January 2026 (Table 24), providing alignment with the national framework wherever currently possible. Once the proposed FRL has completed UNFCCC technical assessment, the reference level values will be reviewed and updated for full alignment. The full ex-ante methodology, parameter registry, and annual results by landscape and activity are documented in Annex 22.

7. MARKET AND VALUE CHAIN DEVELOPMENT

This section presents an overview of the market and value chain context in the three landscapes, including options for transformational change and operational approaches. Information presented here is sourced from the Market and value chain study (ANNEX 2B). This implies that the ANNEX 2B report should be consulted in case there is need for detail or further information.

7.1. CONTEXT

7.1.1. WAZA LANDSCAPE

a) NTFP value chain: scope and structure

The most important NTFPs in the Waza landscape include *Balanites egyptiaca*, *Adansonia digitata*, *Azadirachta indica*, *Ziziphus mauritania*, *moringa oleifera*, and *Tamarindus indica* (Table 47).

Table 69: NTFPs with high potential economic value in the Waza landscape

N°	Local Name	Scientific name	Medium rank (n=14)	Citation frequency (n= 5 focus groups)
1	Balanites	<i>Balanites egyptiaca</i>	1.6	100%
2	Baobab	<i>Adansonia digitata</i>	1.6	60%
3	Neem	<i>Azadirachta indica</i>	1.8	100%
4	Jujube	<i>Ziziphus mauritania</i>	3.4	100%
5	Moringa	<i>moringa oleifera</i>	4.7	60%
6	Tamarin	<i>Tamarindus indica</i>	4.8	100%
7	Gome arabique	<i>Acacia seyal</i>	6.0	20%
8	Nere	<i>Parkia biglobosa</i>	6.0	40%
9	Caïlcédrat	<i>Khaya senegalensis</i>	6.5	40%
10	Ricin	<i>Ricinus communis</i>	7.0	20%
11	Dattier	<i>Phoenix dactylifera</i>	8.0	20%
12	Vitex	<i>Vitex doniana</i>	8.0	40%
13	Anancarde	<i>Anacardium occidental</i>	8.0	40%
14	Ronier	<i>Borassus Aethiopum</i>	10.0	20%

Source: Stakeholder consultation, Market and value chain study

In the Waza landscape, 4 main categories of stakeholders involved in the NTFP value chain: the collectors, local traders, the intermediate collectors, processors, and Traders or retailers. The collection of NTFP is mainly done by women and children, where they independently sell their products to the local market or to local traders (Figure 28). Women are also the most involved in the processing of NTFP either individually or within organized groups by hand or through oil pressing machines. External intermediary buyers from Nigeria come to purchase products such as gum arabic to supply the sub-regional market (Nigeria, Sudan).

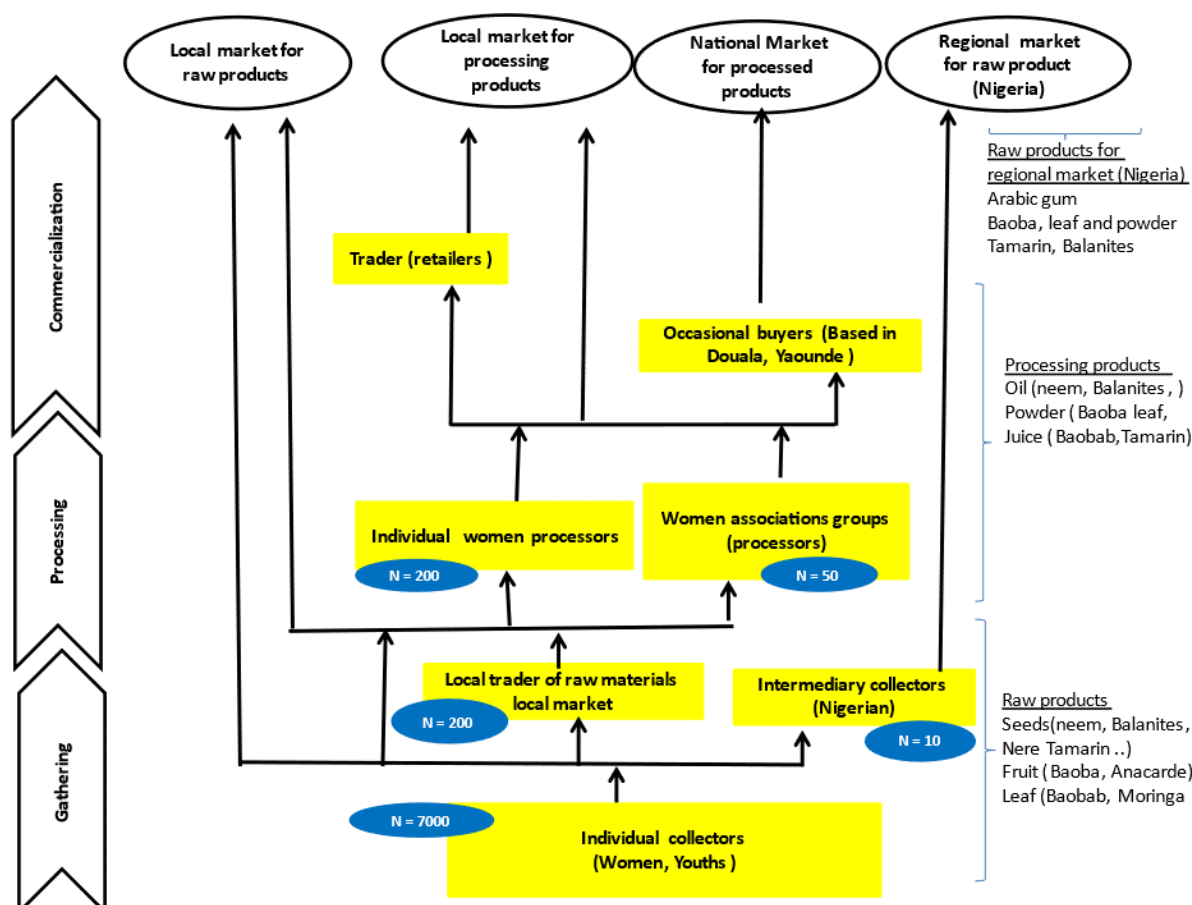


Figure 37: Mapping of actors within the NTFP value chain in Waza landscape

The NTFP market chain study revealed that an estimated 5 000 collectors (90% of women) from approximately 1500 households in the Waza council area are involved seasonally in the NTFP value chain (Table 78). About 231 tons of various NTFP are collected in the production basin around Waza national park, representing an annual turnover of approximately 45,746 million CFA francs generated at the local level (ANNEX 2B).

Table 70: Key information on NTFP value chain around the Waza national park

Parameter	Data
• Approximate number of collectors	5 000
• Percentage of women among NTFP collectors	90 %
• Percentage of indigenous people (Mbororo) among NTFP collectors	15 %
• Approximate number of households involved in NTFP value chain	1000
• Estimated quantity of NTFP produce (Kg/household/Year)	89
• Estimated average price (Fcfa/kg)	514
• Estimated turnover generated by NTFP value chain for a local producer (Fcfa)	45 746 000

The average annual income generated from the collection and commercialization of NTFPs is estimated at 45,772 CFA francs per household that is involved in these activities. The most important products in terms of volume and income generated are Balanites (*Balanites egyptiaca*), Baobab (*Adansonia digitate*), Neem (*Azadirachta indica*), Jujube (*Ziziphus Mauritania*), and Tamarin (*Tamarindus indica*).

The NTFP market in Waza forest landscape can be divided in 3 categories:

- **Village/house-based transactions:** proximity to supply zone, direct transactions producer & buyer. Buyers are sometimes collectors coming from Nigeria;
- **Local periodical markets:** where producers sell their product directly to the local consumers. Popular among markets in the council areas;
- **Urban markets:** weak self-sufficiency, reliance on close and far supply areas, involved intermediaries (□ **Maroua**).

Table 79 Presents the buying and selling prices in different markets for the most important NTFPs in the landscape.

Table 71: Buying and selling prices in different markets for the main NTFP

NTFP	Product	Unity	Buying price (Fcfa)		Selling price (Fcfa)			
			Village/house		Local market (Mora)	Urban market (Maroua)		
			Min	max	Min	Max	Min	Max
Balanites	seed	Koro	250	350	350	400	500	600
	Shelled seed	Koro	1500	2000	2000	2200	2400	2500
Baobab	Fruit pulp	bag	1200	1400	1250	14500	15000	15500
	Leaf	bag	3000	3500	3500	4000	5000	5500
	leaf powder	koro			2500	3000	3000	3500
Neem	seed	Koro	150	200	150	200	200	250
	Shelled seed	Koro	300	400	300	400	400	500
	Oil	liter			3000	4000	4000	5000
Jujube	seed	Koro	250	300	300	350	400	500
Tamarin	seed	Koro	350	400	400	500	500	600

The collection and sale of raw Neem seeds is not profitable following the production cost, particularly for the time invested in the collection process. Generally, these costs are not considered by the collectors. On the other hand, the sale of shelled seeds and their processed oil are profitable. In general, the more advanced the transformation process, the higher the profit margin (Table 80).

Table 72: Cost- benefit analysis of main NTFPs in Waza landscape

NTFP	Product	Production cost	Selling price (Fcfa/kg)	Margin benefit (FCF/kg)	Proportion of margin
Balanites	Fruit	83	125	42	14%
	Shelled seed	500	750	250	86%
Baobab	Fruit pulp	250	400	150	18%
	Leaf	104	250	146	18%
	leaf powder	673	1200	527	64%
Neem	seed	100	75	-25	-5%
	Shelled seed	167	200	33	6%
	Oil	2500	3000	500	94%

NTFP	Product	Production cost	Selling price (Fcfa/kg)	Margin benefit (FCF/kg)	Proportion of margin
Jujube	seed	83	125	42	
Tamarin	seed	83	175	92	

Pertaining to processing, the NTFP transformation process in the Waza landscape and the Sahelian zone in general remains very artisanal (Table 81). Processing involves the shelling of seeds, processing seeds and leaves into oils (Neem) and powder (Baobab), respectively. Initiatives to support the modernization of the processing of NTFPs exists in the area. This includes support from technical and financial partners (e.g., GIZ among others) for the acquisition of small processing units equipped oil presses and crushing machines, mainly for women's organizations. The improvement of NTFP processing reduces women's work time, and increases benefits derived from processed products.

Table 73: Business models for traditional and mechanized production (e.g., Neem oil)

Parameter	Traditional production (manual press)	Mechanized production (Mechanical press)
Quantity of raw material	7 kg	7kg
Quantity of oil produced	1 L	2,5 L
Extraction rate	14 %	35 %
Production time	3 hour	15 minutes
Production costs *	2500 Fcfa	1025 Fcfa
Income (1 liter neem sold at 5000 Fcfa locally)	5000 Fcfa	12 500 Fcfa

Source: Market and value chain study, 2022

The main agroforestry product planted in the Waza landscape is domestic mango (*Mangifera indica*), followed by goyava. Households having these products in their traditional production systems can generate about 3000 - 20 000 Fcfa/year (Table 82)

Table 74: List of main agroforestry products found in the Waza landscape

N°	Common name	Scientific name	Respondents		Quantity sold by households involved (kg/year)		Average selling price (Fcfa/kg)	Income generated per year by households involved (Fcfa)	
			n	%	Min	Max		Min	Max
1	Mango	<i>Mangifera indica</i>	34	32%	30	40	500		20 000
2	Goyava	<i>Psidium guajava</i>	15	14%	20	30	267	5 330	8 000
3	Papaya	<i>Carica papaya</i>	14	13%	5	20	150	2 250	3 000
4	Lemon	<i>Citrus limon</i>	10	9%	15	30	235	3525	7 050
5	Cashew	<i>Anacardium occidentale</i>	5	4,5%	35	50	100	3 500	5 000

In agroforestry systems, farmers retain or protect certain woody species whose leaves or pods are highly valued by small or large livestock (Table 83). In addition, the leaves and pods provide protein-rich fodder for the animals during the dry season.

Table 75: List of main fodder plants found in agroforestry products in the Sudano –sahelian landscape

Scientific name	Name in fufuldé*
<i>Acacia raddiana</i>	Boulbibodhéhi
<i>Acacia seyal</i>	Mboulbi
<i>Acacia sieberiana</i>	Alloukidanéhi
<i>Anogeissus leiocarpus</i>	Kodjoli
<i>Balanites aegyptiaca</i>	Tanne
<i>Daniellia oliveri</i>	Kayerhahi
<i>Faidherbia albida</i>	Tchaski
<i>Leucaena leucocephala</i>	
<i>Prosopis africana</i>	Barkehi

Source: Market and value chain study, 2022

*Local language

b) Wood energy value chain

Households in the Far North region depend on forest biomass for more than 95% of their energy supply. This supply is covered almost entirely by the informal sector, which is characterized by illegal logging and the use of inefficient technology in terms of the production of charcoal.

Although charcoal production in the Far North region is prohibited, this activity continues to grow. The illegal and clandestine nature of charcoal production makes it difficult to find clear and reliable information on charcoal production and wood energy value chain in general.

Findings indicate that between 1.2 and 1.8 tons of fuelwood per household are consumed every year. Households involved in the collection and marketing of fuelwood at the rural market sell between 676 and 975 kg of fuelwood per year for an annual net profit margin of 20,000 - 49,000 Fcfa (Table 84).

Table 76: Data on fuelwood harvesting and consumption in the landscape

Parameters	Values	
	Minimum	Maximum
Quantity collected (Kg/household/year)	1865.5	2759.25
Quantity consumed (Kg/household/year)	1189.5	1784.25
Average selling price of firewood (Fcfa/kg)	50.0	50.0
Quantity of firewood sold per household (kg)	676	975
Production cost (Fcfa/kg)	19.2	19.2
Income from selling of firewood (Fcfa/household/year)	33800.0	48750.0
Profit margin (Fcfa/household/year)	20,800.0	30,000.0
Market value of firewood used in households	59475	89212.5

The development of a sustainable wood energy value chain is crucial in the Sudano-Sahelian landscape because it constitutes a resource that is becoming increasingly scarce in this part of the country. Initiatives of community plantation of wood for energy purposes exist with the

support of partners such as the GIZ, and the European Union (EU) through the development of community forests, communal forests, or community plantations.

c) Straw value chain

Straw is an important resource as it is used in handcraft to make mats and roofs. Straw is collected and stored in bales to ensure a constant and continuous supply to the market as well as the feeding of livestock in the dry season. Peri-urban livestock farmers are the main source market demand. The production and sale of straw generates income for households. A 25 kg bale of straw can bring is sold at 500 and 700 Fcfa and the activity in general generates about 10 000 Fcfa/week/household (ANNEX 2B).

d) Community forest for wood energy

The support to community forests for wood energy production and other fodder resources is a serious option to be supported at the community level. The cost-benefit analysis of the establishment of a community forest in the Sahelian zone, considering the net present value (NPV) at a 10% discount rate, shows that it is worth undertaking a community forest. The whole economic value of the forest is certainly higher if we take into consideration other ecosystem services that are non-marketed like cultural practices, regulation of water flow, microclimate etc. The incremental net benefit will start flowing four years after the beginning of the project (Table 85).

Table 77: Cost-benefit analysis of community forest for wood energy objectives

Dana Community Forest 2 394 ha Mayo-Danay Yagoua											
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Cash out											
Transaction costs for the establishment of the community forest (Fcfa)	2,000,000										
Cost elaboration of management plan (Fcfa)	3,000,000	0	0	0	0	0	0	0	0	0	0
Protection cost (Fcfa)											
Purchase of bicycles (4 *50 000) (Fcfa)	200,000	6,000	13,500	22,500	30,000						
Monitoring and watching the forest (Fcfa)		1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Installation of signs with pictorial messages ((Fcfa)	240,000										

Exploitation and restauration											
Materialisation of land (Fcfa)		15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Labor (Fcfa)		86,333	86,333	86,333	86,333	86,333	86,333	86,333	86,333	86,333	86,333
Material (machete, axe, file,) (Fcfa)		50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Purchase of cart + hitching animal (Fcfa)		50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Reforestation /Defensing (Purchase of 52 250 seedling/ years * 100 Fcfa/seedling) (Fcfa)		52,250	52,250	52,250	52,250	52,250	52,250	52,250	52,250	52,250	52,250
Total cash out	5,647,500	1,769,083	1,776,583	1,785,583	1,793,083	1,763,083	1,763,083	1,763,083	1,763,083	1,555,583	1,555,583
Cash in											
Gathering and selling of Firewood (398 m3 per year x 1500 Fcfa /m3) (Fcfa)		597,371	597,371	597,371	597,371	597,371	597,371	597,371	597,371	597,371	597,371
Gathering and selling of Paille/straw (By Boot, 5320 per year x 500 Fcfa/boot (Fcfa)	0	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000	2,660,000
Grazing tax Per Cattle (51 cattle per year x 10 000 CFA/cattle) (Fcfa)		51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000
Total cash in	0	3,308,371	3,308,371	3,308,371	3,308,371	3,308,371	3,308,371	3,308,371	3,308,371	3,308,371	3,308,371
Balance (cash in - cash out)	- 5,647,500	1,539,288	1,531,788	1,522,788	1,515,288	1,545,288	1,545,288	1,545,288	1,545,288	1,752,788	1,752,788

Cumulative balance (most positive)	- 5,647,500	- 4,108,212	- 2,576,423	- 1,053,635	461,654	2,006,942	3,552,230	5,097,519	6,642,807	8,395,596	10,148,384
IRR Total Net Cash Flow	24%										
Payback Period	4										
NPV	3,601,475										

e) Improved stoves value for energy efficiency

Several initiatives to promote improved stoves exist in the landscape. They are perceived as an effective means of fighting deforestation, desertification, and thus global warming. Similarly, for users, improved stoves reduce the expense and/or effort and time allocated to collecting firewood.

The production and distribution of improved cook stoves is a source of income. Between 2000 and 2020, MINEPDED has distributed more than 67,000 improve stoves free of charge in the Far North region. The cost of this stove is estimated between 5,000 and 7,000 Fcfa per stove. The improve cook stove production, distribution and consumption has not developed because of the low adoption rate by households.

Since 2016, GIZ has been promoting the improved three-stone stoves with more successful adoption by the local population, mainly women. In three years, more than 40,000 three-stone stoves have been built, including 11,000 in households in the Waza council area. The level of adoption of this fireplace is estimated at 80% because the construction is made of local materials (clay, straw, cow dung). The energy efficiency is estimated at 25-35% compared to the traditional fireplace.

7.1.2. DJA-LOBEKE LANDSCAPE

a) NTFPs: Scope and structure

The top important NTFP according to the local population with high potential economic value in the Dja-Lobeke landscape are presented in table 86.

Table 78: Important NTFPs identified in the Dja-Lobeke

N°	Local Name	Scientific name	Medium (n=14)	rank	Citation frequency (n= 8 focus groups)
1	Ndo'o,	<i>Invingia gabonensi</i>		1.13	100%
2	Djangsang	<i>Ricinodendron heudelotii</i>		2.00	100%
3	Bush onion	<i>Afrotyrax lepidophylla</i>		3.50	100%
4	Moabi	<i>Baillonella toxisperma</i>		4.63	100%
5	4 sides	<i>Tetrapleura tetraptera</i>		5.00	100%
6	Balaka, Ebai	<i>Pentaclethra macrophylla</i>		6.00	100%
7	Black pepper	<i>Piper guineensis</i>		7.13	100%
8	Koko, okok, eru	<i>Gnetum africanum</i>		7.17	75%
9	Mushroom			8.00	50%
10	<i>Aframomum</i> spp.	<i>Aframomum</i> spp.		8.80	75%
11	Ding, ozek, pépé			9.67	38%
12	Biter kola	<i>Garcinia kola</i>		10.67	38%

13	Kola	<i>Cola sp.</i>	11.00	25%
14	Mbol		13.00	13%

The NTFP market chain in the Dja-Lobeke landscape involves many actors from the supply area to big markets at national, regional levels. Figure X2 shows the mapping of actors along the value chain. At the level of collection, we have individual collectors in both the Bantou and Baka (indigenous people) villages. The Baka collectors generally collect for the local collectors in the village at a very low price and local collectors then sell to intermediary collectors. The intermediary collectors later sell their products to big collectors based in towns like Yokadouma and Lomie having storage capacity to gather enough for big buyers based in Douala and Yaoundé. Some products (Bush Mango, Djansang, Balaka) are exported to Nigeria (ANNEX 2B).

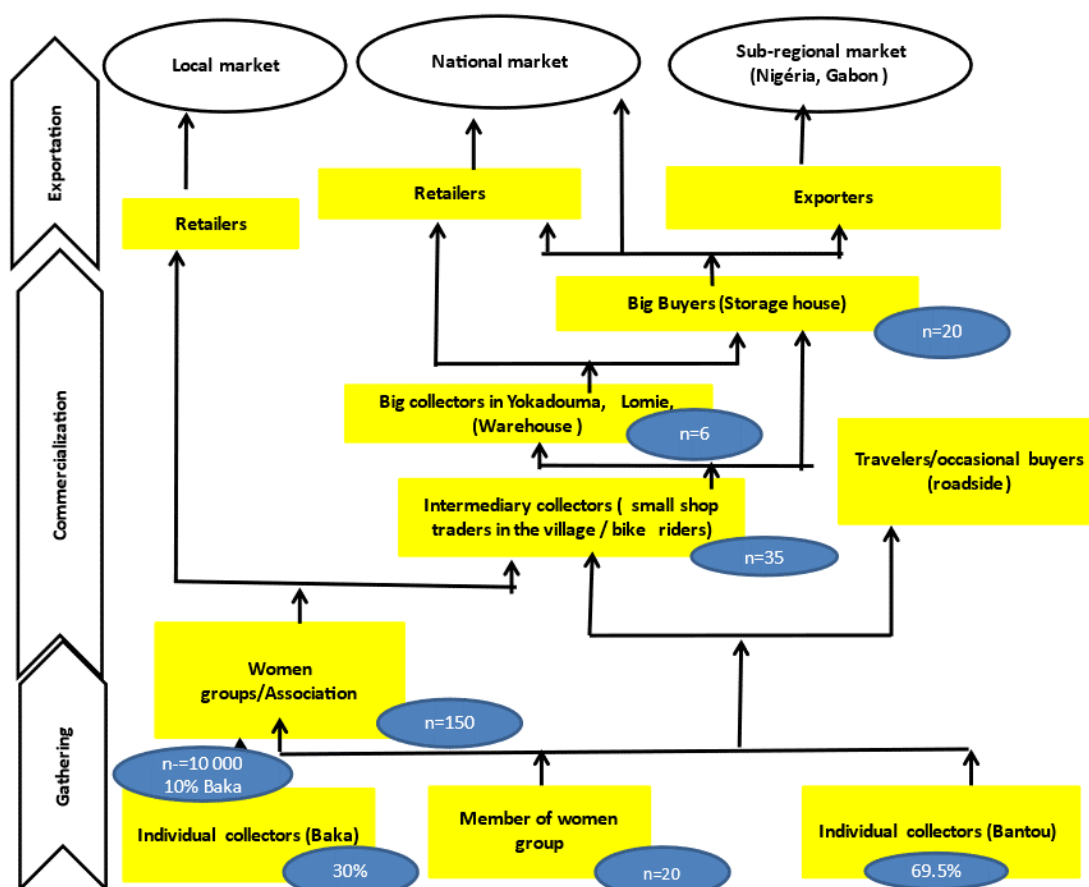


Figure 38: Mapping of actors within NTFP value chain in the humid forest landscape

About 10,000 collectors (80% of women) of approximately 2000 households in the Mouloundou and Salapoumbe councils' areas located in close to the Lobeke National Park are involved seasonally in the NTFP value chain. Around 10% of them are Baka, responsible for 30% of the collection of NTFP in the forest. About 274 tons of various NTFPs are collected per year in the production basin around the Lobeke park, representing a turnover of approximately 238,6 million of Fcfa generated at local level per year.

The average income generated from collection and commercialization of NTFP is estimated at 54 512 Fcfa per year for a Bantou household involved in that activity and 12 231 Fcfa per year for a Baka household. A Baka household earns six times less than a Bantou household. The most important products in terms of volume and income generated are *invingia*

gabonensis, *Afrostryax lepidophylla*, *Gnetum africanum*, *Ricinodendron heudelotii*.
Pentaclethra macrophylla (ANNEX 2B).

The NTFP market in Dja-Lobeke landscape can be divided into 4 types:

- **Forest-edge, farm-gate and village-based transactions**, with proximity to supply zone and direct transactions producer & buyer
- **Local markets**, high self-sufficiency, proximity to supply zone, high local supply & exchange, supply regional & national markets, direct producer-consumer transactions bulking points, intermediaries often involved
- **Large urban markets**, national projection, large range of products, weak self-sufficiency, reliance on close and far supply areas, intermediaries involved
- **Frontier markets**, small & high value transactions, high supply dependence on other areas, specialisation in high volume products, chain of intermediaries involved

Table 87 shows the different markets, the buying and the selling price of the most important NTFPs in the landscape

Table 79: Buying and selling prices in different markets for the main NTFP

Product	Unity	Buying price (Fcfa) (Forest-edge, farm-gate)		Selling price (Fcfa)					
		Min	max	Local market (Lomie, Yokadouma)		Urban market (Yaounde)		Urban market (Douala)	
				Min	Max	Min	Max	Min	Max
Ndoo	Combo ⁶	1000	1500	1500	2500	3500	4000	4200	4800
Rondelles	Bag ⁷	55 000	70 000	70 000	100 000	100 000	120 000	150 000	200 000
Balaka	Bucket 15l ⁸	2 500	3 000	3 500	4 000	5 000	5 500	6 000	7 000
Djanssang	Combo	1 800	2 500	3 000	3 500	4 000	4500	4500	5000
Affromomum	Bag	180 000	200 000	220 000	230 000	240 000	25000	260 000	270 000

Harvesters of NTFPs make only 15 % of all the benefits generated along the value chain while the big buyers make the largest profit (Table 88 and 89)

⁶ 1 Combo of product give approximatively 2,4 kg

⁷ 1 bag give 70 combo and approximatively 168 kg

⁸ 1 Bucket 15 liter = 7 Combos = 16,8 kg

Table 80: Cost-benefit analyses of main NTFPs along the value chain

Product	Harvester			Intermediary collector			Big collector (Yokadouma, Lomie)			Big buyer (Doula)		
	Production cost (Fcf a/kg)	Selling cost (Fcf a/kg)	Profit margin (Fcf a/Kg)	Production cost (Fcf a/kg)	Selling cost (Fcf a/an)	Profit margin (Fcf a/Kg)	Production cost (Fcf a/kg)	Selling cost (Fcf a/an)	Profit margin (Fcf a/Kg)	Production cost (Fcf a/kg)	Selling cost (Fcf a/an)	Profit margin (Fcf a/Kg)
Ndo'o	250	625	325	350	833	433	475	1042	567	975	2000	1025
Rondelles	167	416	249	267	625	358	292	774	482	492	1190	698
Balaka	100	179	79	150	238	88	200	298	98	350	417	167
Djanssang	750	1041	292	850	1084	233	1050	1458	408	1300	1875	575
Means												

Table 81: Distribution of benefits along the value chain

	Harvester	Intermediary	Big collector	Big buyer
Ndo'o	14%	18%	24%	44%
Rondelles	14%	35%	27%	39%
Balaka	18%	20%	23%	39%
Djanssang	19%	15%	27%	38%
Average	15%	25%	25%	40%

b) NTFP processing

The study reveals that NTFP buyers are mainly interested in raw products either as food products directly sold in their markets for consumption or as raw material for the agri-food and cosmetics industries (Nigeria market for example). The only product that is easily undergoes first processing is Moabi, whose seed is transformed into butter. For conservation purposes, the Bush mango kernel is also transformed into powder.

The process of collecting, storing, and marketing NTFPs is still traditional and artisanal in most cases. While processing and improving packaging to meet customer tastes is considered an important step to follow in the value chain logic, it is still marked by several obstacles, including:

- low perception of local organizations of the need to innovate through the processing of NTFPs;
- ignorance of advanced processing techniques;
- lack of quality standards for processing non-timber forest products;
- weak business relations between the possible actors.

Nevertheless, the initiative developed by some micro-small and medium enterprises based in Yaounde and Douala involved in the processing of NTFP already exists. They produce vegetable oil from Ndjansang, Mbalaka, and coconut oil and butter from moabi, bush mango and cocoa. But the market for processing of NTFP is still not well developed. Some effort is to be made in terms of quality, packaging and standards to boost the value chain of the processing of NTFP.

c) Agroforestry products

The agroforestry is the system with the most potentials in the landscape. However, the adoption rate is low with people involved in enriching their agroforestry systems or the house gardens with useful domestic fruit trees such as avocado, mangoes and safou (Table 90).

Table 82: List of main agroforestry products found in the Dja-Lobeke landscape

N°	Agroforestry products		Bantu				Baka			
			Respondents		Where do you plant?		Respondents		Where do you plant ?	
	Common name	Scientific name	n	%	House garden (%)n	Agroforestry system (%)n	n	%	House garden (%)n	Agroforestry system (%)n
1	Cocoa	<i>Thebroma cacao</i>	33	100	0	(100)33	56	5.36	0	(100)3
2	Avocado	<i>Persea americana</i>	10	30.3	(60)6	(40)4	2	3.57	(100)2	0
3	Mango	<i>Mangifera indica</i>	5	15.1	(80)4	(20)1	0	0.00	0	0
4	Safou	<i>Dacryodes edulis</i>	3	9.09	(100)3	0	0	0.00	0	0
5	Citrus	<i>Citrus spp</i>	2	6.06	(100)1	0	1	1.79	(100)1	0

d) Ecotourism

Lobéké National Park (LNP) has an exceptional biological diversity including 305 species of birds, 134 species of fish, more than 50 species of large mammals, 18 species of reptiles, 16 species of amphibians, 215 species of butterflies and 764 species of plants recorded to date. The density of elephants and gorillas, are among the highest in Central Africa, estimated at 6 individuals/km² and 2.98 individuals/km² respectively (WWF-MINFOR, 2014). The LNP has a few reception structures, bungalows, watchtowers, and camping areas.

Given this wildlife diversity, since the year 2000, ecotourism has experienced variable fluctuations. The statistics of the number of visitors per year are estimated at an average of 87.4 tourists per year, which remains very low (Nguenang, 2020)

7.1.3. BAKOSSI-BAMBOUTOS LANDSCAPE

a) NTFPs: scope and structure

It emerged from field consultations that most NTFPs consumed in the Bamboutos and western region in general, come from elsewhere, principally from the forest areas of the eastern,

central, and southern regions, however, some NTFPs are encountered in the landscape (Table 91)

Table 83: Important NTFPs with high potential economic value in the Bakossi-Bamboutos landscape

N°	Local Name	Scientific name	Medium (n=6)	rank	Citation frequency (n= 3 focus groups)
1	Wine Raffia Palm	<i>Raphia vinifera</i>	1.33		100%
2	Prunus	<i>Prinus africana</i>	1.0		33%
3	Black fruit	<i>Canarium schweinfurthii</i>	2.67		100%
4	Kola	<i>Cola anomala</i>	3.00		67%
5	Afframomum	<i>Afframomum</i>	4.7		60%
6	Biter kola	<i>Garcinia cola</i>	5.00		33%

The raffia wine value chain involves, (i) producers or winemakers, (ii) a set of commercial intermediaries who own motorcycles and, (iii) traders (wholesalers or retailers) (Figure 29). In some cases, producers take their products directly to the market. Markets are organized around the seller/buyer pair (direct consumers or resellers), generally women resellers (ANNEX 2B).

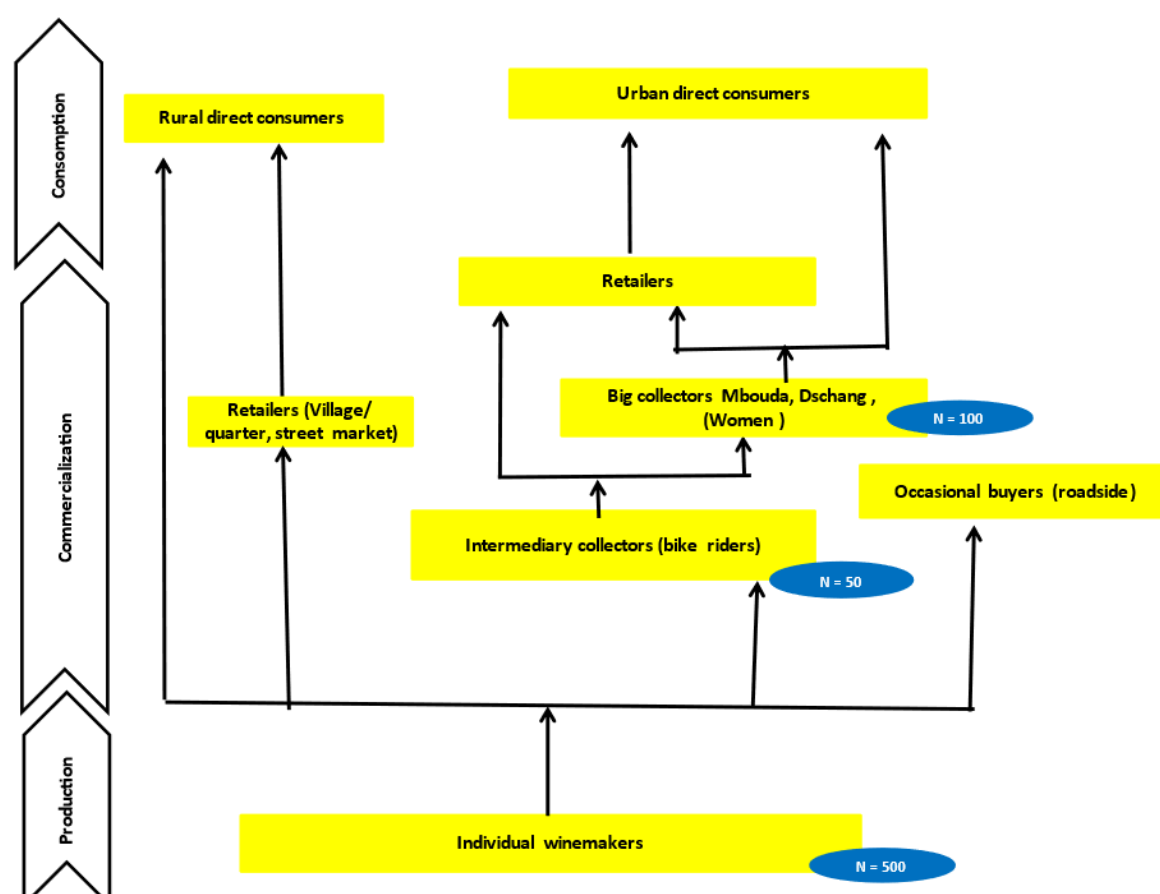


Figure 39: Mapping of actors within Raffia palm wine value chain in western highlands landscape

About 500 Raffia palm wine producers (particularly young men) operate in the villages around Mount Bamboutos. About 1 500 litres are collected per year by producers representing a

turnover of approximately 300 000 Fcfa generated at the local level per year/per household (Table 92).

Table 84:Key information on Raffia palm wine value chain in the villages around Mount Bamboutos

Parameter	Data
• Approximate number of collectors	500
• Estimated quantity of palm wine produced (l/producer/Year)	1500
• Estimated average price production area (Fcfa/l)	200
• Estimated turnover generated by raffia palm wine value chain producer in a village around Mounts Bamboutos (Fcfa)/year	150 000 000

Palm wine is a multipurpose tree that is very important for the local population, supplying food, fibres, and building material. There is a need to protect the resources and guarantee the sustainability. This will contribute to stabilize the microclimate, secure production, and improve the functioning of the raffia wine industry to sustainably meet local and especially urban demand, which has become increasingly high.

b) Black fruit

Belonging to the *Burseraceae* family, the black fruit tree (*Canarium schweinfurthii*) is a forest fruit species that grows in isolation in humid savannahs and various agroforestry systems. The fruit (an ellipsoidal drupe that turns purplish when ripe) is the subject of a flourishing trade. Farmers do not have a tradition of planting the tree, they simply protect the seedlings (wildings) and transplant them to a location of their choice. The black fruit value chain involves, (i) producers, (ii) wholesalers, and (iii) retailers (Figure 30).

About 200 households are involved in the collection and marketing of black fruits (mainly women) in the villages around Mount Bamboutos (ANNEX 2B). Approximately 60 kg are sold per year per household, representing a turnover of about 15,000 CFA francs generated locally per year per household owning a black fruit tree (Table 93).

Table 85:Key information of Black fruit value chain at the village level around Mount Bamboutos

Parameter	Data
• Approximate number of collectors	200
• Estimated quantity of Black fruit produced (kg/producer/Year)	60
• Estimated average price (Fcfa/kg)	250
• Estimated turnover generated by Black fruit value chain at local level in village around Bakossi-Bamboutos (Fcfa)	3 000 000

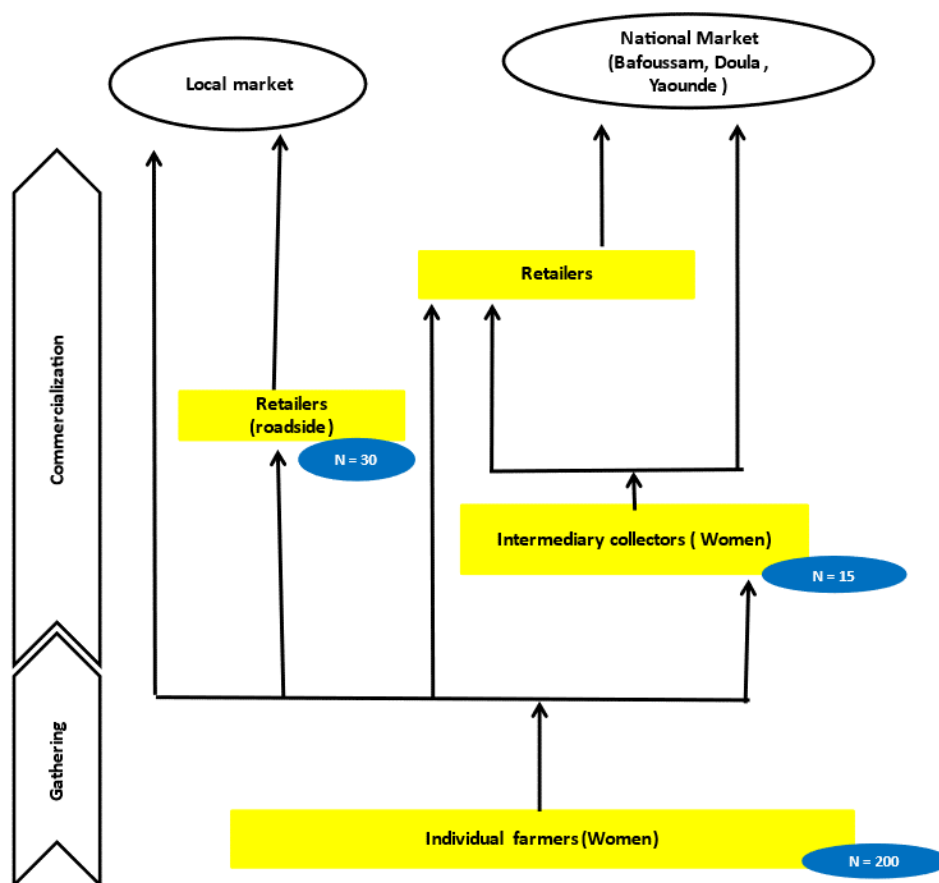


Figure 40: Mapping of actors within Black fruit (*Canarium schweinfurthii*) value chain in Bakossi-Bamboutos landscape

c) Kolanut

They are very few kolanut producers in the study area. They collect fruit from their farmlands and sell them to the intermediary buyers who in turn sell to wholesalers. Since the resource is not yet cultivated on a large scale, the population as a whole uses the revenue that comes from selling to solve daily problems.

Populations do not have the culture of keeping large amounts of kola to ensure its availability throughout the season. The main reasons include low yearly production, lack of preservation techniques, household poverty etc.

Intermediary' buyers go into different communities producing the resource to buy the goods at low prices. Aboard motorcycles or vehicles inaccessible areas, they buy the products they are asked to deliver to wholesalers the hours and days following their passage.

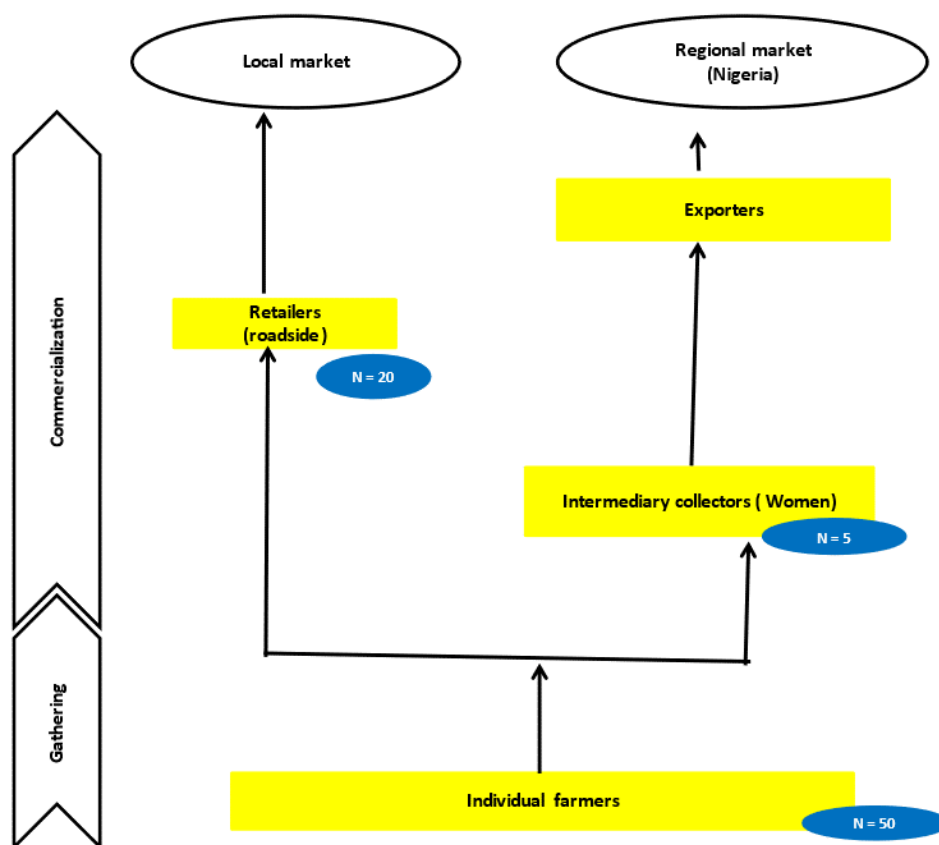


Figure 41: Mapping of actors within Kola nut value chain in Bakossi-Bamboutos landscape

The study estimated that at about 50 farmers are involved in gathering and commercialization of kola nut in the villages around Mount Bamboutos. About 190 kg is sold per year per farmer (Table 94) representing a turnover of approximately 57 000 Fcfa generated at local level per year per farmer (ANNEX 2B).

Table 86: Key information on kola nut value chain in villages around Mount Bamboutos

Parameter	Data
• Approximate number of kola nut farmers	50
• Estimated quantity produced (kg/producer/Year)	190
• Estimated average price (Fcfa/kg)	300
• Estimated turnover generated by Kola value chain at local level in village around Mount Bamboutos (Fcfa)	2 850 000

The sale prices of the kola nut are negotiated between the actors at each stage of the market and depending on the availability of the resource. Thus, in a period of abundance, 15l buckets of kola costs between 5 000-7 000 Fcfa in the villages, the intermediary buyers resell it at 9 000-11 000 Fcfa to the wholesalers, and the wholesalers sell it at 12 000-15 000 Fcfa. During low production periods, the price of this quantity of kola is evaluated between 14 000-17 000 Fcfa at the village level, the intermediary buyers sell at 18 000-20 000 Fcfa, and wholesalers resell at 23 000-25 000 Fcfa. During the off-season, 15l bucket costs 22 000-25 000 Fcfa at the level of the villages, the intermediary buyers resell the same quantity at 28 000-32 000 Fcfa, and the wholesalers resell at 35 000-45 000 Fcfa (Table:95).

Table 87: Prices of kola nut per season

Selling price Season	Quantity	Price (Fcfa)		
		Producers	Intermediary buyers	Wholesalers-Exporters
Season of high production	15l	5000-7000	9000-11000	12000-15000
Season of low production	15l	14000-17000	18000-20000	23000-25000
Intermediate seasons	15l	22000-25000	28000-32000	35000-45000

d) Agroforestry products

i. Avocado value chain

In Cameroon, the Bamboutos, Noun and Menoua Divisions are presented as the largest avocado producing areas. Consumers pay an average of 100 F to 500 F for a fruit and Resellers buy a 100 kg bag at 25 000 F or even 65 000 F depending on the specie. The avocado tree (for example grafted trees) starts producing 3 to 4 years after planting and a well-managed avocado plantation can produce more than 10 tons of avocado per hectare annually.

The government of Cameroon has made efforts to improve the avocado value chain through the creation of an avocado oil production plant in the Bamboutos division, one of the leading avocado production basins in the country. This project aims to create income-generating activities in rural areas. To this regard, 34 avocado producers in this locality plan to plant approximately 369 hectares of improved avocado trees variety. Once in production, these new plantations will allow producers to harvest 5,000 tons of avocados per year, compared to 1,500 tons currently harvested.

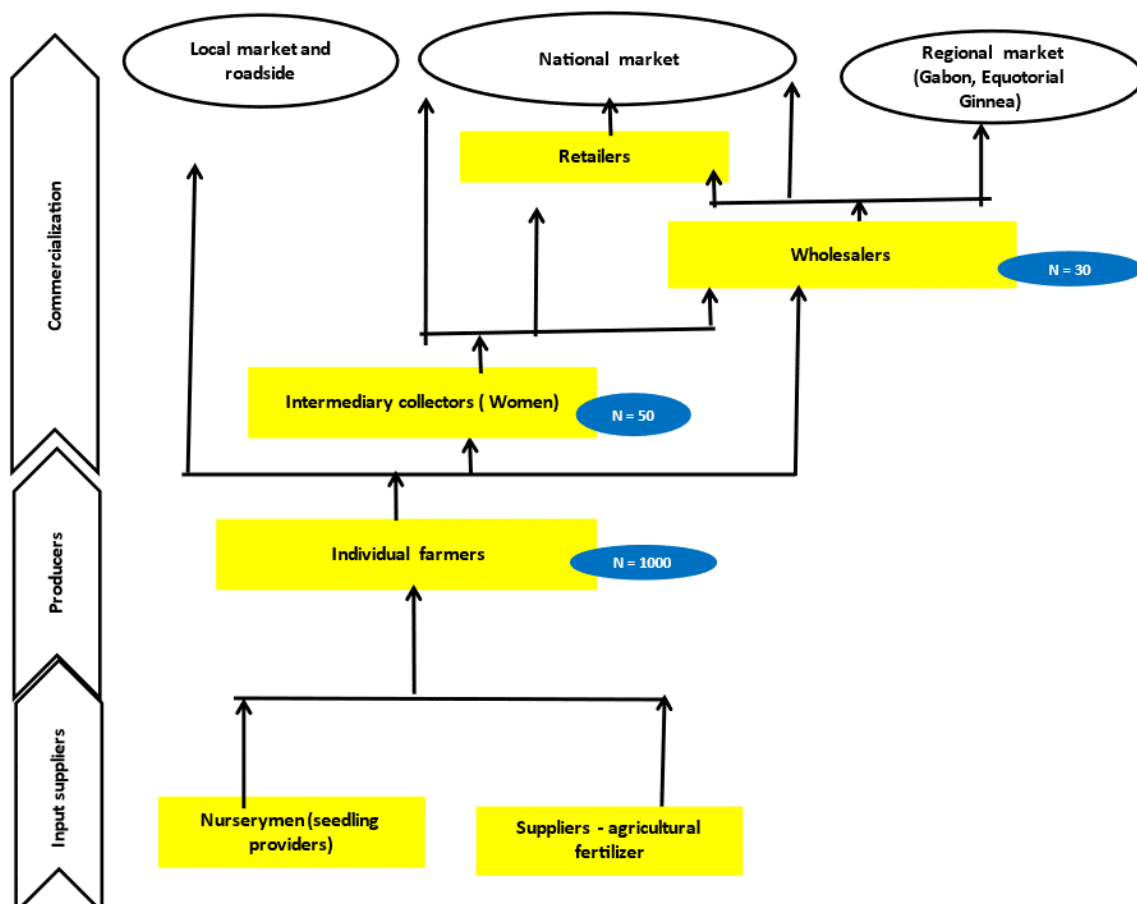


Figure 42: Mapping of actors within the Avocado value chain in the Bamboutos landscape

The cost-benefit analysis of the Avocado value chain shows that it is profitable to invest in the cultivation of avocado. considering the net present value (NPV) at a 10% discount rate. Incremental net benefit will be positive (04) four years after the start of the project and investment payback is expected 5 years after (Table 96).

Table 88: Cost-benefit analysis of avocado value chain (1 ha)\

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 7	Year 8	Year 9	Year 10
Cash out											
Land rental (100000 Fcfa/ha)	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Purchase of 150 seedling /2000 Fcfa	300,000	0	0	0	0	0	0	0	0	0	0
Purchase input (fertilizer, pesticide)	25,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Clearing	50,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Operating costs	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000
Total cash out	835,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
Cash in											
Production (tons)	0	0	0	5	8	10	10	10	10	10	10
Selling price (Fcfa/ton)	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Total cash in	0	0	0	750,000	1,200,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Balance (cash in - cash out)	- 835,000	-500,000	-500,000	250,000	700,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Cumulative balance (most be positive)	- 835,000	- 1,335,000	- 1,835,000	- 1,585,000	-885,000	115,000	1,115,000	2,115,000	3,115,000	4,115,000	5,115,000
IRR Total Net Cash Flow	26%	%									
Payback Period	5	No. of years									
NPV			1,761,701								

ii. Eucalyptus value chain

Eucalyptus strongly dominates the forest landscape of the western region. It is a tree that grows fast, and it is used for furniture, construction, electricity distribution, telecommunication, wood energy etc. The eucalyptus tree is of great medicinal value - it treats various illnesses such as fever, respiratory, and digestive ailments. It is reputed to relieve various rheumatic conditions.

In the Bamboutos Mountains, which have a highly variable geomorphology, farmers have created small, wooded areas, usually on slopes. These trees do not compete with food crops, which are generally found at the bottom of the slope. Some eucalyptus trees are also planted as hedges that not only mark the boundaries of the land, but also stabilise the soil along the fragile tracks and prevent the intrusion of cattle (belonging to the Bororo) into the crop fields (Njoukam, 2002). The productivity of eucalyptus trees varies from 15 to 20 cubic metres per hectare per year ($\text{m}^3/\text{ha}/\text{yr}$). A tree of about 7 metres sells for 2500 CFA francs each. The price of a large eucalyptus tree is around 20,000 CFA francs (ANNEX 2B).

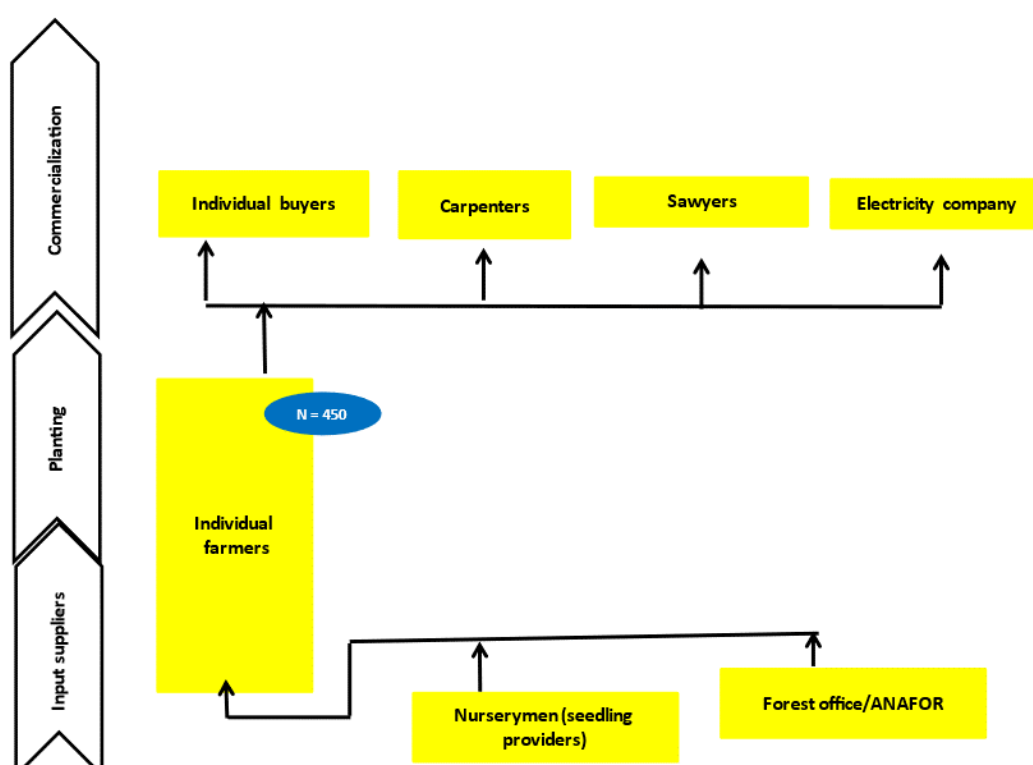


Figure 43: Mapping of actors within Eucalyptus value chain in Bamboutos landscape

The exploitation of the poles (straight trunks with a diameter of 25 to 35 cm at the base and a length of about 15 m) of eucalyptus starts at the age of 6 to 10 years. The cost-benefit analysis of the Eucalyptus wood value chain shows that it is profitable in terms of investment. The value of the eucalyptus forest is certainly higher if we take into consideration other ecosystem services that are non-marketed like domestic firewood, regulation of water flow and microclimate etc. Incremental net benefits start flowing (04) four years after the beginning of the project (Table 97).

Table 89: Cost-benefit analysis of Eucalyptus wood value chain in Bamboutos landscape (1 ha)

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	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Cash out										
Land rental (100000 Fcfa/ha)	10000 0	10000 0	1000 00	1000 00	1000 00	1000 00	1000 00	1000 00	1000 00	1000 00
Purchase of 2000 seedling /500 Fcfa	10000 00	0	0	0	0	0	0	0	0	0
Clearing	50000	25000	1000 0	0	0	0	0	0	0	0
Maintenance of the plantation	50000	25000	0	0	0	0	0	0	0	0
Operating costs	36000 0	12000 0	6000 0	6000 0	6000 0	6000 0	6000 0	6000 0	6000 0	6000 0
Total cash out	15600 00	27000 0	1700 00	1600 00	1600 00	1600 00	1600 00	1600 00	1600 00	1600 00
Cash in										
Proportion of trees exploited (%)	0	5	5	15	25	10	15	10	10	5
Production (nb of stem)	0	100	100	300	500	200	300	200	200	100
Selling price (Fcfa/stem)	0	500	1000	2500	4000	5000	7500	1000 0	1500 0	2000 0
Total cash in	0	50,00 0	100, 000	750, 000	2,00 0,00 0	1,00 0,00 0	2,25 0,00 0	2,00 0,00 0	3,00 0,00 0	2,000 ,000
Balance (cash in - cash out)	- 1,560, 000	- 220,0 00	- 70,0 00	590, 000	1,84 0,00 0	840, 000	2,09 0,00 0	1,84 0,00 0	2,84 0,00 0	1,840 ,000
Cumulative balance (most be positive)	- 1,560, 000	- 1,780, 000	- 1,85 0,00 0	- 1,26 0,00 0	580, 000	1,42 0,00 0	3,51 0,00 0	5,35 0,00 0	8,19 0,00 0	10,03 0,000
IRR Total Net Cash Flow	37%	%								
Payback Period	4	No. of years								
NPV	4,211, 750									

7.2. OPTIONS TO ENHANCE VALUE CHAIN AND MARKET DEVELOPMENT

7.2.1. WAZA LANDSCAPE

Agroforestry and NTFP value chain

Objective of proposed business model	To increase the added value generated by women groups and farmers' organizations from the sustainable production, harvesting and marketing of raw and processing agroforestry and non-timber forest products through the development of structured community-based micro enterprise to promote conservation around the Waza National Park	
Target products	NTFP • Balanites seed • Balanites oil • Neem seed • Neem oil • Baobab powder leaf • Jujube seed • Tamarinus seed	Agroforestry product • Cashew (<i>Anacardium occidentale</i>) • Mango (<i>Mangifera indica</i>) • Goyava (<i>Psidium guajava</i>)
Elements of strategy	• Set up village nurseries center (VNC) equipped with water wells (drilling) to produce quality plants and water access facility in the communities • Facilitate and support the commercialization of NTFPs by local organizations by strengthening their umbrella structures using the ADM (Market Analysis and Development) approach developed by FAO (http://www.fao.org/forestry.entreprises). • Empower collectors' and producers' organizations and strengthen their networking with buyers; • Support the set-up of small processing unit equipped with machine oil press, crushing machine for women micro enterprise	
Direct/final benefits	• Village around Waza national Park (5 villages) • Farmers' organizations of producers in the target priority areas of the landscape, (100 organizations, 3,000, direct beneficiaries including at least 50% women) • Micro-sized enterprises (MSE) specialize in processing vegetable oil and powder (Baobab leaf (about 10)	
Proposed indicators	• At least 100 NTFP community-based micro-enterprises are organized and functioning • At least 5 community benefitting from Village Nurseries Center (VNC) equipped with water wells (drilling) • At least 200 households are involved in NTFP planted stand per village in the target priority area of the project • Income generated by community-based micro-enterprises from sustainable NTFP value chain are increased to 25 % after the first year of implementation of the project and at least 50% after the second year compared to the baseline situation • At least 10 micro-sized enterprises (MSE) benefit from processing units equipped with oil press and crushing machines	

Community forest to produce wood energy and other useful biomass

Objective of proposed business model	To increase the supply of wood energy and other useful resources (fodder, straw) for economic resilience of local communities through community, private plantations and community forests
Target products	• Wood energy • Fodder • Straw
	• Identify community planting, private, and community forestry initiatives • Mapping of existing actors in the tree production and planting sector • Elaboration of action plan and incentive mechanism for the promotion of tree plantations
Direct/final benefits	• Community benefit either community plantation, private plantation or community forest
	• At least 5 community forests set up • At least 5 community plantations set up

Improved cook stoves

Objective of proposed business model	To promote the vulgarization of improved three-stone stoves to reduce women's workload and fight against deforestation in and around the Waza National Park
Elements of the strategy	• Mobilization through women association • Training of trainers (local facilitator) • Construction is made of local materials (clay, straw, cow purse).
	• Household around Waza park
Proposed indicators	• At least 15 000 three-stone stoves built

7.2.2. DJA-LOBEKE LANDSCAPE

Objective of proposed business model	To improve the livelihood of local and indigenous people around Lobeke Park as an incentive to promote conservation through sustainable harvesting and commercialization of non-timber forest products by well-structured community-based micro enterprises
Target products	• Bush mango ; • Djansang ; • Moabi; • Bush Onion • Balaka
Elements of the strategy	• Strengthen the NTFP production by supporting the organization of community based micro-enterprises, as well as mobilization of networks of women's associations at the local level and decentralized entities that also protect the environment in their activities. • Facilitate and support the commercialization of NTFPs by local organizations by strengthening their umbrella structures using the MAD (Market Analysis and Development) approach developed by FAO (http://www.fao.org/forestry.entreprises). • Empower collectors' and producers' organizations and strengthen their networking with buyers; • Develop and support a program for the implementation of village nurseries and planting on farms of targeted NTFPs to ensure increased

Objective of proposed business model	To improve the livelihood of local and indigenous people around Lobeke Park as an incentive to promote conservation through sustainable harvesting and commercialization of non-timber forest products by well-structured community-based micro enterprises
	future sources of raw material from farms and indirectly increasing the carbon stocks, as well as alleviating pressure on wild sources of the NTFPs as is presently the case
Direct/final benefits	• Farmers' organizations of producers in the target priority areas of the landscape, (100 organizations, 3,000, direct beneficiaries including at least 50% women) • Small and medium-sized enterprises (SMEs) specialized in processing agri-food products (about 10)
Proposed indicators	• At least 100 NTFP community-based micro-enterprises are organized and functioning • Income generated by community-based micro-enterprises from sustainable NTFP value chain is increased at least to 25 % after the first year of implementation of the project and at least 50% after the second year compared to the baseline situation • At least 50 households involved in NTFP, and have a planted stand per village in the target priority area of the project

7.2.3. BAKOSSI-BAMBOUTOS LANDSCAPE

Objective of proposed business model	To increase the useful value of degraded upland and lowland ecosystems by supporting the development of community nurseries and the planting of NTFPs and agroforestry trees	
Target products	NTFP • Raffia Palm (<i>Raphia vinifera</i>) • Kola (<i>Cola anomala</i>) • Black fruit (<i>Canarium chweinfurthii</i>) • Prunus (<i>Prinus africana</i>)	Agroforestry product • Avocado (<i>Persea Americana</i>) • Eucalyptus (<i>E. saligna</i> or <i>E. grandis</i>) •
Elements of the strategy	• Set up village nurseries center (VNC) equipped with water wells (drilling) to produce quality plants and water access facility in the communities • Empower and train producers' organizations on nurseries and tree planting especially for Raffia palm	
Direct/final benefits	• Villages around Mount Bamboutos (30 villages) • Farmer Producer organizations in the target priority areas of the landscape, (100 organizations, 3,000, direct beneficiaries including at least 50% women) • Micro-sized enterprises (MSE) specialize in the production of good quality seedling (about 20)	
Proposed indicators	• At least 100 NTFP community-based micro-enterprises are organized and functioning • At least 30 Village Nurseries Center (VNC) equipped with water wells (drilling) • At least 500 households involved in NTFP planted stand per village in the target priority area of the project • Income generated by community-based micro-enterprises from sustainable NTFP value chain are increased at least 25 % after the first year of implementation of the project and at least 50% after the second year compared to the baseline situation	

- | | |
|--|--|
| | <ul style="list-style-type: none"> • At least 10 micro-sized enterprises (MSE) supported to set up their high-quality nurseries to produce seedling |
|--|--|

7.3. OPERATIONAL STRATEGY FOR ENHANCING VALUE CHAINS ACROSS THE AGRO-ECOLOGICAL ZONES

It came out of the market and value chain analysis study that the main strategies for upgrading value chains should be based on four pillars:

- Creation of community micro-enterprises;
- Creation of platforms to bring value chain actors together including private investors; and financial institutions;
- Support to groups through the provision of equipment;
- Ecotourism.

7.3.1. CREATION OF COMMUNITY MICRO-ENTERPRISES

Main steps to follow

Step 1. Identification and Organization of farmer groups

The development community micro-enterprises consist of the organizing and structuring of farmers organizations, particularly women, into small, well-structured groups called "micro-enterprise", to sustainably exploit forest resources. The identification and engagement with existing organisations/groups should be finalised during project inception in communities to work with them instead of creating new groups in the same communities.

Step 2. Choice of products to be valorised by the micro-enterprise

The targeted products should be selected after rapid research with key information on the market, having defined the production objectives and elaborated an action plan called micro-Enterprise Development Plan (EDP) following an approach inspired by the MAD (Market Analysis Development) tool of the FAO⁹.

Step 3. Setting a production objective for the group

The group should set their production objectives, including the approach to achieve them.

This aspect should provide answers to questions concerning the quantity that the micro-enterprise wants to produce, the identified market, transportation, storage, sales approach.

It is important to find out in advance about the prices in the different markets. This allows you to choose the market where you have the best profits but also allows the group to decide at what time of the year, they want to sell their product.

Step 3. Profit estimation

Based on these defined market objectives, the group calculates in advance its profit by considering the various costs (expenses).

Step 4. Development of an action plan

Once the production objectives have been set, the market identified, and the marketing strategy developed, the group develops a detailed plan for the implementation of activities and responsibilities.

⁹ <http://www.fao.org/forestry/enterprises/25492/fr/>

Step 5. Elaboration of a micro-Enterprise Development Plan (EDP)

All the information from the choice of the product to be valorised to the action plan is compiled by the groups in a document called EDP according to an easy to fill in template that will be made available to them.

Who will be involved?

It is important to have project facilitators on MDA training with the project. And then trained group leaders as trainers, according to an agreed and roadmap. The topics covered during the training should relate to the notions of leadership; micro-enterprises; group dynamics; objectives and benefits; estimation of expenses and projection of benefits and elaboration of a micro-Enterprise Development Plan (EDP).

Business as usual Vs Proposed business model

Income from the NTFP (Bush mango) per households before and after structuration of women in micro-enterprise in Mbang council East-Region (Nguenang, 2016¹⁰)

Parameter	Business as usual Not organized group	Proposed business model Micro-enterprise, train
Number of households involve in the activity (year)	307 (2010)	530 (2012)
Quantity collected and sold (kg)	1500	35 604
Total net margin (FCFA)	1 608 500	45 548 220
Income generated/household (FCFA/year)	5 239	85 940
The structuring of producers into micro-enterprises allows for a substantial increase in income from the collection and commercialization of NTFPs. With the introduction of the micro-enterprise (business) approach, producers are better organized to value the NTFPs available in their environment. They no longer view these products as useful for self-consumption only, but more as a source of income. The fundamental change lies in the way they organize themselves and work. They work with a business vision that is defined in their context as a set of activities (agricultural, forestry, etc.) carried out by one or more people to produce goods or services, sell/market them, make a profit and have money to solve the problems (in part or in whole) of the family, save or invest.		

7.3.2. CREATION OF PLATFORMS TO BRING VALUE CHAIN ACTORS TOGETHER INCLUDING PRIVATE INVESTORS AND FINANCIAL INSTITUTIONS

The creation of this platform is foreseen in the National NTFP Development Plan piloted by the Ministry of Forests. It will simply be a matter of activating the establishment of platforms by sector in the different landscapes of the project to develop integrated value chains of non-timber forest products

Main activity here is to organized workshop with key actors of the value chain involving:

- Institutional actor (MINFOF)
- Private sector (SME, Buyer, Processor)
- Producer cooperative include women association

Objective of the key actor's workshop

¹⁰ Nguenang G.M. (2016). Valorisation des PFNL et développement local. Rapport atelier de capitalisation de dix années de mise en œuvre de la foresterie communale au Cameroun. GIZ-CTFC-MINFOF.

- Agree on a vision and strategy for upgrading the value-added chain;
- Analyze opportunities and constraints;
- Set operational objectives for upgrading;
- Identify and distribute roles and responsibilities of actors to implement the strategy;
- Anticipate the impact of improving the value chain;
- Strengthen private business relationships;
- Introduce social, ecological and product quality standards.

7.3.3. SUPPORT NON-TIMBER FOREST PRODUCT PROCESSING UNITS OF FARMERS' ORGANIZATIONS.

(i) Main step to follow

Step 1. According to the model, a grant should be given to processor groups through the provisions of machinery and other accessories to modernize their production unit. But this is a "guided" grant because an organizational mechanism will be put in place to assist the beneficiaries in the use and management of the equipment.

The processing unit is transferred to the identified group/cooperative based on a signed agreement between the parties with the approval of the local authorities (Council and local administration). The group sets up a monitoring committee for the operation of the processing unit.

Step 2. Capacity building of locals on equipment maintenance and repair

The installation of the equipment should be accompanied by training on the maintenance and management of the equipment. These trainings should target both the members of the beneficiary group and local craftsmen and technicians (machine mechanics,) identified in the rural and urban areas near the installation sites. The objective is to have a pool of experienced artisans on machine maintenance that can be easily mobilized in case of need for the maintenance and repair of the machines.

(ii) Business as usual Vs Proposed business model

Parameter	Traditional production (manual press)	Mechanized production (Mechanical press)
Quantity of raw material	7 kg	7kg
Quantity of oil produced	1 litre	2,5 litres
Extraction rate	14 %	35 %
Production time	3 hour	15 minutes
Production costs	2500 FCFA	1025 FCFA
Income (1 liter neem sold at 5000 FCFA locally)	5000 FCFA	12 500 FCFA

Source GIZ (2019). Valorization of forest products in Cameroon. Capitalization of results and management approaches, supported under the support program for the implementation of the rural sector development strategy from 2010 to 2019.

8. PROJECT JUSTIFICATION

8.1. EVALUATION OF THE INTERVENTIONS ACCORDING TO THE INVESTMENT CRITERIA OF THE GREEN CLIMATE FUND

8.1.1. POTENTIAL FOR A PARADIGM SHIFT

The project will transform land use and forest exploitation practices within PFA that causes deforestation and forest degradation and hinders restoration. It looks to transform these practices into systems that will sustainably generate forests ecosystems goods and services for the national and local economy and support the resilience of communities.

The transformative vision of the project will be achieved through three technical components, including a management component that incorporates knowledge management and learning. They include:

- Sustainable forest management and restoration.
- Strengthening green investment financing for restoration and value chain development
- Capacity building of stakeholders to sustain long-term implementation of project activities
- Project management, monitoring, partnership, and Knowledge management.

Activities that will be implemented under these components have the potential to catalyse meaningful and measurable change. These activities will bring structural changes that will alter the interplay of social, institutional, economic, ecological, and technological dimensions related to forestry management and development in general. Component 2 on strengthening green investments and value chain development involves private sector stakeholders and financial institutions that will contribute to catalyse long-term transformation in the forestry and land resources use sector from a business-as-usual emission scenario to a low emission scenario.

More specifically, component 2 will led to the in-depth analysis to identify and establish appropriate incentive approach to motivate farmers and actors involved in restoration (ROAM phase 2), operationalise restoration incentive schemes that favour private sector involvement and investment; Organise and structure community based micro-enterprises and mobilise networks integrating women and IPs, establish and operationalise of multi-stakeholder (producers-buyers'- investors- microfinance institutions) platforms including partnerships; establish purchase agreements, identify and develop suitable green banks / credit lines and financial products; facilitate interactions between beneficiaries and national financial institutions for the effective use of new financial products and services, and Set-up small processing units for women/youths led micro-enterprises through.

The project will establish green credit lines to support investments in agriculture and forestry production systems by identifying and developing suitable green banks / credit lines and financial products. This activity will involve in-depth analysis of potential micro-finance products and services suitable for rural development and green investments. Based on the findings of the analysis, targeted support in terms of capacity will be provided to selected micro-finance institutions for the development and mainstreaming of new green credit lines. The Afriland First Bank, the Association of micro financial institutions of Cameroon, Union Bank of Cameroon, Credit du Sahel, Cameroon Cooperative Credit Union League (CamCCUL ltd) and FEICOM have expressed their intentions to create permanent green funds/green bank departments in their respective institutions. Thus, the green credit lines that will be created and capacity building support they will receive during project implementation will contribute to the project's sustainability.

Potential for scaling up and replication

The project interventions and expected results are first of their kind in forestry management and climate change response processes in Cameroon. For example, the revision of the regulatory and policy instruments of PFAs, including the integration of climate change mitigation, the creation of incentives for the adoption of SFM practices in production forests and incentives for upscaling restoration and strengthening institutional coordination, communication amongst land-use sectors that are implementing land use operations to avoid overlapping and conflicting user rights in time and space, providing opportunity to consult and make choices on pre and post land-based investments including inter-Ministerial and inter-departmental consistencies.

The scope of the project is national, even though the impact and intervention areas are in different landscapes and regions of the country. The revised instruments for PFAs management will be applied to all PFAs (production forests and protected areas) across the national territory. The incentive scheme to enhance the adoption of SFM practices in production forests will be applicable to all production forests in Cameroon. This is also the case with the instrument for preparing the management plans of protected areas. The revised instruments will be piloted in cases in the intervention areas, then replicated to other PFAs in the impact areas and later for adoption out of the impact areas.

The market and value chain development component will serve as a model for the implementation of the National NTFP Development plan in Cameroon.

The adoption, upscaling and replication of the interventions will be facilitated by enabling factors such as awareness raising and capacity building of key stakeholders throughout the national territory.

Potential for knowledge sharing and learning

The replication and scaling-up of project activities will depend on knowledge generation, sharing and learning. The project activities were designed on the basis that they will provide opportunities for putting together information and lessons learned. Three key activities will contribute to knowledge sharing and learning. First, the project will elaborate communication and knowledge management products. Second, lessons learned, best practices and experiences will be consolidated and disseminated to facilitate replication and capitalization of results. Lastly, statutory annual, semester and quarterly technical reports as well as policy briefs will be elaborated and disseminated to seek feedback from project stakeholders.

Contribution to the creation of an enabling environment

The project interventions have potentials to contribute to the enabling environment for forest management in the context of climate change mitigation and adaptation such as the creation and operationalisation of incentive schemes, capacity building, awareness on the uptake and adoption of restoration practices and the improved SFM instruments. The restoration investment and action plans that will be developed by PFAs management entities, will enable them to be able to attract investments. The enabling environment for REDD+ will be improved as well following the pilot testing of key operational instruments such as the forest monitoring system, the REDD+ registry and REDD+ safeguard information systems and the capacity building of key stakeholders.

Contribution to the regulatory framework and policies

The project activities will contribute to the regulatory and policy framework related to the management of PFAs. It will improve the regulatory instruments related to production forests and protected areas, in relation to improved practices and the integration of climate change adaptation and mitigation. The policy framework related to the approach to incentivise the uptake and scaling up of restoration will also be improved.

Overall contribution to climate-resilient development pathways consistent with relevant national climate change adaptation strategies and plans

The revised instruments to guide the elaboration of management plans, takes into consideration of integration of adaptation and resilience in the management plans of production forest and protected areas. The adaptation components of the management plans are expected to target both the forest ecosystems of PFAs and communities living around PFAs. Communities around PFAs will be capacitated on climate resilient agriculture practices. In addition, the restoration of degraded lands and forest will contribute to the flow of ecosystem goods and services, thus the resilience of vulnerable communities. These pathways are consistent with the national adaptation plan that underscores the important role of forest ecosystems goods and services in climate change adaptation in Cameroon.

8.1.2. POTENTIAL FOR SUSTAINABLE DEVELOPMENT

The project will make a significant contribution to improving sustainable climate change adaptation and mitigation strategies for Cameroon's forest sector. While working towards improving SFM instruments of PFAs, enhancing forest restoration activities, and improving the livelihood support systems and resilience of communities, the project additionally contributes to sustainable development through significant environmental, economic, and social co-benefits.

Environmental co-benefits:

The protection and restoration of degraded areas in parks (Waza National Park, for example) will provide migratory corridors to animals and insects, hence helping to conserve the biodiversity in the Waza area, which is the largest UNESCO biosphere reserve in Cameroon.

Better management of production forests because of the improved management instruments will lead to the enhancement of biodiversity and the health of forest ecosystems.

The restoration of degraded agriculture lands, hillsides and slopes, riparian forests etc., will contribute to controlling erosion and landslides, production of organic matter and nutrients cycling, regulation of water quantity and quality, increase groundwater recharge and provide riparian buffers.

Project activities will contribute to raising environmental awareness among local communities by raising awareness among local communities about the causes and detrimental effects of deforestation, forest, and landscape degradation, including the different strategies to offset forest cover loss and the recovery of forest ecosystems. Similarly, the restoration and conservation efforts of the different activities will raise the appreciation of local communities for the environmental value of forests as such and transfer knowledge of best practices in efficiently and sustainably utilising land. For example, farmers will be educated on improved agricultural practices and support them in increasing the biodiversity on their land and the selection of fit species for their sites.

Social co-benefits:

The project will promote equality and participation where relevant in all project activities. Local populations will take part in making decisions on the choice of the land (size and location) and the tree species for restoration. Increase in income of the local population will lead to the improvement of their well-being. Furthermore, the project will promote informal and formal social networks (groups, associations, cooperatives etc), as a form of social capital since these networks will serve as the entry points for the implementation of project activities at the community level. An assessment of the indigenous and other vulnerable group was carried out and an IP plan developed to ensure social inclusion.

Economic co-benefits

The project activities will generate and improve the income of local communities leaving around PFAs in the intervention landscapes. First, communities will generate income from the increase in agriculture productivity because of capacity and support on climate smart agriculture and the restoration of degraded agriculture lands. Second, communities will generate income following the improvement of market access and value chain development. This will follow the technical assistance and capacity building support they will receive related to organising production, transformation, and marketing of NTFP and agriculture value chains. Ecotourism activities will be revived in the Lobeke National Park. This will serve as a major source of economic empowerment for the local populations. The project's financial and economic benefits are estimated at \$67 496 844 and \$52 842 294 respectively (see feasibility study document or annex 8 of the feasibility study for details on the benefits of the different production systems of the project (Annex 2A).

Gender-sensitive development

The project will promote the participation and empowerment of women and girls in project activities. Women, girls, and vulnerable groups will be targeted in the market and value chain development component of the project. Their association and groups will be strongly involved in the activity related to the creation/ reorganization, structuring, and functioning micro-enterprises. Women and girls will be involved in the NTFPs value chain development concerning collection, transformation and marketing. Their groups will be part of the multistakeholder platforms that will bring together producers-buyers'- investors- microfinance institutions. Women and girls will be key beneficiaries of many of the capacity building activities. For example, capacity building of farmers on climate-smart agriculture practices, capacity building of farmers associations and cooperatives on the organization and management of micro-enterprises, notably on agriculture and NTFPs to mobilize financial resources through credits, capacity building of potential micro-enterprises to prepare action and development plans etc. A gender assessment and a gender plan have been developed as part of the annex to ensure gender inclusion where necessary in all project activities.

8.1.3. BENEFICIARY NEEDS

The GCF grants will act as a catalyzer to support activities that will mobilise and facilitate the involvement of the private sector and financial institutions to support long term green investments in low emission forestry and land use practices. Private sector involvement and the availability of credits to enable investments in value chains and forest management at the household, group and organisational levels are required in these landscapes and in Cameroon in general. This is relevant for both the local and the national economy. The Human Development Index (HDI), which translates progress made by the country in terms of revenue per inhabitant, education, and health, improved slightly between 2018 and 2019, increasing from 0.560 to 0.563. While the country hasn't experience deterioration in its HDI since 1995, the country's poverty rate remains high (UNDP, 2022). The national poverty line of the country was 39% in 2019, dropping by 1.2% since 2001 (OCHA, 2019; World Bank, 2020).

In 2020, the COVID-19 pandemic caused a sharp decline in consumption, which led to income losses for households and businesses, impacted public and private investments, and disrupted public services. It is estimated that the health crisis exacerbated poverty throughout the country, increasing the extreme poverty rate from 24.5% in 2019 to 25.3 % in 2021 (World Bank, 2022). The country is experiencing a fast-growing population with an increasing number of people living below the poverty line, with about 90% and 69% living in rural areas and in the Northern regions respectively. The Sudano-Sahelian AEZ, which is one of the project impact areas, is the most vulnerable region in terms of climate change, land degradation and desertification, biodiversity loss and other impacts of climate change. The populations depend on climate sensitive and vulnerable sectors for their socioeconomic sustenance. Thus, it is necessary to support resilience of the populations, the forests, and related resources that they depend on for survival. They will need assets and resources such as income, information and

knowledge, social networks, technical capacity, access to markets, farming inputs, value addition on agriculture and NTFPs.

The institutional and policy framework of the forestry and environment ministries need to be strengthened. It needs to evolve and adapt to the increasing role that forestry is expected to play in the fight against climate change, biodiversity loss, desertification and land degradation and poverty reduction. There is a need to build the institutional capacity of the relevant institutions to enable them to participate effectively and efficiently in the design and implementation of initiatives that will contribute to achieve national objectives and respond to international commitments.

8.1.4. COUNTRY OWNERSHIP OF THE PROJECT

Alignment with the National Determined Contributions

The Project will contribute to the implementation of the NDC in Cameroon, particularly the contributions that seek to address emission reduction in the forestry and land use sector. Project activities aligns with key forestry sector actions of the NDC such as (i) Sustainable management of forests through the exploitation and development of production forests, (ii) contribution to economic growth and the fight against poverty through job creation, (iii) and conservation of biodiversity by strengthening the national network of protected areas.

Alignment with the National REDD+ Strategy

The Project will contribute to the implementation of the REDD+ strategy in Cameroon. By enhancing the enabling environment for REDD+ implementation and by implementing direct forestry and land use activities (restoration, protection, climate smart agriculture etc.) the project will contribute to (i) the reduction of GHG emissions from deforestation and forest degradation, (ii) help conserve and increase forest carbon stocks, (iii) improve sustainable forest management, as well as (iv) improve the livelihoods and well-being of local and forest dependent populations.

Alignment with the National Forest Landscape Restoration Strategic Framework

The FLR strategy has made commitments to restore about 12 million hectares of degraded forest and land. This will require a combination of actions on the ground, policy, and institutional change. The projects direct investment restoration activities will contribute to the objectives of the strategy. Furthermore, the project will serve as source of lessons, best practices, success stories to drive replication and upscaling of restoration in Cameroon.

Alignment with the 2030 National Development strategy

The national development strategy acknowledges the threat posed by climate change to national development. To this regard, the strategy stresses the need to (i) strengthen actions for the sustainable management of natural resources (soil, flora, fauna, water); and (ii) take adequate measures for adaptation and mitigation of the effects of climate change. Concerning Flora, the Government intends to: (i) encourage communities and councils to create use seed banks of forest species and the establishment of reference nurseries; (iii) promote reforestation activities; and (iv) improve information on the state of the forest resource. The project activities related to sustainable forest management and restoration will make contrition's to achieving these objectives.

Alignment with Rural Sector Development Strategy and the National Investment Plan (SDSR/PNIA)

SDSR/PNIA includes four priority areas: (i) development of production systems and improvement of food and nutrition security; (ii) modernization of rural infrastructure and improved access to financing; (iii) sustainable natural resource management and an increase in the value added to those resources; and (iv) governance and institutional development. The project activities related to sustainable forest management, value chain development and green financing will contribute to the priority areas.

Alignment with Cameroon's Climate Change National Adaptation Plan (NAP)

The NAP addresses the impacts of climate change in the country by proposing actions such as reducing population vulnerability by increasing the resilience and quality of life, as well as, increasing adaptive capacity to new opportunities for the country development. The project will contribute to the objectives of the NAP through the activities that will enhance the climate change resilience of local and forest-dependent communities. Furthermore, the project activities will contribute to the resilience of forest ecosystems promoting access to sustainable livelihoods.

Alignment with the GCF Country program

Six out of the 12 priority programs of the GCF Cameroon country program are linked to forests and land use. These include the protection, conservation and sustainable management of forests, emissions reduction from deforestation and forest degradation, resilience of forest ecosystems to climate change, development of integrated, and resilient agriculture in response to the effects of climate change. Project interventions are directly aligned and will contribute to these priority areas.

Alignment with FAO REDD+ council forest project

The Sustainable Forest Management project under the authority of Cameroon's communes aims to reduce deforestation and forest degradation in communal forests (CF) in order to improve biodiversity conservation, reduce emissions and increase carbon stocks while improving the livelihoods of local communities by promoting sustainable income-generating activities. The implementation of this initiative requires a combination of efforts and actions at national and local levels. The project's direct or indirect investment through activities to integrate climate change measures into communal forest management plans and restore degraded landscapes will not only contribute to the achievement of the FAO REDD+ project targets (communal forest and 7,186 ha of land to be reforested in these CFs), but also to the sustainable management of these communal forests. In addition, the project through component 2 will contribute to the improvement of local communities' livelihoods by encouraging green investments in key agricultural sectors. These different actions will have a considerable impact on the mitigation of threats to the country's permanent forests. This goal is also targeted by the FAO REDD+ project for council forests in Cameroon.

Capacity of accredited entity (IUCN)

IUCN, The International Union for Conservation of Nature, and Natural Resources is the Accredited Entity for the project. IUCN is an international association of governmental and non-governmental members, organized and existing under the laws of Switzerland pursuant to the Statutes of IUCN, dated 5 October 1948, as amended (last amended on 13 October 2015) and having its world headquarters and registered office at Rue Mauverney 28, 1196, Gland Switzerland. IUCN has been involved in the design and implementation of programs and projects in different regions of the world. IUCN is active in Cameroon under the West and Central African regional program where it is implementing projects covering a wide range of activities that include protection of forests and vulnerable ecosystems, protected area management and climate change mitigation and adaptation. IUCN became a GCF AE in 2016 and has the capacity to facilitate and support the design and implementation medium-sized projects up to \$250 million USD, and projects with medium environmental and social risks. MINFOF as the lead EE has coordinated and executed many projects in collaboration with other government entities, bilateral and multilateral development partners - World Bank, European Union, GEF, UNDP, GIZ, KfW, AFD, JICA etc. etc.

Role of the NDA

The NDA office was heavily involved in the Project formulation process, from the concept note to the funding proposal. The office was involved in all the meetings the took place throughout the process and provided strategic guidelines on the project scope and interventions along

the way. Observations and comments from the NDA were incorporated in the final version of the funding proposal. Furthermore, the NDA will be closely involved in implementing project activities and will be part of the steering committees if the project.

Engagement with civil society organizations and other relevant stakeholders, including indigenous peoples, women, and other vulnerable groups

The project development process involved engagement with a variety of stakeholders through two rounds of consultations at the national, sub national and local levels. The consultations targeted sectoral ministries (central and deconcentrated services, financial and technical partners, financial institutions, CSO, local communities, women groups, traditional authorities, Indigenous peoples, and their networks). All these categories of stakeholders were involved in defining the problem, identifying the interventions and activities, identifying ongoing and planned activities related to the project, identifying roles and responsibilities. They were further involved in the ESIA, IP and gender assessments, that facilitated the elaboration of the ESMP, the gender plan, and the IP plan. Stakeholder engagement (including further consultation under ROAM 2) will continue during project implementation.

8.1.5. EFFICIENCY AND EFFECTIVENESS OF THE INTERVENTION

Adequacy of financial structure:

GCF funding is critical to carry out this project. Due to the country's current economic situation, any meaningful opportunity to assist or facilitate the mobilization of additional resources towards accelerating investments in the management of PFAs such as strengthening the regulatory frameworks, restoration, value chains, climate smart agriculture and forestry practices is very important.

It is imperative that the GCF funding is utilized to address the barriers present in the project through the financial assistance to its activities and outputs. Project analyses have been conducted to ensure requested financial support was not exaggerated and will be utilized in the most effective and efficient manner to support the implementation of this project.

The project addresses the limited funding available for improving PFA management and the socio-economic wellbeing of forest dependent communities. Taking into consideration the limited capacity or feasible economic situation to meet additional costs to reduce emissions and enhance sinks, GCF grants are vital to overcome barriers to mobilize additional resources that will contribute to enhance investments in the sustainable forest management of production forests, restoration, value chain development and market access. Grant funding is necessary to overcome barriers and constraints and to catalyze investments in improve SFM, restoration, value chain development and market access. Outcomes of these activities do not present themselves to return to the government or the GCF, therefore it is vital to receive the maximum concessionally in grant financing.

Cost-effectiveness:

Project design and implementation strategies are based on experience and lessons learned from similar previous and ongoing projects in Cameroon and Central Africa. Additionally, project frameworks have been designed from primary and secondary literature and data collection from sites where similar projects have been implemented. Analysis of the project was identified and built around best practices, thereby ensuring solutions identified are to be completed with a high level of confidence in their respective impacts and cost-effectiveness.

The project's financial and economic approach entails the training of a critical mass of smallholder farmers, especially women over the duration of the project, to ensure up-scaling through farmer-to-farmer interactions occurs naturally after the completion of this project. These farmer-to-farmer interactions will distribute knowledge until the project's ideas referring

to meteorological and hydrological monitoring, climate smart agriculture, and soil and water management become common practice.

Individual and group discussions with stakeholders were conducted to identify barriers and constraints; climate change trends and impacts; vulnerability and livelihood security; agricultural potential, climate resilient and climate smart practices; partnership opportunities, market access etc

8.2. RATIONALE FOR FUNDING REQUEST

The GCF's financial support in the form of a grant is indispensable to effectively overcome obstacles to Cameroon's efforts to transition to a low-emission climate resilient development, specifically, the reduction of carbon emissions from forestry and related land uses. Cameroon's financial needs to initiate this transition are significant, whereas the resources available are very limited. According to the NDC, 25 784,66 million USD is required to invest in low emission pathways by 2030 with about 2974,84 million USD estimated for the forestry sector (RoC, 2021).

The government of Cameroon is making effort to enhance contribution of forests resources to the national and local economies. However, allocated investment budget for the forestry and wildlife sector is insufficient to respond to the needs of the sector in terms of development. This condition is rendered more complicated with the additional burden imposed by climate change adaptation, mitigation and reduced access to sustainable livelihoods. To this regard, additional financial resources is required to enhance the development of sustainable livelihoods and take into consideration climate change adaptation and mitigation in forestry management and development.

Cameroon is going through a very challenging period characterized by persistently weak and unstable macroeconomic conditions. Cameroon's economy continues to depend heavily on the sale of its products on the world market, and fluctuations in the global prices of its primary goods—petroleum and cocoa—have made its economic situation unpredictable; poor governance, a persistent problem, also hampers economic development. All these factors are exacerbated by the COVID-19 pandemic crisis.

In the absence of GCF engagement to complement or strengthen ongoing efforts and address key insufficiencies and gaps, the Government of Cameroon is unable to take sufficiently robust measures to improve the management of PFAs. Given the limited resources for public investment of the country, the government is constrained to invest in measures that are critical to secure PFAs and the resilience of surrounding communities. GCF support facilitates additional private and public-sector investments that will foster scaling up of existing and additional efforts for transformative change in the management PFAs.

The GCF funding will be critical in:

Addressing the financial limitations in covering the costs of improving the enabling conditions for SFM and restoration of PFAs in the context of climate change

Current investments to improve the sustainable and adaptive management of PFAs is insufficient, as it fails to provide the adequate tools, technical capacity and incentives for use and uptake by relevant stakeholders. The private sector has little incentive to invest to improve SFM practices. Communities and decentralised entities are also adamant in making investments in landscape restoration. The government recognises the significance of ensuring that communities, private sector, decentralised entities have the capacity, incentives, and institutional support they need to spur their engagement in low-emission and climate resilient forest resources use. The government is unable to increase investments in forest management which might affect the contribution of the sector to economic growth in the future. GCF resources are indispensable to create the environment that will catalyse engagement and investments from the private sector.

Leveraging and combining public and private sector financing for community-level investments in improving value chains and market access

GCF funding will enable the leveraging of additional resources to support investments in improving value chains, together with community contributions. This project will engage the private sector in public-private partnerships to promote value chain linkages for priority commodities. These partnerships will integrate suppliers, buyers, credit institutions, relevant government agencies, and smallholder producers' organizations in Multistakeholder Innovation Platforms aimed at ensuring rapid communication, consensus and agreement around strategic production and commercialization goals, coordination of input provision and marketing. These partnerships will ensure efficient coordination of project resources for sustained impact on the ground.

Leveraging upfront investments

The financial analyses of the various business models under consideration by the project clearly show that without an external contribution in the form of a grant to cover the investment costs and certain initial operational costs, the adoption of the restoration practices will be unprofitable for farmers and other local entities. This will be exacerbated by the fact that project beneficiaries are not bankable, so MFI and commercial banks will not easily fund restoration models. The financial grant from the GCF will remove these barriers to investment on the supply side, allowing producers to adopt land use practices that will enhance restoration by supporting the establishment of productive systems with multiple benefits in terms of mitigation and adaptation.

8.3. EXIT STRATEGY AND SUSTAINABILITY

The project exit strategy and sustainability are based on stakeholders' abilities to continue to implement project activities beyond project completion.

The landscape restoration models that will be introduced by the project will generate benefits that are much higher than the investments initially mobilized, thus producing important financial benefits for the beneficiaries in the middle and long term. The organization and structuring of micro-enterprises will inject the sense of business and high profitability in the income generating activities of beneficiaries. They will be supported to develop business plans that will enable them to mobilize and attract credits from the green credit scheme that will be put in place. Bringing buyers-producers and investors together under a platform, will create long term bond for business development.

The incentive schemes that will be put in place to enhance the adoption of improved SFM practices in logging concessions and the upscaling of restoration will contribute to ensuring an enabling environment that is relevant for implementation of project activities in the long-term.

Institutional sustainability is based on the Project's iterative approach anchoring the Project's new structures onto the pre-existing government institutional and policy frameworks. First, project is aligned with the framework of the REDD+ National Strategy for Cameroon, which aims to obtain results-based payments for activities that reduce GHG emissions from deforestation and forest degradation. The project will support the strengthening of enabling conditions for REDD+ that will enable Cameroon to attract or mobilise and implement results-based payments in future from GCF or other sources. Second, the project is embedded in the institutional and policy frameworks of the SFM of PFAs (protected areas and production forests), where management is carried out under the sustainability umbrella. Thus, project results on improve SFM tools will be used over decades in activities related to protected area management and the exploitation of production forests. Third, the Restoration activities of the project ties strongly with the landscape restoration strategic framework in Cameroon, that has a long-term objective of building degraded land and forest ecosystems. Project results on

restoration will be upscaled and replicated to be able to drive towards the achievement of the long-term restoration objectives in Cameroon.

Another key aspect related to institutional sustainability is the institutional capacity building and ownership of project activities by stakeholders at the national and local levels (public, private, CSOs, local communities) involved in project implementation. The component on capacity building will provide capacity building to stakeholders across the different activities in the different components – SFM, restoration, REDD+, value chains development and market access, alternative income generating activities etc. These stakeholders will then be better equipped to sustain the Project's benefits and to effectively conduct other similar low emission and climate resilient initiatives in the medium and long-term.

CONCLUSION

The study set out to assess the feasibility context of the project idea related to the protection of PFAs in Cameroon, in terms of conserving existing forest, restoring degraded areas in and out of PFAs and improving the socioeconomic conditions of populations around PFAs.

The study draws on information from 9 analytical studies that combined secondary and primary data. Primary data was collected through consultations with categories of stakeholders at the national, sub national and locals. The project will target PFAs in three agroecological zones as the impact sites – the Sudano Sahelien (with the WAza landscapes as the intervention area), the Bimodal (with the Dja-Lobeke as the intervention area), the Western Highlands (with the Bakossi-Bamboutos landscape as the intervention area). PFAs areas are made up of production forests (forest management units, council forests) and protected areas.

Findings indicate that the project idea is well situated in the socio-economic, biophysical, political etc., context of Cameroon. The project aligns with the forestry, climate change and other related land use national and international commitments, policies, strategies, and programs of the country. The study has identified the direct and indirect drivers of deforestation and forest degradation in the targeted landscapes that involves a combination of socio-economic, demographic, governance related factors. Furthermore, PFAs offer huge opportunities to increase or build-back degraded lands and forests through restoration.

The study identified and proposed a combination of activities structured under 4 components that will provide a holistic approach to offset the barriers to improve the management and restoration of PFAs. The interventions involve the improvement of the enabling environment and concrete investment actions on the ground in relation to SFM, restoration, REDD+, market access and value chain development, local livelihood support systems, and capacity building that capacity building.

In terms of investment, the project is viable economically and financially and has the potentials to continue after project completion in relation to financial and institutional sustainability.

The project has potentials to catalyse and sustain transformation change with great features for upscaling and replication, knowledge generation and sharing, improvement in the enabling environment and the policy and regulatory framework.

In terms of institutional arrangements, project implementation will be led by a three group of entities – Steering committee, PMU, Implementing partners and service providers. The monitoring and evaluation of the effective and efficient implementation of the project following GCF requirements will be guided by the M&E approach of the IUCN supported by the PMU.

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