FOREST CONSERVATION IN BOUMBA-ET-NGOKO

Document Prepared by Carbonsink Group S.r.l.

Contact Information

Project Title	Forest Conservation in Boumba-et-Ngoko
Version	4.1
Date of Issue	17 July 2023
Prepared By	Carbonsink Group S.r.l.
Contact	Piazza Beverini 4, 19121 La Spezia, Italy +39 055 4574675 info@carbonsink.it www.carbonsink.it

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The Forest Conservation in Boumba-et-Ngoko Project (FCBN) is located in one of the densest and most important forest areas in Cameroon. It is a state-owned forest granted in concession for the exploitation of wood resources, and is of great economic interest due to the presence of high-value timber species. Since 2002, this forest unit has been managed by La Filière Bois (LFB), a subsidiary company of Société d'Exploitation Forestière et Agricole du Cameroun (SEFAC Group). LFB harvests commercial timber from the forest area, following the terms of the Management Plan (Plan d'Aménagement - PDA) drawn up at the start of management.

The *VCS Improved Forest Management (IFM) - Logged to Protected Forest (LtPF)* project aims to preserve a part of the forest from the exploitation of forest resources, which would anyway be used in the following years as foreseen in the documents approved by the Ministère des Forêts et de la Faune (MINFOF) - Ministry of Forests and Wildlife. The area that will be exempted from the work is approximately 38'309 ha for an estimated volume of 1'800'129 m^3 (1'908'025 including the seasonally flooded area into the MIT stratum). The forest is intended for timber production through selective logging.

The project aims to stop planned logging activities, in order to protect the forest and avoid emissions generated by logging, transport, processing of raw material as well as collateral damage to vegetation, decomposition of material left in the forest, construction of forest tracks for transport to the storage point, construction of hydraulic engineering works, construction of bridges and other infrastructure. A further advantage is due to the cessation of the disturbance to the fauna, which includes, among other species, forest elephants (*Loxodonta africana cyclotis*), gorillas (*Gorilla gorilla*), cephalophines (*Cephalophus monticula* and *C. sylvicultor*), chimpanzees (*Pan troglodytes*) and red river hog (*Potamochoerus porcus*).

Thanks to the absence of commercial forest logging and monitoring, by means of patrols within the project area, the forest will be able to store carbon through the conservation of trees cover over the years, as well as avoid the emissions from wood harvesting, processing and production.

From the implementation of the project, it is estimated that a net average of 249'241 tonnes of GHG emissions will be avoided from entering the atmosphere annually and a net total of 4'984'814 tonnes of GHG emissions will be avoided through the 20 years of implementation of the project.

1.2 Sectoral Scope and Project Type

The project is developed under VCS *sectoral scope 14 – Agriculture, Forestry and Other Land Uses (AFOLU)*. The category is *Improved Forest Management (IFM)* and the activity type is *Conversion from Logged Forest to Protected Forest (LtPF)*. The project is not a grouped project.

1.3 Project Eligibility

This Project is an eligible IFM project as it reduces GHG emissions on forest lands managed for wood products such as sawn wood as well as emissions due to the construction of infrastructures both for the operation of machinery and derived from collateral damages caused by forest exploitation. For this project activity, the improved forest management consists in not carrying out any forest harvest within the limits of the project area therefore avoiding any kind of cutting.

Both the baseline and project scenarios for the project area qualify as forests land remaining as forests land, such as set out in the *IPCC 2006 Guidelines on National GHG Inventories*.

The project area falls entirely within a state-owned area defined by law included in the Cameroonian Permanent Forest Estates and designed and approved for wood product management by a relevant governmental regulatory body (see Section 1.7)[1,2].
VM0010 methodology used to implement this project is appropriate as La Filière Bois holds a pre-existing legal right to harvest[3] and has the intent to harvest[4] (see Section 3.5). Logging Managements are the habitual managing practice concerning these kinds of forests in Cameroon.

The project corresponds to the *Logged to Protected Forest (LtPF)* category, which includes practices for converting the forest from a productive state to a conservative one, allowing the natural growth or regrowth of the forest stand, preventing trees from being cut down and ensuring greater carbon storage in the biomass.

For these reasons, the project is considered eligible under the methodology *VM0010 v.1.3*. Thus, the project is eligible under the scope of the VCS Program.

1.4 Project Design

The project has been designed to include a single installation of an activity and of a single activity instance, which is IFM project activity converting the once logged forest to conservation with no other activities included. The proposed project is not a grouped project.

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[1] MINFOF Order n°0975 of 20th November 2007 - Cahier des Charges Convention Définitive

[2] Décret n° 2012/1001/Premiere Ministre/ of 10th of April 2012

[3] Décret de Classement n° 2005/0260/Premiere Ministre/ of 26th of January 2005

[4] UFA 10-064 Management Plan (the document will be shared with the VVB) and its approbation MINFOF Order n°0974 of 20th November 2007

Eligibility Criteria

As defined under the *VCS (VCS Standard 4.3, 2022)*, the project has been designed as a single installation of an activity. The proposed project it is not a grouped project.

1.5 Project Proponent

Organization name	Carbonsink Group S.r.l. (CSG)
Contact person	Tania Cencetti
Title	NBS Manager
Address	Via Madonna del Piano, 6 50019 Sesto Fiorentino - Firenze (Italy)
Telephone	+39 055 4574675
Email	tania.cencetti@carbonsink.it

1.6 Other Entities Involved in the Project

Organization name	La Filière Bois (LFB)
Role in the project	Project Implementer on the field, entity that hold the forest concession
Contact person	Angelo Piazzalunga
Title	Head of Certification
Address	146 Rue des Ecoles, Douala (Cameroon)
Telephone	+39 349 3935299
Email	piazzalunga@vastolegno.com

1.7 Ownership

The Cameroonian National Forest Estate (NFE) is divided into Permanent Forest Estate (PFE) and non-Permanent Forest Estate (nPFE)[5]. PFE consists of lands designated to remain as either forest

[5] Loi n° 94/01 du 20 janvier 1994 – art. 20

or wildlife habitat. By law, PFE must cover 30%[6] of national territory and must be sustainably managed[7] according to management plans approved by the relevant administrative authority.

Logging in the permanent state domain is governed by logging agreements. These agreements apply to a forestry concession composed by one or more forest management units (*Unité Forestière d'Aménagement - UFA*) and must be conform to a Management Plan approved by the Minister in charge of forests[8].

By law, the forest is sectioned into 6 productive areas called Forest Exploitation Unit (*Unité Forestière d'Exploitation or "blocks" - UFE*)[9]. These blocks are isovolumetric with a maximum volume difference of about 2.5%, in order to ensure a constant and continuous harvest throughout the implementation of the Management Plan. Furthermore, each UFE is divided into five Annual Allowable Cut areas (*Assiette Annuelle de Coupe – AAC*). These areas must have the same surface area (possibility by volume)[10] to facilitate their location on the ground and the monitoring of their exploitation, with a maximum surface difference of about 2.5%.

The project area falls within the UFA 10-064 (total 115'842 hectares), located in the south-eastern part of Cameroon on the border with the Central African Republic and the Republic of Congo. La Filière Bois holds the exploitation rights for UFA 10-064, which were acquired by LFB from the Ministère des Forêts et de la Faune (MINFOF) through the decree n°2012/1001 of 10th April 2012[11] and the order n°0974 of 20th November 2007. The UFA Management Plan (2002-2031) is effective for 30[12] years and was applicate by LFB, which is the concessionaire for the area having the legal right to control and operate in the project area[13]. Therefore, project ownership arises by virtue of a statutory, property or contractual right in the land, vegetation or conservational or management process that generates GHG emission reductions and/or removals (where the project proponent has not been divested of such project ownership).

The proponent will provide the VVB with the original concession license documents and the required evidence upon project evaluation.

1.8 Project Start Date

[6] Loi n° 94/01 du 20 janvier 1994 – art. 22

[7] Arrêté n° 0222/A/MINEF/ 25 mai 2002 – art. 11, par. 1

[8] Arrêté n° 0222/A/MINEF/ 25 mai 2002 – art. 2, par. 1

[9] Arrêté n° 0222/A/MINEF/ 25 mai 2002 – art. 7, par. 1

[10] Arrêté n° 0222/A/MINEF/ 25 mai 2002 – art. 13, par. 1

[11] Décret n° 2012/1001/Premiere Ministre/ of 10th of April 2012 – art.1, 3

[12] Arrêté n° 0222/A/MINEF/ 25 mai 2002 – art. 6 - Calcul de la possibilité forestière, pt. g

[13] Please refer to Section 1.13

The project start date is established as 01-01-2018 as the first year since LFB has suspended the annual commercial timber harvest within the UFA 10-064. On that date, LFB had already begun the process of GHG emission reductions by stopping logging activities for the year 2018/2019 (and the following years)[14].

1.9 Project Crediting Period

Crediting period start date: 01-01-2018

Crediting period end date: 31-12-2037

Crediting period: 20 years

Crediting period will start from the cessation of logging operations.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	
Large project	X

Year	Estimated GHG emission reductions or removals (tCO_2e)
2018	70'908
2019	106'927
2020	136'879
2021	168'611
2022	196'329
2023	233'315
2024	259'323
2025	307'119

[14] MINFOF - Attestation de non activité - 002176

2026	338'600
2027	377'720
2028	366'869
2029	372'456
2030	369'405
2031	365'925
2032	301'940
2033	266'696
2034	234'974
2035	194'569
2036	158'123
2037	158'123
Total estimated ERs	**4'984'814**
Total number of crediting years	**20**
Average annual ERs	**249'241**

1.11 Description of the Project Activity

The FCBN project area is entirely located into the UFA 10-064, in the south-eastern region of Cameroon, and is part of the Permanent Forest Estate. The area is classified as a dense humid

semi-deciduous forest [15,16]. Main local species presents in the project area are: Ayous/Obeche (*Triplochiton scleroxylon*); Fraké (*Terminalia superba*); Sapelli (*Entandrophragma cylindricum*); Tali (*Erythrophleum suavolensis*); Emien (*Alstonia bonei*). Forest area was harvested since his acquisition by LFB in 2002, following the guidelines in the Management Plan (Plan d'Aménagement - PDA) approved by MINFOF in 2007 and that includes a definition of the spatial extent of the forest, the volume of the timber resource to be extracted and a description of harvesting practices[17].

This project aims to prevent GHG emission related to forest logging by avoiding any kind of commercial harvest and other emissions linked to logging activities, such as those from decomposition of harvested tree, bark burning and the emissions due to carbon fraction sequestered from wood products over time. Avoiding production activities will give benefits even to the biodiversity, removing negative impacts from forest degradation and disturbance.
In the Baseline scenario, forest regrowth contributed to carbon sequestration after timber logging operations. The project scenario aims to avoid logging so that carbon is stored as long as possible by the forest's carbon sink even over project longevity.

The project area is entirely into a productive area of about 38'309 ha of forest, including all the AACs that would be exploited since 2018. The project surface is at net of wetlands areas, mandatory protected by Cameroonian forest laws. The project surface corresponds approximately to the 33% of total UFA 10-064 surface, including a part of UFE 4 (from AAC 4-2 to AAC 4-5) and entire UFE 5 and UFE 6 (see Section 1.12 for more details).

Because of the intrinsic conservation nature of this IFM project, there are no specific technologies, services or products involved in its implementation.

Beyond the creation and sale of GHG credits, the Forest Conservation Project activities will be focused on property supervision and monitoring. In order to monitor any disturbances that may affect the whole forest, LFB employs a permanent control team that monitors the state of the forest with regard to illegal logging, plant diseases, hunting and wildfires. This ecosystem will then continue to provide its services to all the communities and entities that depend on it.

Neighbouring populations are entitled to certain rights within the forest. In fact, according to the Cameroonian law on user rights, the local population have the possibility to collect NTFPs (non-timber forest products) for various uses, such as handicrafts, construction or as firewood.

For handicrafts, plant material is used for the following purposes

[15] Letouzey R., 1985. Notice de la carte phytogéographique du Cameroun au 1 : 500 000 (1985). Institut de la carte de la végétation, Toulouse, France

[16] Source: https://www.worldwildlife.org/publications/terrestrial-ecoregions-of-the-world

[17] UFA 10-064 Management Plan

- house construction (Raphia leaves woven into mats for roofs, wooden or bamboo stakes to support the wall or roof of houses) by the Bantu and branches, Raphia leaves, banana trees, marantaceae or zingiberaceae for the construction of huts by the Baka (pygmies communities);
- basketry (baskets, hoods, furniture) by the rattans (*Lacosperma spp*);
- manufacture of other miscellaneous objects such as mortars, pestles, tool handles, stools, beds, mattresses, brooms (Raphia leaves) or clothing.

Dead wood is used as a source of energy for cooking and heating. It is collected from fields, fallow land or occasionally from the forest. In addition to these rights, local communities also have the possibility of subsistence hunting and fishing, as stated in the Management Plan of UFA 10-064. Thanks to the conservation of the area the continuation of those local activities will be preserved.

Through years of activity in the region, LFB has built a strong network of relationships with local authorities, communities and their representatives. In fact, as required by forestry law, LFB carries out various social works and provides medical and food supplies. Relations are maintained through participative meetings in which the inhabitants of the various villages affected by the logging activities are involved.

In these participative meetings, both the village chief and the representative of the Farmer-Forestry Committees (Comités Paysans-Forêt – CPF) are present, and sometimes the forest police, customs and military authorities also participate as guests.

In the specific case of the project area, the communities that are affected are those of the nearby settlement of Socambo-Mongokélé.

The FCBN project intends to make use of this solid and already established dialogue structure in order to optimise communication between the populations, the authorities and the company on the progress of the project.

In the present document, it is demonstrated that the project activity is additional and not the most financially attractive scenario.

The FCBN project is located within a jurisdiction that is not covered by a jurisdictional REDD+ program.

1.12 Project Location

The FCBN project area is located in the Moloundou district, Boumba-et-Ngoko department, in the Eastern Region of the Republic of Cameroon. The project activity is fully located inside UFA 10-064 (Figure 1). This forest area borders the north with the Lobéké National Park, the east with the Sangha River, (the natural border between the Republic of Cameroon and the Republic of Congo), the south with the Ngoko River, and the west by UFA 10-063. LFB is the concessionaire of the entire project area and have the legal right to control and operate in the project location. Prior to the implementation of the project, the forest within the project area was logged annually according to the timber harvest plan. During the exploitation of forest resources, various

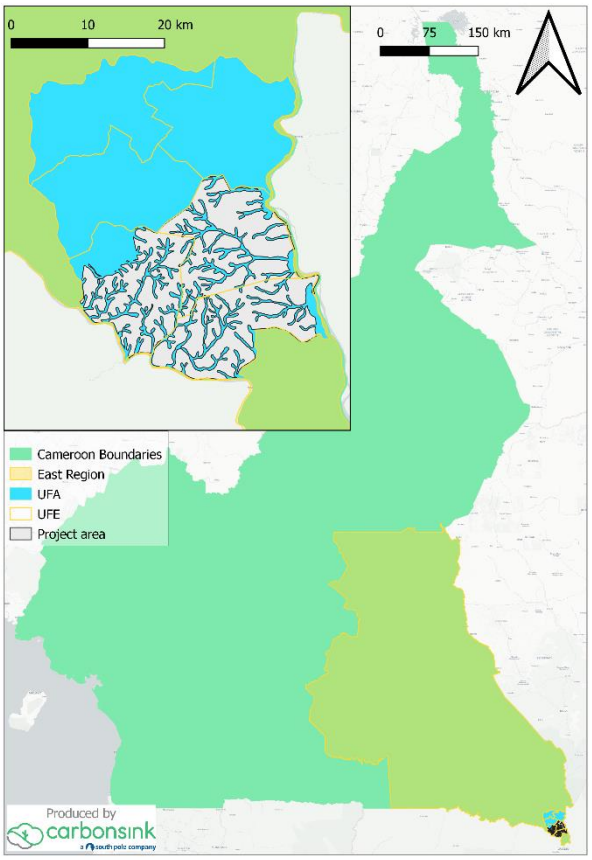

Figure 1: Localization of the project area inside the Cameroon boundaries

infrastructures were created to allow longitudinal travels.

The total project area that will be set aside for conversion from logged-to-protected forest is 38'809 ha of productive forest. The project surface corresponds approximately to the 33% of total UFA 10-064 surface, including a part of UFE 4 (from AAC 4-2 to AAC 4-5) and entire UFE 5 and UFE 6 (Figure 2).

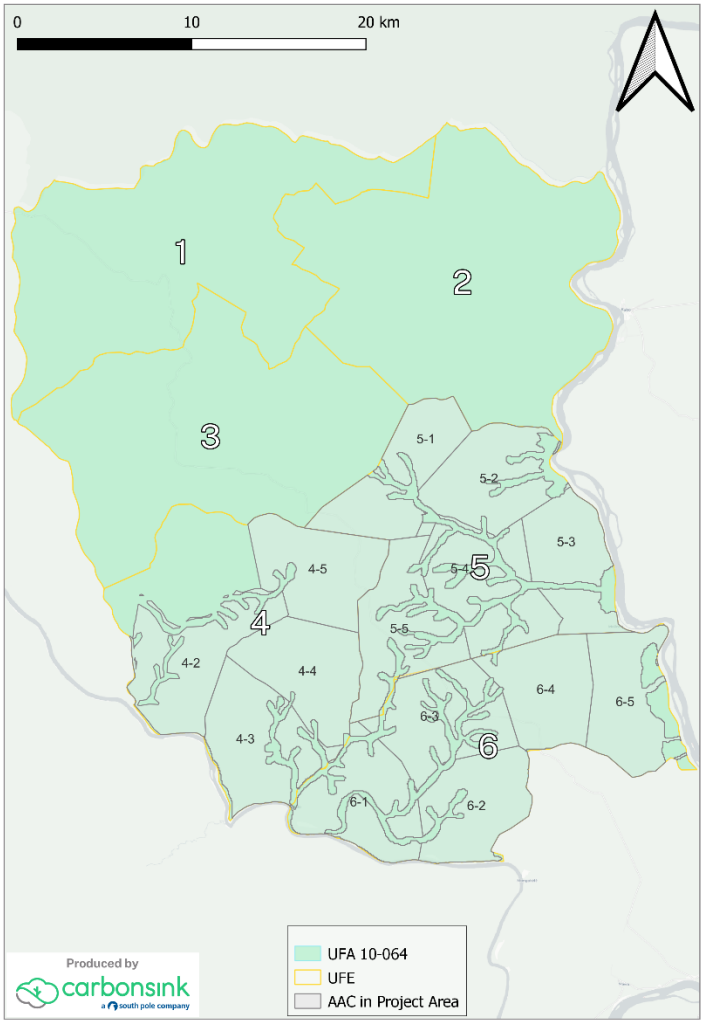

Figure 2: Annual Logging Areas (AACs) included in the project area

The following table reports in detail the surface of the UFEs and of the respective AACs inside the project area.

Table 1: AACs surfaces within project area

AAC in Project Area		
UFE	**AAC**	**Surface [ha]**
4	4-2	2'797
	4-3	2'793
	4-4	2'637
	4-5	2'635
Total UFE 4 [ha]		*10'861*
5	5-1	2'447
	5-2	2'949
	5-3	2'653
	5-4	3'154
	5-5	2'806
Total UFE 5 [ha]		*14'008*
6	6-1	2'948
	6-2	2'506
	6-3	2'856
	6-4	2'638
	6-5	2'492
Total UFE 6 [ha]		*13'440*
Total project area		**38'309**

The project surface is at net of wetlands areas, mandatory protected by Cameroonian forestry laws. Permanently flooded areas and those crossed by the river flows were excluded from the Project Area, in order to match the eligibility criteria of *the VCS VM0010 methodology*. Geographic coordinates of each block included are available separately in *.kmz and *.shp files.

Table 2 shows the vertices delimiting the project area within UFA 10-064. The georeferencing reference system is WGS84 with the projection UTM 32633. Vertex shapefiles are available to VVB.

Table 2. Project area vertex coordinates

WGS 84 – UTM32633		
Name	x	y
1	601.730.185	196.985.301
2	601.446.234	198.530.750
3	598.047.983	197.690.732
4	596.331.303	202.614.954
5	594.012.287	202.627.389

6	592.591.191	204.370.945
7	592.358.735	208.101.591
8	599.817.228	210.993.917
9	599.067.500	214.643.946
10	602.297.594	214.486.542
11	606.445.839	217.866.960
12	610.750.137	221.999.144
13	612.039.696	220.034.755
14	613.607.101	220.485.803
15	616.597.212	219.759.814
16	617.565.893	216.831.772
17	619.880.536	212.651.740
18	620.323.342	208.943.656
19	623.082.862	208.823.737
20	622.879.960	207.872.113
21	624.208.805	201.522.269
22	621.612.295	200.266.203
23	619.691.870	201.391.484
24	615.030.828	201.695.070
25	615.361.611	199.108.543
26	613.726.994	195.376.011

1.13 Conditions Prior to Project Initiation

Prior to the implementation of the project, the forest within the project area was logged annually according to the timber harvest plan. La Filière Bois holds the exploitation rights for UFA 10-064, through the decree n°2012/1001 of 10th April 2012[18] and the order n°0974 of 20th November 2007. In the UFA 10-064 forest, the provisional convention occurred from 2002 to 2005. The Management Plan of UFA 10-064 was approved by MINFOF in 2007 for the forestry concession allocated to La Filière Bois, thus complying with all the requirements of legality concerning the exploitation of wood resources. The UFA Management Plan (2002-2031) is effective for 30[19] years and was applied by LFB, which is the concessionaire for the area having the legal right to control and operate in the project area. The logging operations were thus carried on from 2002 to 2017. During the exploitation of forest resources, various infrastructures were created to allow longitudinal travels. Logging managements are the habitual managing practice concerning these

[18] Décret n° 2012/1001/Premiere Ministre/ of 10th of April 2012 – art.1, 3

[19] Arrêté n° 0222/A/MINEF/ 25 mai 2002 – art. 6 - Calcul de la possibilité forestière, pt. g

kinds of forests in Cameroon[20]. Since 2018, LFB stopped its logging activities[21]. From the cessation of timber harvesting activities, which would have been present in the baseline scenario, the project aims to avoid emissions generated by harvesting, transport, processing of raw material as well as collateral damage to vegetation caused by the fall of cut trees on surrounding plants and the construction of new infrastructures in the forest area.

Ecosystem

According to the classification of Agro-ecological zones provided by the WWF, UFA 10-064 falls within the Tropical and Sub-tropical moist broadleaf forest, specifically within the Northwestern Congolian Lowland Forest Eco-region[22]. The land has not been cleared of native ecosystems within 10 years of the project start date.

Climate

The climate of the region is equatorial continental. It is influenced by the monsoon and the harmattan wind. There are four seasons during the year:

- the main rainy season from September to November;
- the long dry season from December to February;
- the short rainy season from March to June;
- the short dry season from July to August.

The average rainfall for a 20-year period (1999-2019) is 1'556 mm per year, while the average monthly temperatures range from 22.9°C to 26.2°C (Figure 3). The average relative air humidity is about 80% over the year built on 20-year period (1999-2019).

[20] Atlas Forestier du Cameroun, Cameroon's Forest Estate (2011-2017), Map.1 – Tab.1 – pag. 15, 16 Retrieved from https://cmr-data.forest-atlas.org/

[21] Arrêté n° 002176/ANA/MINFOF/DRE/DDBN du 20 Octobre 2020

[22] Source: https://www.worldwildlife.org/publications/terrestrial-ecoregions-of-the-world

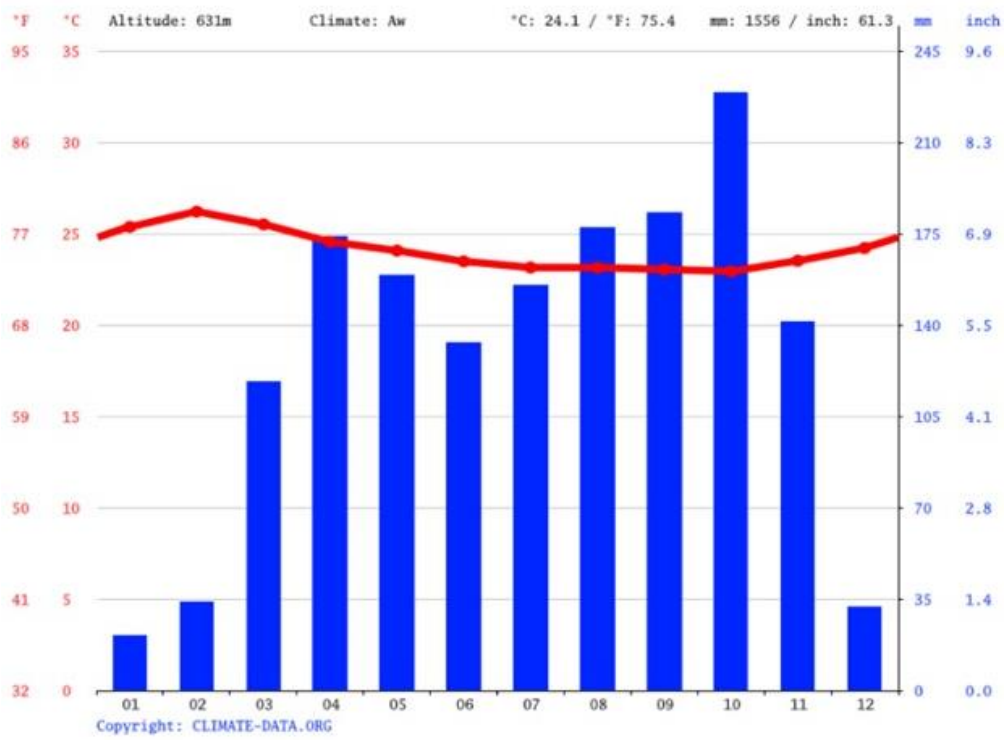

Figure 3: rainfall (blue) and temperature (red) monthly average (1999-2019) at Moloundou, Cameroon (source: https://it.climate-data.org/info/sources/)

Hydrology

In hydrographic terms, UFA 10-064 belongs to the Congo Basin. Its hydrographic network is relatively dense (Figure 4). The main watercourses are the Bolou, Mikongo, Moboussamba and Mokoto to the west of the UFA, Ngoko to the south, Moko-paka, Ndjoke, Kimou, Bolima, Nadimaguina and Ndjangue to the north, and the River Sangha to the east.

These rivers form complexes of floodable and marshy forests, the main ones being situated along the River Sangha. The hydrological regime of the watercourses is closely linked to the rainfall pattern. The maximum water levels are observed from October to November, and the minimum levels from January to February.

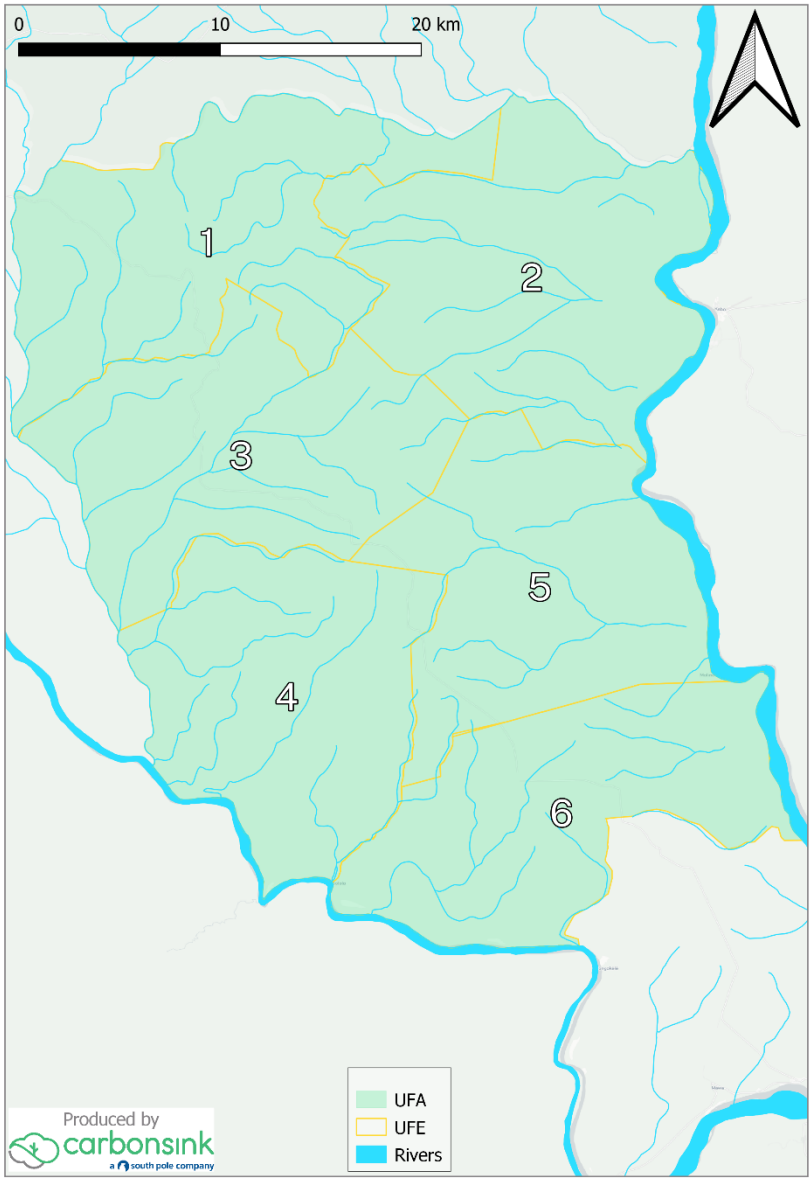

Figure 4: Water streams in UFA 10-064

Topography

UFA 10-064 is located on the north-west side of the Congo basin. Its landform is relatively flat, with a few hills. Its altitude ranges between 400 and 520 meters. The altitude decreases from north to south.

Geology and Pedology

The area of UFA 10-064 consists of metamorphic formations from the Precambrian to Cambrian eras belonging to the lower Dja series, mainly consisting of tillites, quartzites, shale, limestone and dolerite. In the low-laying areas, these geological formations are covered with alluvium dating from the quaternary era. The soils are hardened and covered in places by ferruginous duricrust. They are lateritic soils deriving from ancient metamorphic rocks. They are acid and clayey, with a low content of nitrogen and exchangeable bases. Their humus layer is relatively thin. Hydromorphic soils are also found in some places.

Vegetation

During the preparation of the Management Plan for UFA 10-064, it was necessary to intervene with a study to carry out a forest inventory in order to identify the species present in the forest and estimate the volumes related to them. For the creation of a database dedicated to this forest, the following was used TIAMA inventory software[23], a support software agreed by MINFOF[24] that has been used for many years by forestry technicians in the Congo Basin[25], and which was still in use at the time of the UFA 10-064 forest inventory. Output database will be available to the VVB if requested.

Forest formations on dry land

According to Letouzey's classification[26], UFA 10-064 belongs to the semi-deciduous sector *sensu stricto* of the Guinean-Congolian dense humid semi-deciduous forest domain represented by two types of forest formation:

- semi-deciduous forests with sterculiaceae and ulmaceae;
- mixed, semi-deciduous and evergreen forests of the Dja, with predominantly semi – deciduous forest elements.

These semi-deciduous forests differ from the evergreen forest by the presence of more numerous large trees with more rectilinear shafts and greyer bark, rare tabular tops, and the foliage of many tree species that are deciduous for a few weeks or days during the dry season. The main species encountered that are of interest for forestry are: Ayous (*Triplochyton scleroylon*), Sapelli (*Entandrophagma cylindricum*), Fraké (*Terminalia superba*), Tali (*Erytrophleum ivorense*), Kotibé (*Nesogordia papaverifera*), Kossipo (*Entandrophragma candolei*), Dibetou (*Lovoa trichilioides*), Padouk rouge (*Pterocarpus soyauxii*), Eyong (*Eribloma oblogum*), Diana Z (*Celtis zenkeri*).

[23] Rapport d'Inventaire d'aménagement – Table de contenance pag. 21 (TIAMA database will be provided to the VVB, if requested)

[24] Arrêté n° 0222/A/MINEF/ 25 mai 2002 – art. 6 – Inventaire d'aménagement, pt. b

[25] Ogolong, C.F.M. Mise en place d'un logiciel d'aide à l'aménagement des concessions forestières du Cameroun, 2019. Retrieved from https://www.dynafac.org/files/upload/mediatheque/CIRAD/Memoire-Soutenance-DaffSecc.pdf

[26] Letouzey R., 1985. Notice de la carte phytogéographique du Cameroun au 1 : 500 000 (1985). Institut de la carte de la végétation, Toulouse, France

Forest formations on flooding-subject land

In the southern and eastern parts of the UFA, there are important swamp forests, especially along the tributaries of the Sangha and Ngoko rivers. In the central and northern parts of the UFA, there are also numerous sites with special vegetation formations such as raphiales, marshy clearings, salines and bauges. All these raphiales' formations, swamp forests or periodically flooded forests with raphiales are formations consisting of clumps of palms and variable areas dominated by palms.

A forest stratification map was realized matching photo-interpretation and Cameroon vegetation map. The map was presented in the Forest Management Plan (Figure 5). The exact stratification of the different blocks is available separately in *.kmz and *.shp files.

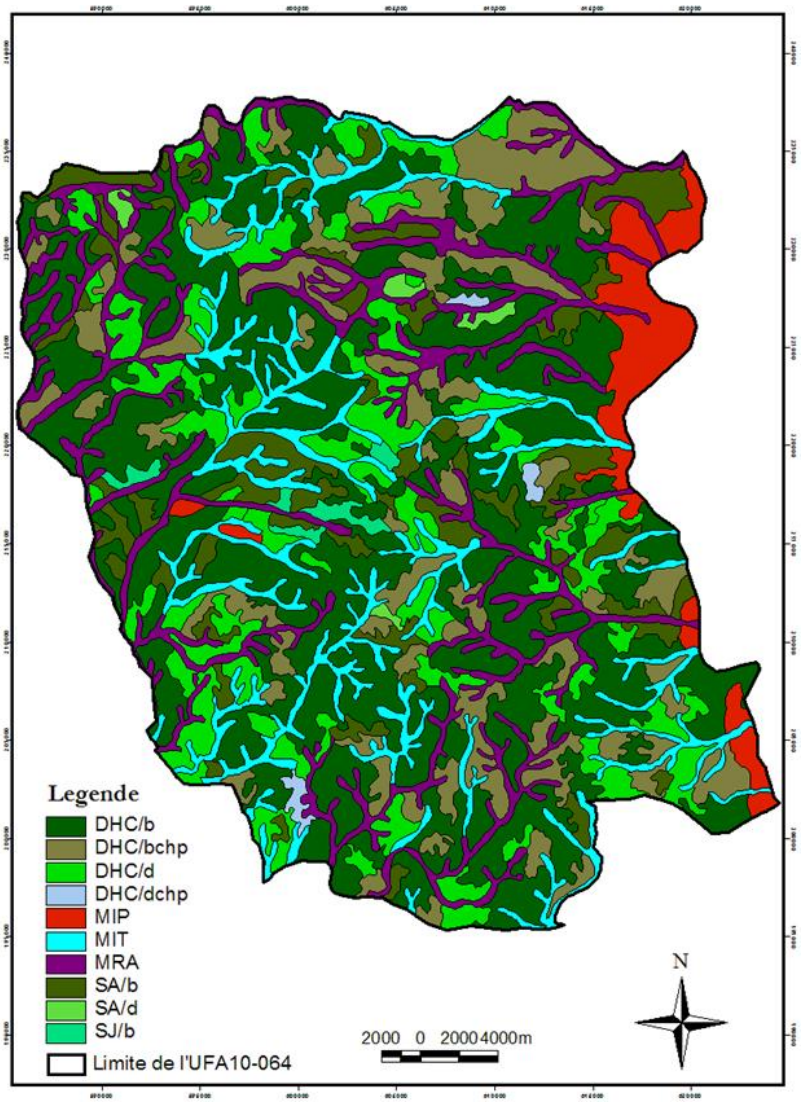

Figure 5: Stratification map of the UFA 10-064 (from the 2002 Forest Management Plan)

The stratification map reported the vegetation in two main terrain types:

- forest land, which includes vegetation formations on dry land (*DHC b, DHC CHP b, DHC CHP d, DHC d, SA b, SA d* and *SJ b*) ;
- forest formations on hydromorphic soils consisting of swamps (*MIP, MIT* and *MRA*).

The meanings of the acronyms can be found in the following table (Table 3).

Table 3: Different strata in UFA 10-064

Code	Stratum (French)	Stratum (English)	Destination (productive/non-productive)
DHC b	Forêt humide semi caducifoliée densité forte	Semi-deciduous moist forest high density	PR
DHC CHP b	Forêt humide semi caducifoliée chablis partiel densité forte	Semi-deciduous moist forest Partial windfall High density	PR
DHC CHP d	Forêt humide semi caducifoliée chablis partiel densité faible	Semi-deciduous moist forest Partial windfall Low density	PR
DHC d	Forêt humide semi caducifoliée densité faible	Semi-deciduous wet forest low density	PR
SA b	Forêt secondaire adulte densité forte	High density mature secondary forest	PR
SA d	Forêt secondaire adulte densité faible	Low density mature secondary forest	PR
SJ b	Forêt secondaire jeune densité faible	Young secondary forest low density	PR
MIT	Forêt marécageuse inondée temporairement	Temporarily flooded swamp forest	PR
MIP	Forêt marécageuse inondée en permanence	Permanently flooded swamp forest	NP
MRA	Forêt à raphias	Raphia forest	NP

Fauna

UFA 10-064 is home to a rich and diverse fauna. The fauna inventory carried out by the WWF Jengi south-east project on behalf of the Société Filière Bois on the status of large and medium-sized mammals (Nzouh Dogmo et al. 2002) in the UFA 10-064 shows that it contains a fairly high number of forest elephants (*Loxodonta africana cyclotis*), lowland gorillas (*Gorila gorilla*), red duikers and blue duikers (*Cephalophus monticola*). However, animals such as bongos (*Tragelaphus euryceros*), buffalo (*Syncerus caffer nanus*), bushpigs (*Potamochoerus porcus*), chimpanzees (*Pan troglodytes*) and yellow-backed duikers (*Cephalophus sylvicultor*) are less numerous in this forest.

Other studies in the Lobéké National Park adjacent to the northern part of UFA 10-064 (Ekobo, 1994; WCS, 1996; Makazi et al., 1998) show that the area contains several different species of large and medium-sized mammals, birds, reptiles, amphibians, fish, shrimps and lepidopterans.

Socio-economic context

The socio-economic study of the UFA 10-064 surrounding area, carried out in 2005 for LFB[27]. The main representatives ethnic groups are the Bangando, the Bakwelé and the Baka (pygmies) which represent around 75% of the local population. Other minor representative ethnise are the Betis, the Maka, the Haoussa and the Bamiléké.
The only ethnic group that lives inside the UFA 10-064 forest are the Baka. There are 5 villages that have been recorded around the forest (Figure 6):

- Kika (inhabited mainly by workers of another forestry company);
- Mambele;
- Socambo/Mongokélé (in the vicinity of the project area);
- Jerusalem;
- Magwanda.

[27] Socio-economic survey report (2005)

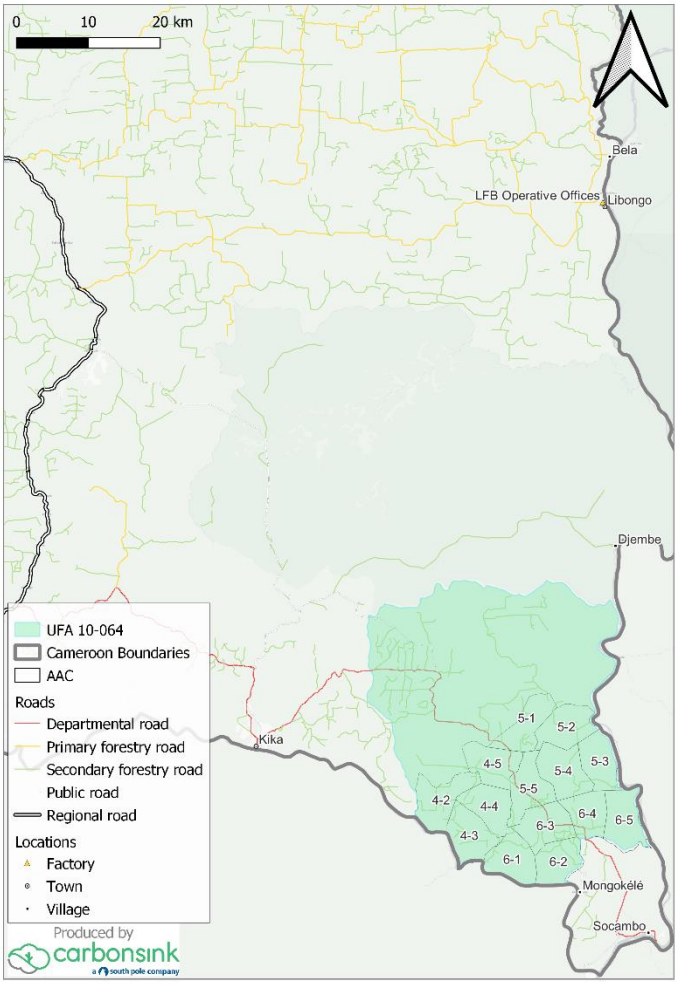

Figure 6: Main villages in the UFA 10-064 nearby and LFC offices location

The main economic activities carried out by communities in the surroundings of UFA 10-064 can be mainly related to agriculture, livestock breeding, NTFP collection, fishing and hunting.

There are no recent data concerning the populations living in these areas, given the lack of such data carried out with local accuracy. However, studies carried out by the Joint Research Centre Data Catalogue of the European Commission[28] show that the density of the entire Boumba-et-Ngoko province is extremely low, at 4.39[29] inhabitants per km^2. This figure must be considered absolutely overestimated for our area, as the populations living there are in the extreme south of the country, 312 km from Yokadouma, the largest population centre in the region.

A more recent study of the entire Moloundou district (2022)[30] estimate a population of 31 621 inhabitants: most of them are Bantu (Bangando, Bakwélé, Sangha-sangha), while Baka is a

[28] Retrieved from https://data.jrc.ec.europa.eu/dataset/jrc-ghsl-10007

[29] Retrieved from https://www.city-facts.com/boumba-et-ngoko

[30] https://oidp-afrique.org/2022/07/05/commune-de-moloundou-2/

minority (5'000 people, almost the 17% of the population). Moreover, the economic activities of the primary sector include, in order of importance, agriculture, hunting, fishing, crafts and livestock.

Agriculture occupies more than 90% of the active population and is divided into two types: subsistence agriculture and cash crops farming. The first one is practiced to ensure subsistence. It is centered on crops such as cassava, plantain, peanuts, corn, macabo, yams, potatoes, pineapples, etc. The products of this agriculture are used for self-consumption for a large part, and the rest is intended for sale. Commercial agriculture is practiced exclusively by the Bantu and is particularly concentrated on cocoa.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Cameroon legislature on forest regulation is identified by law n° 94/01 of 20th January 1994, which defines the different types of forest that are part of the State Forest domain, which also includes production forests.

The main objective of this law is to maintain the state natural heritage through the protection of forests and biodiversity in all its forms.

This objective fits in perfectly with the aims of the project activities, which aims to convert the forest from selective cutting to a protection forest, benefiting both the local population and the biocenosis comprising the forest ecosystem.

The management implementation of these forest production and protection practices is dictated by the need to carry out various preliminary, sociological and ecological studies, aimed at drawing up a Management Plan, as indicated by the order n°0222/A/MINEF/ of 25th May 2001.

The Management Plan of UFA 10-064 was approved by MINFOF in 2007 for the forestry concession allocated to La Filière Bois, thus complying with all the requirements of legality concerning the exploitation of wood resources.

Through the surveillance and control operations described in the Management Plan and required by the above-mentioned order, both the project proponent and the project implementer undertake to cooperate with the control bodies set up to report any disturbances in the project area.

Further shreds of evidence of good forestry practices by the concessionaire are the certificates of origin of the wood (Origine et Légalité du Bois – OLB), which attest the legality and traceability of the timber through an official certificate issued by an independent third party. These certificates have been recognized at LFB since 2010 and they cover all the timber harvested in this UFA from 2018, the year in which this project began, until 2020 (those documents are available if requested).

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project is neither registered nor intended to be registered under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

This project will only generate net GHG emission reductions on an additional and voluntary basis; there are no ongoing emissions trading programs in the Republic of Cameroon. Moreover, being a developing country, Cameroon has no binding limits on GHG emissions or compliance requirements under international multilateral agreements. GHG removals generated by this project will not be used for compliance with binding limits to GHG emissions since such limits are not enforced in the country.

1.16.2 Other Forms of Environmental Credit

The present project has not sought or received another form of GHG-related environmental credits, including renewable energy certificates.

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development Contributions Activity Description

At 2018, Cameroon attained a 55.62 score points in the SDG Index Score[31], where the latter is a measure of a country's total progress towards achieving all 17 SDGs. Among those, the project activities are mainly intended to act on the SDG 13 (Climate Action) and the SDG 15 (Life on Land). At the project start (2018), Cameroon is on track in maintaining SDG 13 achievement, while major challenges remain in attaining SDG 15.

Cameroon pledges to reduce by 32% its GHG emissions with respect to a reference scenario by 2035[32]. Sustainable forest management was included among the principal objectives of this policy ensemble, with a specific effort in increasing the forest carbon sink. The project scenario aims to avoid logging so that carbon is stored as long as possible by the forest's biomass, thus decreasing emissions from logging operations and wood product preparation and distribution. This project aims to prevent GHG emissions related to forest logging by avoiding any kind of commercial harvest and other emissions linked to logging activities, such as those from

[31] Source: https://dashboards.sdgindex.org/profiles/cameroon

[32] Contribution prévue déterminée au plan national (CPDN), Cameroun, 2015
Source: https://www.fao.org/faolex/results/details/en/c/LEX-FAOC188809

decomposition of harvested tree, bark burning and the emissions due to carbon fraction sequestered from wood products over time. The project activities will thus support Cameroon to keep on track on the SDG 13, by preventing the release of GHG emissions from the forest.

Moreover, the project area is included in the Congo basin, one of the area with the highest rate of deforestation and biodiversity loss hotspots[33]. The project also enhance the shelter (forest canopy) to biodiversity of all present life forms during the project period. Thus, avoiding production activities will also give benefits to the biodiversity, removing negative impacts from forest degradation and disturbance (such as the emergence of disease and pest). This will contribute to halt deforestation, one of the indicators of SDG 15 (Life on Land).

As presented further in the Section 5, the planned monitoring activities in the project area will ensure also the monitoring of the progress toward the SDGs that the project support. Specifically, annual monitoring patrols in the project area will demonstrate the absence of illegal deforestation in the area, demonstrating its preservation through the project activities. The project implantation, during its entire lifetime, will continue to contribute to the achievement of the abovementioned SDGs.

1.17.2 Sustainable Development Contributions Activity Monitoring

Project activities contributed to achieve SDG contributions identified in Table 4 of this report. The project proponent monitored the absence of forest disturbance related to illegal logging during the monitoring period (2018-2021). The avoided forest logging in the project area contributed to the Cameroon pledge to reduce emissions by 32% with respect to a reference scenario by 2035[34]. Moreover, by engaging in stopping logging activities and through monitoring activities of illegal logging, LFB committed also in halting deforestation and, thus, promoting a sustainable management of the project area.

[33] Curtis, P. G., Slay, C. M., Harris, N. L., Tyukavina, A., & Hansen, M. C. (2018). Classifying drivers of global forest loss. Science, 361(6407), 1108–1111,
Retrieved from https://www.science.org/doi/10.1126/science.aau3445

[34] Contribution prévue déterminée au plan national (CPDN), Cameroun, 2015
Source: https://www.fao.org/faolex/results/details/en/c/LEX-FAOC188809

Table 4: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
Sequential row number	*SDG Target number*	*Number and text of SDG indicator or, if no official SDG indicator is applicable, user-defined indicator*	*Indicate the project's contribution to the SDG Indicator (implemented activities to increase or decrease)*	*Brief description of the quantifiable impact of the project's activities related to the SDG indicator, during the monitoring period.*	*Brief description of the cumulative quantifiable impact of the project's activities related to the SDG indicator, over the project lifetime.*
1)	13.0	Tons of greenhouse gas emissions avoided or removed	Implemented activities to increase	By preserving 10'861 ha of tropical moist dense forest (AAC 4-2, 4-3, 4-4, 4-5), the Project Boumba-et-Ngoko has prevented the release of about 480'000 tons of carbon dioxide into the atmosphere during the monitoring period (2018-2021).	Prevented the release of about 4'900'000 tons of carbon into the atmosphere over the project lifetime therefore from 01-01-2018 to 31-12-2037.
2)	15.1	15.1.1 Forest area as a proportion of total land area	Implemented activities to increase	100% of the project area for the monitoring period (about 10'800 ha) was kept untouched (by avoiding logging).	100% of project area (about 38'900 ha) will remain as untouched forest area, since the forest manager will avoid logging. This will help maintaining the forest as intact as possible, by avoiding forest disturbances such as forestry infrastructures and stand damage from tree logging.

3)	15.2	15.2.1 Progress towards sustainable forest management	Implemented activities to increase	100% of the project area for the monitoring period (about 10'800 ha) was kept untouched (by avoiding logging).	By avoiding logging, the impact of the forest manager will be minimal in the project area (only related to monitoring activities). The total project area (about 38'309 ha) will be thus managed in a sustainable way

1.18 Additional Information Relevant to the Project

Leakage Management

Refer to Section 4.3 of the document.

Commercially Sensitive Information

There is no commercially sensitive information excluded from the public version of the project description. If otherwise indicated or if requested during validation/verification, any useful document will be made available to the VVB.

Further Information

There is no other additional relevant information.

2 SAFEGUARDS

2.1 No Net Harm

As described in Section 2.2, during the LSC, some doubts and concerns were raised by the participants at the meeting. In summary, some stakeholders raised some concerns regarding the LFB monitoring capacity within the project area. To respond to this point, through its personnel and in particular through Mr. Gwet Likaa, the manager in charge of relations with the local population located in the surroundings of UFA 10-064, LFB will increase the accuracy with which the patrolling is carried out, in order to intensify the monitoring of the area. Therefore, the possibility to hire more forest rangers has been taken into consideration by the LFB Managers.
Furthermore, Mr. Gwet Likaa made himself available for any future interaction between LFB and the stakeholders and will also supervise in case any distinctions between the various members of the local ethnic groups are observed. In case this will occur, dialogue and spaces for meetings will be encouraged and realised. Regarding the faunistic impact on which not clear feedbacks were received, the project proponent and LFB will include from the next monitoring a section aimed at obtaining feedback from hunters on their hunting success rate.
Stakeholders can contact the company by telephone, through postal correspondence or through direct interaction with LFB members that are on site (the LFB personnel including Mr. Gwet Leeka are permanently located in Libongo factory).

2.2 Local Stakeholder Consultation

In the area of UFA 10-064, as in all state-owned forests in the Republic of Cameroon, no settlement activity is allowed, with the exception of the semi-nomadic pygmy populations, of the Baka ethnic group, who historically lived in the forests, and who are allowed full access to the resources that the forest produces.
As also reported in the 2005 socio-economic survey made for LFB, the area around UFA 10-064 is sparsely populated. In fact, the census carried out by this study shows five residential settlements, and only the one in Socambo-Mongokélé is in the vicinity of the project area.
As already specified, the only settlement that would be affected by the hypothetical forest logging activities, as should be in the baseline scenario, would be the Socambo-Mongokélé communities. These communities have been identified as stakeholder because, in the baseline scenario, the logging activity would affect the portion of land in the proximity of these villages, so the FCBN project activities will have influence in their daily activities. Therefore, the inhabitants of these settlements are by right the stakeholders that must be informed and approached throughout the development and implementation phase of the activities that the project has set itself.

The Local Stakeholder Consultation was held on April 12th 2022, at the 'Forestry and Hunting Checkpoint' in Socambo village, in Boumba-et-Ngoko District, East Region. The purpose of this meeting was to provide to local population and stakeholders the information on the project and its activities, and to gather information and opinions from the participants on the possible social and environmental implications. The overall goal was to improve the project description and monitoring documents through their observations and to maximize the inclusiveness and awareness of the stakeholders on the project's activities.
Participants were invited by means of a poster. The announcement was posted on the March 25th 2022 on the Socambo village notice board remaining visible until the date of the LSC [35]. In fact, as mentioned, Socambo and the Mongokélé villages were identified as the closest to the project activities. Representatives of the local authorities were also invited through a personal letter of invitation, sent on the March 25th 2022[36].
A total of 106 participants took part in the LSC and signed the attendance sheet, of whom 25 were women and 81 were men[37].
In particular, as reported in the attendance sheet, the local authorities who participated to the meeting were:

- Head of the forestry and hunting post of Socambo/Mongokélé;
- Chief of the Village of Socambo/Mongokélé;
- President of the Farmer-Forestry Committees (Comités Paysans-Forêt – CPF) of Socambo;
- Head of the Gendarmerie post of Socambo/Mongokélé;
- Head of the 15th BIM (Motorised Infantry Battalion) detachment in Socambo;

[35] Announcement photo will be provided to VVB.

[36] Scanned version of the invitation letter will be provided to VVB.

[37] Scanned version of the signed participant list will be provided to VVB.

- Head of the Socambo/Mongokélé border post.

Figure 7: Authorities who participated at the LSC

Summary of the meeting

The meeting was coordinated by Mr. René Samuel Gweth Likaa, Head of Management of LFB, and had the following agenda:

1. Opening of the meeting;
2. Registration of the participants (signing the participant list);
3. Project presentation;
4. Questions and answers;
5. Discussion on the input/grievance mechanism and monitoring the impacts of sustainable development;
6. Closure of the meeting and filling the evaluation forms.

1. Opening of the meeting

The meeting started with the customary playing of the anthem of the Republic of Cameroon, followed by a welcome message from the Socambo-Mongokélé village chief, who thanked the organisers and all participants for the large turnout. Then, Subprefect of the Municipality of Molundou read out the receipt of the declaration for permission to hold the meeting. Mr. Gweth Likaa introduce himself and as responsible for the relationship with the local communities and as a meeting facilitator of LFB.

The minutes of this meeting between the stakeholders, local authorities and the LFB representative was taken by a technician from the Water and Forestry Bureau and authenticated by MINFOF. The minute, which records what happened during the meeting afterward, is available at the VVB complete with its annexes.

2. Registration of the participants (signing the attendance sheet)

The participants were invited to fill the attendance sheet. The participants signatures were collected during the meeting. A copy of the evaluation forms to be completed at the end of the meeting were distributed to all participants[38].

Figure 8: Mr. Gweth (LFB) during the Project explanation

3. Project presentation

Afterwards, Mr. Gweth Likaa started giving the contextualization of Forest Conservation in Boumba-et-Ngoko project, explaining its object and purpose focusing on the current situation at UFA 10-064.This was explained with the help of a large-scale map entitled "Follow-up of the exploitation of UFA 10-064", which was divided into three colours. The pink colour symbolises the AACs that have already been logged, following the timber harvest schedule plan provided for in the 30-years Management Plan (Figure 9). The four AACs (4-2, 4-3, 4-4, 4-5) object of the monitoring and the 5-1 (that will be monitored during the next verification round) were coloured in red and represent areas that are no longer exploited. Highlighted in green are all those AACs that the FCBN project is committed to protecting for years to come (5-2 to 5-5 and the whole of UFE 6). Consequently, the above-mentioned AACs were not exploited and are to be considered as conservation areas.

In the second part of the Mr. Gweth Likaa's presentation, the project activities were described. All participants were informed of the cessation of logging activities within the UFA portion of the conservation project, confirming that all monitoring activities already carried out by law, will be continued and implemented by other monitored parameters to ensure the current state of the forest, both from a structural and phytosanitary point of view. The results of these monitoring activities, as well as any updates on the current and future status of the project, will be communicated through notices posted on the municipal notice board in Socambo. LFB representative initially reassured that the rights of use will be maintained by the company and afterwards that the social welfare works benefiting the communities surrounding the forest will

[38] Scanned version of the compiled evaluation form has been uploaded as Annex to the project.

still be carried out as agreed in the forest Management Plan, although exploitation activities have been suspended[39]. Cameroon's forestry law recognises the right of all inhabitants of the district to collect NTFPs useful for subsistence and the production of tools, construction materials, etc.
Thus LFB representative illustrated how the added value of a rich biodiversity would benefit not only the environment, but also people who inhabit it: greater biodiversity equals a greater variety of resources that can be used to sustain human, animal and plant communities, as well as greater genetic variety that makes all living beings less susceptible to external interference. Mr. Gweth also stressed that similar projects can contribute to countering the climate change that is affecting the entire planet, especially most of the environments at risk, such as the tropics.
Furthermore, Mr. Gweth informed the public that the conservation project does not affect the availability of non-timber forest products (NTFP), but rather will make them rationally and sustainably available for generations to come.
Due to the conservation nature of the project, no risks or costs to the local community are expected from activities within the project area.

The audience was reassured that if any negative effects from the implementation of the project and its activities were to occur, they would be identified, monitored and mitigated by LFB. At the end of the presentation, LFB representative made it clear to the meeting attendants that the success of this conservation project has many advantages, not only for the government and the company but also for those who live in the area and carry out activities there. If this is respected, the project will be able to go ahead and the company will continue to fulfil its commitments to the government (payment of various taxes, compliance with the specifications) and to the population (implementation of welfare activities such as agricultural donations, medicines, construction of wells and rural electrification, etc.). In addition, thanks to the cessation of logging activities within the forest, the population has been informed that the ecosystem will not be damaged by disturbances due to exploitation, guaranteeing a larger quantity of available resources, as NTFP, compared to the baseline scenario, which foresees the cutting and disturbance of the forest.
During the meeting, the dedicated national and international tools for forest, environmental and climate change conservation (national laws, international agreements, climate finance, specializing cooperation programs) were communicated.
Further details derived from the project development will be disclosed in subsequent stakeholder meetings.

[39] Cameroon's forestry regulations require exploiting companies to carry out social works in the villages that are affected by logging activities (ex. Distribution of medicines, construction of infrastructure etc…). The identification of the communities that benefit from the social works is done by projecting the boundary of the AAC outwards, to include all the villages in the proximities.

Figure 9: Persons attending the speech of the LFB representative at the Forestry Outpost with, on the right, the poster of different stages of project implementation on the UFA 10-064 map.

Figure 10: Participants to the Local Stakeholders Meeting held on the 12th of April 2022 in Socambo Village (Boumba-et-Ngoko district, Est Region)

4. Question and answers

After the presentations of the project activities, participants were asked to express in favour of project implementation and unanimous approval was voted by the participants. At the end of the meeting, it was possible to collect 24 filled evaluation forms. The response and suggestions arisen during the meeting were recorded in the minutes and the questionnaire have been collected by LFB and kept in a specific folder. These responses will be available to the VVB. As LFB have a permeance presence in the area, the personnel are at disposal in case any other questionnaire will be submitted after the ending of the meeting. During the discussion, it was assured that if any negative impacts occur, they will be identified, prevented and mitigated. LFB in the person of Mr. Gweth and the technicians who will visit the village of Socambo, are available to organise further meetings with stakeholders in order to update the inhabitants on the status of the project, collect comments and discuss possible solutions for the mitigation of problems that may emerge with the implementation of the next steps of the project. If applicable, the project design will be updated based on these comments or the project entities will justify to the local stakeholder why the project design cannot be updated.

5. Discussion on the input/grievance mechanism and monitoring the impacts of sustainable development.

As far as workers are concerned, LFB recruits the labour force by relying directly on the local village committees, the CPFs, which act as intermediaries to identify who among the local candidates can be hired by the logging company. Workers' rights in Cameroon are protected through the 'Labour Code', namely Law n°92/007 of 14th August 1992[40] setting out how labour unions are set up and which are the modalities of different labour contracts, wages, working conditions, workplace safety, wages, bodies, professional institutions, disputes and sanctions.

6. Closure of the meeting

To conclude the meeting, as reported in the minutes drawn up by the Cameroonian law enforcement agencies, the participants received explanations and advices on the UFA 10-064 conservation project, as well as being reassured that the local population will not be deprived of its right of use, social welfare works, and that the environmental, social and economic aspects will always be respected by LFB in the implementation of the activities outlined.

Stakeholders were given the opportunity to contact LFB project implementers if they had any questions to clarify the project, the public consultation process and/or answer to the questions sent. LFB team is always available at the head office of Libongo, Boumba-et-Ngoko District, East Region while technical field assistants are directly located. Furthermore, contact details of LFB

[40] Retrieved from https://www.ilo.org/dyn/natlex/docs/WEBTEXT/31629/64868/F92CMR01.htm#:~:text=%2D%20(1)%20Le%20droit%20au,forc%C3%A9%20ou%20obligatoire%20est%20interdit.

like address, emails, website, and telephone numbers were shared for any type of feedback or to manage the grievance from internal stakeholders. The communication with the local stakeholder regarding any project aspect including project design and implementation, results of monitoring, risks, costs and benefits the project may bring to local stakeholders, all relevant laws and regulations covering workers' and the process of VCS validation/verification process and site visit, will therefore be ensure trough technical presence and meetings with the stakeholders, were they will have the possibility to express their position and idea. In addition, as a mechanism for on-going communication with local stakeholders, the project proponent will send them the questionnaire prior to each verification event.

Summary of the received feedback

Overall, the opinion of participants regarding the project was positive and the participants agreed that the presentation of the objectives of the meeting and of the project was clear. Participants were encouraged to ask questions and leave comments.

Below is presented a summary of main comments received during the meeting. Totally 24 feedbacks were received:

Social/economic impacts

Under the socio-economic aspects, there was a very favourable response from the participants at the meeting, who remarked how the implementation of the project could bring favourable developments to the economic sector related to the NTFP and venison products commercialisation. This is also reflected in the improvement of the community's daily living conditions. In addition, thanks to the fact that LFB will maintain its presence in the area, some social activities like donation of medicines to the local health outpost, will continue to be carried out in the area.

Environmental impacts

From an environmental point of view, the participants were unanimous on the positive impacts of the project on the environment and the comments received were in favour of the conservation of the ecosystem, protection of biodiversity and of the fauna component. In fact, as specified in the previous paragraph, the resources that the forest naturally provides for the population are increasingly prosperous due to the lack of disturbance of the forest caused by exploitation activities. Sustainable resource management was another very important point that opened up a discussion on the need to monitor the area in order to ensure that neither illegal cultivation activities nor poaching, and illegal logging can take place within UFA 10-064.

Faunistic impacts

In this section the stakeholders were asked whether they used the hunting resource for their livelihood and whether the amount of wild animals in UFA 10-064 had increased or decreased since the project began.

The feedback was mixed in this respect, although the unanimity of the answers incriminated the exploitation of hunting through poaching. Those who do not hunt and therefore are not closely associated with these activities within the forest, stated that the amount of animals found there

had decreased. However, those who use this resource for their livelihood, as also permitted by the provisions of the forestry law, actually found an increase in the amount of animals following less disturbance of the habitat.

Climate change impact

LFB's communication regarding greenhouse gas emission reduction and the other targets received a very good response in terms of opinions. In fact, in the majority of the completed forms, it can be deduced that the explanation of this issue was a matter of interest for the entire population.

Summary of negative impacts stated by stakeholders and suggestions

The negative comments focused mainly on the fear that this project would not be realised and that the forest would not therefore continue to be protected in the future, as is already the case with the mentioned AACs. One comment concerned the ethnographic division, expressing that no distinctions should be made between the various members of the local ethnic groups, with respect for ranks and positions of everyone. Through its representative, Mr. Gweth, the LFB intends to pay attention to this type of complaint by intensifying the dialogue between the villagers and the company through direct contact with the offices in Libongo[41], where the LFB has its operational offices. During the meeting, it was explained how to use direct communication channels, such as telephone and postal correspondence, or contact LFB workers whenever they are in the village.

Among the negative comments was the reported capacity of control within UFA with regard to supervision by LFB. Also on the management side, some comments called for a strengthening of management. Concern was expressed that poaching and illegal cultivation may occur within the UFA, and a request of a more present patrolling of the forest conducted by entrusted LFB personnel was presented. In order to comply with this type of request as well, in the near future LFB will endeavour to reinforce its presence through patrols by ensuring an even more thorough control than is already done.

Regarding the mixed comments received on the faunistic impact, as stated above, and in the framework of the mechanism for ongoing communication with local stakeholders, the project proponent and LFB will include from the next monitoring a section aimed at obtaining feedback from hunters on their hunting success rate. Depending on the comments that the project proponent will receive from hunters, the project proponent will determine if steps must be taken to mitigate any eventual impact. Mr. Gweth, as the manager for LFB, is the person in charge of maintaining relations with stakeholders. As for the near future, more meetings with villagers will be organised through him, who will always remain available either through conventional communication (telephone, mail) or in-person (at the village or at the operational offices in Libongo).

Potential negative impacts concerns raised by local stakeholders are managed by LFB through continuous forest patrols and access controls, to contrast illegal poaching and logging (see

[41] Source: http://www.groupesefac.com/factory/the-libongo-factory/

Section 5.3 for more information about the monitoring plan). Moreover, the fear that forest would not continue to be protected in the future is not relevant, since LFB already asks to the Cameroonian Government for a permission renewal for the UFA 10-064 management LFB continues to implement ameliorations in light of the advices and comments received from stakeholders.

2.3 Environmental Impact

The project activities do not foresee any kind of logging operations, so an Environmental Impact Assessment (EIA) is not required. Being a conservation project of a forest block, there will be only beneficial impacts on environmental qualities such as water and biodiversity. The key mitigation action of the project activities are related to protect and improve the surviving environment, keep the ecological balance, save the species resources and enhance homeland security. Therefore, no negative environmental impact is expected from the implementation of a logged to protected forest project.

2.4 Public Comments

This project was open for public comment from 21-03-2022 to 20-04-2022 but no comment was released.

2.5 AFOLU-Specific Safeguards

Local stakeholders were identified prior to validation through the analysis of project activities, defining their area of influence among the region. Having the opportunity to benefit from the NTFPs provided by the forest, the inhabitants of the surrounding areas were therefore indicated as those who will face the direct effects of the conservation activities. The list of the stakeholder that be interested by the project will be updated at each verification event with the same method used during the identification process.

Projects activities being related to the conservation, are not expected to impact negatively the potential local stakeholders, in fact as reported in Section 2.2 and stated in the LSC's minute, local inhabitants are allowed to exercise their right of hunting and collecting activities into the project area.

Proof that there are no negative effects that have manifested in these first years of the project are the comments collected through the forms, which have been enthusiastic. Their comments will be monitored throughout the project longevity and the result of such consultation will be presented in the monitoring report. The results of monitoring will be communicated to local stakeholders by sending them the link to access all public documents on the Verra registry.

The grievance redress procedure to resolve any conflicts which may arise between the project proponent and local stakeholders will be applied in accordance with the national Labour Code.

LFB, as stated in the Management Plan of UFA 10-064 and as required by law, annually provides the local communities with infrastructure works identifying, through the usual participatory meetings, what the needs of the communities are, year after year. This mechanism, already implemented by LFB, allows for direct and continuous contact with the inhabitants, who can also be informed or request information regarding the project and its activities thanks also to the permanent presence of LFB on the ground.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The project uses the Verified Carbon Standard – Approved VCS Methodology VM0010 – Methodology for Improved Forest Management: Conversion from Logged to Protected Forest (v 1.3, 28 April 2016, Sectoral Scope 14).

Listed below there are the latest versions of the modules and tools used for the application of the methodology:

- *VCS tool VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities (v3.0, February 2012, Sectoral Scope 14).* This tool provides for a step-wise approach to demonstrate additionality in VCS AFOLU projects. Project proponents proposing new baseline methodologies may incorporate this tool in their proposal. In validating the application of this tool to a proposed project activity, validation/verification bodies should assess credibility of all data, rationales, assumptions, justifications and documentation provided by project proponent(s) to support the selection of the baseline and demonstration of additionality.

- *VCS AFOLU Non-Permanence Risk Tool (v4.0).* This tool provides the procedures for conducting the non-permanence risk analysis and buffer determination required for Agriculture Forestry and Other Land Use (AFOLU) projects. The tool sets out the requirements for project proponents, implementing partners and validation/verification bodies to assess risk and determine the appropriate risk rating.

3.2 Applicability of Methodology

The project meets all the applicability requirements of the methodology VM0010, as summarised in the table below:

Table 5. VM0010 methodology applicability conditions

Applicability Conditions	Project Justification
Forest management in the baseline scenario must be planned timber harvest	When the project was implemented, the entire UFA was managed through a forest Management Plan approved by MINFOF[42], which divided the entire forest into five-year logging blocks, addressing the forest to productive activity.
Under the project scenario, forest use must be limited to activities that do not result in commercial timber harvest or forest degradation	In the project scenario all logging activities in the forest are suspended, so there will be no exploitation of products from this UFA.
Planned timber harvest must be estimated using forest inventory methods that determine allowable off take as volume of timber (m3/ha)	The forest inventory is carried out when the UFA Management Plan is drawn up. All logging activities are conducted once they have been approved by MINFOF, which authorizes the exploitation of an AAC (Assiette Annuelle de Coupe) within the limits of the permitted cubage (m^3/ha)[43].
The boundaries of the forest land must be clearly defined and documented	As part of the Cameroonian Republic's forest domain, the boundaries of the UFA are defined by law, identified in the Management Plan and clearly visible in the field. (refer to Kml file).
The baseline scenario cannot include conversion to managed plantations	According to the previously issued timber harvest plan, the project baseline scenario is planned timber harvest within the project area, which doesn't include conversion to managed plantations.
The baseline scenario, project scenario and project case cannot include wetland or peatland	Cameroonian law protects wetlands within production forests by including them in the High Conservation Values (HVC), so all wetlands, swamps, or areas with watercourses and surrounding areas within 30 meters of them are excluded from production areas and therefore excluded *a priori* from project areas[44]. However,

[42] MINFOF Order n°0974 of 20th November 2007

[43] Rapport d'Inventaire d'aménagement (the document is at disposal of the VVB if required)

[44] Décision n° 0108/D/MINEF/CAB du 09 février 1998 – Normes d'intervention en milieu forestier – Art. 15

	according to the Ramsar Convention[45] and IPCC[46] definitions of wetland, the hydromorphic soil strata (*MIP*, *MIT* and *MRA*) were not considered in the project area due to their swamped or permanently flooded conditions.(see chapter 3.4 for more details).
All applicability conditions of VCS and CDM tools used in conjunction with this methodology must be met.	The project description document meets all applicability conditions of VCS and CDM tools used in conjunction with the VM0010 methodology (refer to Table 6).

Table 6. Applicability conditions of VCS and CDM tools used in conjunction with the VM0010

VCS/CDM Tools	Applicability Conditions	Justifications
VCS tool VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities	AFOLU activities similar to the proposed Project Activity on the land within the proposed Project boundary performed with or without being registered as the VCS AFOLU project shall not lead to violation of any applicable law even if the law is not enforced.	Project activities are in line with Cameroon's forestry regulations[47].
	The use of this tool to determine additionality requires the baseline methodology to provide for a stepwise approach justifying the determination of the most plausible baseline scenario. Project Proponents proposing new baseline methodologies shall ensure consistency between the determination of a baseline scenario and the determination of additionality of a Project Activity.	The tool was used to determine the most plausible baseline scenario through a stepwise approach (see Section 3.4).

[45] Ramsar, 1971. Convention on Wetlands of International Importance especially as Waterfowl Habitat.

[46] IPCC, 2003. Good Practice Guidance for Land Use, Land-Use Change and Forestry, Section 3.5 "Wetlands"

[47] Loi n° 94/01 du 20 janvier 1994

Therefore, the Forest Conservation in Boumba-et-Ngoko project is fully compliant with all the listed applicability conditions in the selected methodology.

3.3 Project Boundary

The geographical boundaries of the project area are to be identified in the south of UFA 10-064, (UFE 4: AACs 4-2, 4-3, 4-4, 4-5), and the entire UFEs 5 and 6 which are located in the south-eastern part of Cameroon (as outlined in Section 1.12 of this document). The project area boundaries are well defined and will not change as the project evolves. The physical boundaries of the project area are as shown in the following image (Figure 11).

Project activities, such as monitoring, are carried out entirely within UFA 10-064 and more precisely within the project area. As far as the leakage study is concerned, the entire national territory of Cameroon is to be considered.

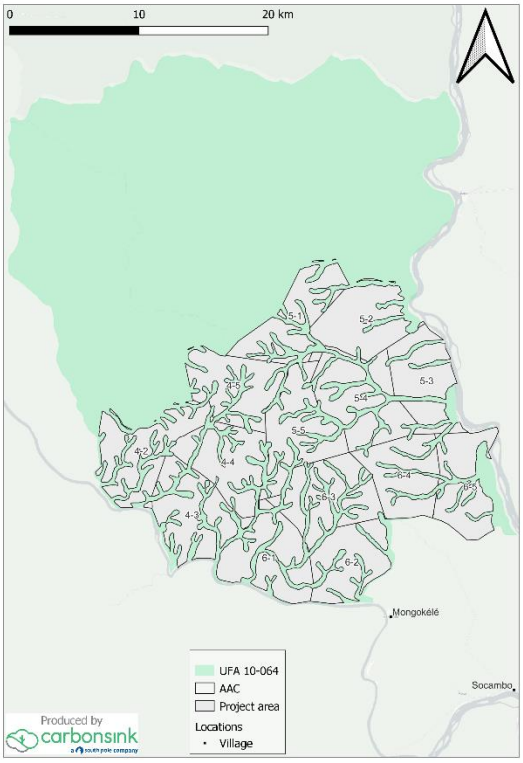

Figure 11: Project Area with AACs and nearby villages

Regarding the temporal boundaries of the project, we can refer to the credit period from 01-01-2018 to 31-12-2037. The minimum duration of a monitoring period is one year and the maximum duration is 10 years. The next verification event will happen every year to five years, depending on the decision of the project partners. Following the *VCS* definition of market leakage, the geographic boundaries for leakage from market effects are those of the country in which the project area occurs (Cameroon).

Carbon pools

The carbon pools included or excluded from the project boundary are shown in the table below:

Table 7. Carbon pools as identified in methodology

Carbon pools	Included?	Justification / Explanation of choice
Aboveground trees	Included	The stock change in the above ground tree biomass must be estimated
Above ground non-tree	Excluded	Exclusion is always conservative when forests remain as forest
Belowground	Excluded	Unlikely to change significantly in forests remaining as forests and it is difficult to measure. Omission is conservative
Deadwood (logging slash)	Included in the baseline	The dead wood (logging slash) carbon pool is expected to be larger in the baseline than in the project scenario, and therefore this pool must be included
Dead wood (naturally accumulated)	Excluded	Following IPCC guidelines, it is assumed that carbon stocks in the naturally occurring dead wood pool (both standing and lying) are equivalent in both the project and baseline scenario, and therefore this pool is conservatively excluded. It is not conservative to account for this pool in the baseline scenario only.
Harvested wood products	Included	Will be greater in baseline than project scenario and significant
Litter	Excluded	Insignificant and exclusion is conservative
Soil organic carbon	Excluded	Exclusion is always conservative when forests remain as forest

Emission Sources

The emission sources included or excluded from the project boundary are shown in the table below:

Table 8. GHG emission sources

Source		Gas	Included?	Justification/Explanation
Baseline	Combustion of fossil fuels (in vehicles, machinery and equipment)	CO_2	Excluded	Conservative as emissions will be greater in the baseline scenario than in the project scenario.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	Burning of biomass	CO_2	Excluded	Not applicable in the project area region, since the practice of burning biomass after logging and the use of nitrogen fertilizer are not commonly applied[48].
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
Project	Combustion of fossil fuels (in vehicles, machinery and equipment)	CO_2	Excluded	Conservative as emissions will be greater in the baseline scenario than in the project scenario.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	Burning of biomass	CO_2	Excluded	Not applicable in the project area region, since the practice of burning biomass after logging and the use of nitrogen fertilizer are not commonly applied.
		CH_4	Excluded	
		N_2O	Excluded	

[48] Eyi Obame, A.P. Niveau de valorisation des dechets d'exploitation forestiere : identification et estimation des rebuts de bois dans l'aac 2014 de la seef a Nzamaligue. 2019. Retrieved from https://www.researchgate.net/publication/326092700_Niveau_de_valorisation_des_dechets_d'exploitation_forestiere_identification_et_estimation_des_rebuts_de_bois_dans_l'AAC_2014_de_la_SEEF_a_Nzamaligue

Source	Gas	Included?	Justification/Explanation
	Other	Excluded	

No management activity will take place as part of the project scenario. Only supervision and monitoring activities will take place: no installation are needed for these activities.

3.4 Baseline Scenario

As required by the methodology, the VCS tool *VT0001 Tool for the Demonstration and Assessment of Additionality in AFOLU Project Activities* (v3.0, February 2012) is used to assess which of the baseline alternatives must be excluded from further consideration. In particular, this section responds to Step 1 of the tool, which is focused on the 'Identification of alternative land use scenarios to the proposed VCS AFOLU project activity'.

Sub-step 1a. *"Identify credible alternative land use scenarios to the proposed VCS AFOLU project activity"*

The project developer has identified two plausible baseline scenarios as alternatives land uses for the project area:

Alternative 1. Continuation of the pre-project land use

The VM0010 Methodology requires for eligibility criteria that the project proponent demonstrate 1) the legal right to harvest, and 2) the intent to harvest. MINFOF establishes, through Order 222, the duration of a forest management plan. Considering the subdivision of the forest (UFA) into 6 management blocks (UFE) each consisting of 5 annual harvested areas (AAC), the duration of a management plan is thus set at 30 years. In the first 4 or 5 years, therefore until the review and final validation of the management plan by MINFOF, the forest is managed through a provisional convention.

In the UFA 10-064 forest, the provisional convention occurred from 2002 to 2005[49] and will continue until the termination of the approved Management Plan (2031).

Before an AAC can be exploited, a forest inventory must at first be carried out. The values collected are then submitted to MINFOF which, from year to year, validates them and issues through the Annual Operating Permit (Permis Annuel d'Opérations – PAO) the extractable volumes for the year of logging operation. These documents are realized in accordance with the Cameroon forestry law, and subsequently approved by MINFOF[50,51]. At the end of the period covered by the management Plan, it will be necessary to carry out a new inventory study of the forest resources

[49] During the period of approval of the management plan, the Cameroon forestry law indicates the possibility of managing the forest through a provisional convention. UFA 10-064 was managed through this agreement from 2002 to 2005.

[50] MINFOF Order n°0974 of 20th November 2007

[51] UFA 10-064 Management Plan

to implement a new management plan. As reported, in the official contract of the UFA 10-064 concession, LFB at the end of the management period will have the possibility to renew agreements in order to continue managing the forest.
The actual concession will expire in 2027. The Cameroonian law[52] specifies that the renewal request must be submitted at least one year in advance of the expiry date.
The renewal request was submitted to MINFOF on 21 June 2022 and officially received on 29 June 2022. Trough the Ministerial Document No. 4837, the Minister of Forests, Jules Doret Ndongo, forwarded the documents to the Head of Government on 29 August 2022.

The forwarding of the request from the MINFOF means that all the documents submitted meet the legal requirements for the renewal of forests (listed in the aforementioned decree)[53]. Since the competent minister has endorsed the application for concession renewal, the Head of Government shall accept the concession renewal.

However, Cameroon's bureaucratic timelines cannot provide a period in which the signature can be obtained with certainty. According to the decree, at least one year should be necessary to send and evaluate the approval for all concessions.

Finally, the forest concession related to the project area will be thus renewed before its natural expiry date.

Therefore, in the absence of the Project, the forests in the Production Areas of the UFA would have been logged according to the Forest Management Plan approved by the local government.

Alternative 2. No Harvest

In this scenario, it is proposed that forest management would be abandoned by LFB and this would be an alternative that does not generate revenues from wood sales. The consequence will be the withdrawal of all monitoring activities, including land patrolling and general surveillance, control on poaching activities, illegal logging and periodical check on the phytosanitary status.

Sub-step 1b. *"Consistency of credible land use scenario with enforced mandatory applicable laws and regulations"*

In the scenarios proposed in the previous sub-step, LFB would continue to pay the compulsory forestry tax, retaining the forest stand rights. In this way, there would be no infringement of Cameroonian forestry laws while maintaining the rights already mentioned.

Sub-step 1c. *"Selection of the baseline scenario, justifying the selection and determination of the most plausible baseline scenario"*

[52] Décret n° 95/531/PM – Titre V – Chapitre I – Section I – art.74

[53] Renewal documentation will be provided to the VVB

The most suitable baseline scenario would be the continuation of the planned timber harvest according to the governmental approved management plan.

Modelling the Baseline Scenario

A Historical Baseline Scenario approach was chosen for the Baseline Scenario modelling, in accordance with the Section 6.2 of the VM0010 methodology (v..1.3).
The existence of a Management Plan for the UFA 10-064 validates this approach. The Management Plan was developed on the basis of the Forest Inventory, which was carried out in 2005[54]. The methodology request to validate the Forest Inventory, if older than 10 years with respect to the project start date. This process is presented in the Section 3.6, In accordance with the Section 6.2.1 of the methodology, a baseline scenario and timber harvest plan derived from the historical practices of the baseline agent of timber harvest was modelled as the baseline. The following documents are presented to demonstrate the compliance to the methodology guidelines:

1. *Historical records of forest management exist for a minimum of 5 or more years preceding the project start date.*
   The UFA 10-064 Forest Management Plan was approved by MINFOF in 2007. Moreover, every year an annual operation plan is realized on the basis of an Annual Operations Permission (Permis Annuel d'Opérations – PAO). The latter indicates the number of the AAC to be exploited and the volumes of timber that can be logged in the operating year.

2. *Historical records indicate that the management practices have surpassed the legal requirements (provided by conforming to all local and regional forest legislation).* According to Cameroon law, the forest management plan, to be valid, must be approved by MINFOF. Regarding UFA 10-064, the Management Plan was approved by MINFOF through the order n. 0974 of the 20th November 2007.

3. *Historical records that indicate that the historical management surpasses financial barriers by providing above average financial returns.*
   The following data refers to the economic benefits that LFB has recorded in its financial statement in the management of the total UFA 10-064. The following data were reported in the approved PDA.[55]

Table 5. Financial statement of UFA 10-064 Management Plan

[54] Rapport d'Inventaire d'aménagement (R.I.A.), 2006

[55] The monetary currency has been converted to €. Exchange rate was calculated on 17/01/2022 from https://www.beac.int/

Total revenues	438'195'126.93 €
Expenses	288'199'951.42 €
Earnings	149'995'175.51 €

The PDA for UFA 10-064 fully complies with the requirements described in "Box 1: Timber Harvest Plan" of the VT0001: Tool for the Demonstration and Assessment of Additionality in AFOLU Project Activities.

Stratification

As presented in the Section 1.13 of this document, the PDA proposes a subdivision of the UFA 10-064 according to its component forest types[56]. The stratification of the forest was carried out by photo-interpretation of aerial images of the forest. According to Letouzey's mapping of vegetation types[57], 10 different forest strata were identified: *DHC b*, *DHC d*, *DHC CHP b*, *DHC CHP d, SA b*, *SA d*, *SJ b*, *MIP*, *MIT* and *MRA*.

The *DHC* strata, that include *DHC b*, *DHC d*, *DHC CHP b*, *DHC CHP d strata*, identify the vegetation types characterised by the presence of dense moist forest, including windbreak, high- and low-density forests. The *S* strata that include *SA b*, *SA d*, *SJ b* strata, brings together all the areas populated by high- and low-density adult secondary forest and low density young secondary forest.

The last forest strata come from hydromorphic soils. These include permanent (*MIP*) and temporarily (*MIT*) flooded areas, the latter falling within the productive zone of the forest, and Raphia forest (*MRA*).

The extension of the hydromorphic soil strata were not considered in the project area due to their swamped or permanently flooded conditions. However, the *MIT* stratum meets the legislative requirements to be exploited for logging, as it does not fall within the permanently flooded areas, and therefore it was yearly logged by LFB according to the PDA. According to the Ramsar Convention[58], wetlands are "areas of marsh, fen, peatland, or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six meters". Moreover, IPCC[59] defines wetlands as land covered or saturated by water for all or part of the year and that does not fall into the forest land, cropland, grassland, or settlements.

[56] Table 3.1 of UFA 10-064 Management Plan – pag. 16

[57] Letouzey R., 1985. Notice de la carte phytogéographique du Cameroun au 1 : 500 000 (1985). Institut de la carte de la végétation, Toulouse, France

[58] Ramsar, 1971. Convention on Wetlands of International Importance especially as Waterfowl Habitat.

[59] IPCC, 2003. Good Practice Guidance for Land Use, Land-Use Change and Forestry, Section 3.5 "Wetlands"

As for the applicability condition regarding wetland in VM0010 methodology v1.3, the MIT could be not included in the project area. Project proponent thus not considered the MIT areas in the calculation of carbon benefits which arise from forest conservation in these areas. However, due to the project implementation, forest stratum in MIT will not be logged and the project will thus acts indirectly on wetland conservation in the UFA 10-064 area.

In order to improve the efficiency of calculations and according to the TIAMA inventory software, the applicable strata were united into 2 main strata that shared the main descriptive characteristics.

Therefore, as reported in Figure 12, the project area was divided in the 3 main following strata:

- Primary (*DHC*), which includes *DHC b*, *DHC d*, *DHC CHP b* and *DHC CHP d* strata; and
- Secondary (S), which includes *SA b*, *SA d* and *SJ b* strata.

The shapefile of the stratification of the project area is available to the VVB.

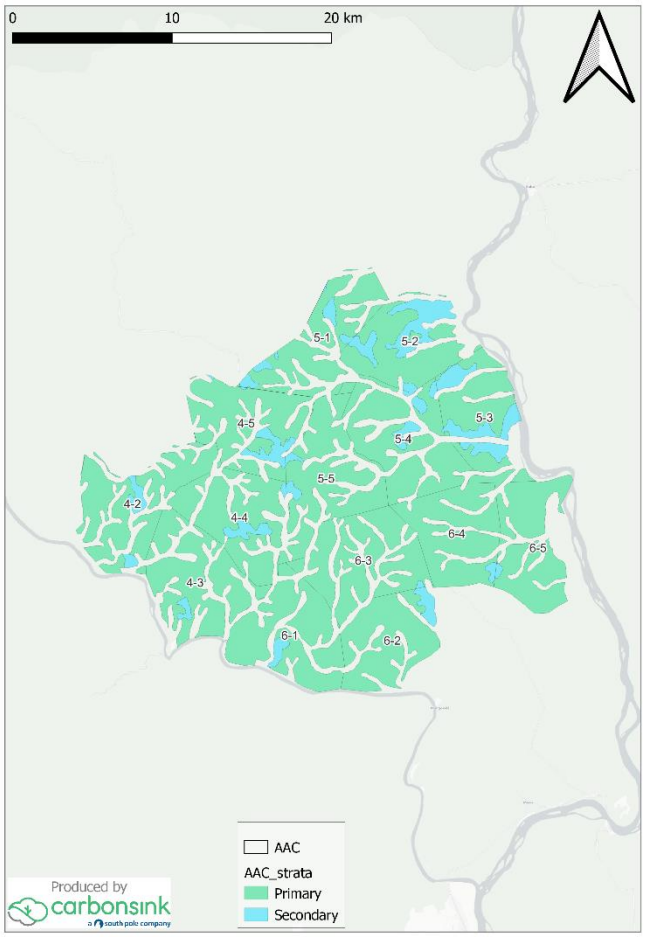

Figure 12 Project area stratification

3.5 Additionality

According to the VCS methodology, the VCS Tool VT0001 is the procedure to be used for determining the baseline scenario and for demonstrating additionality. The flowchart reproduced below is extracted from the VT0001 document:

Step 1 – Selection of the baseline scenario

In the previous section, it was demonstrated that the most plausible baseline scenario is the continuation of the planned timber harvest according to the approved Forest Management Plan.

We proceeded to Step 2 (Investment analysis).

Step 2. Investment analysis

As the entire forest is managed for productive purposes[60], the only income in the project area would be derived from logging operations and timber sales. There are no other types of financial income that this region could generate as the only land use allowed in these areas is forestry.

For this reason, the cost-benefit analysis approach adopted was the 'Sub-step 2b. –Option I. Apply simple cost analysis'. The details of the cost-benefit analysis for the project scenario are provided to the validation agent in a separate Excel file.

The project generates revenue only by putting the related Carbon Credits on the market. The costs that the project has to face are those related to forest maintenance, monitoring and control and other additional costs. Moreover, also the costs inherent to the drafting of the PDD, in compliance with the Verified Carbon Standard, and those concerning the validation/verification process for the registration of Verified Carbon Units (VCU) will be present for the project scenario. By implementing the project, LFB is depriving itself of the income that would have been generated by the exploitation of the remaining 14 AACs of the UFA 10-064. The project activity on the other hand is additional since it would not be implemented without the incentive of VCS approval and subsequent sale of GHG credits.

It is concluded that the proposed VCS AFOLU project produces no financial benefits other than VCS related income. We then proceed to Step 4 (Common practice analysis).

Step 4. Common Practice Analysis

A search carried out both in-situ through LFB contacts and through the web demonstrated that within the geographical boundaries of Cameroon there are no active projects of the same type in place or in the process of doing so.

[60] Paragraph 4.1, UFA 10-064 Management Plan – pag. 22

Step 4 is not satisfied, since similar activities cannot be observed and essential distinctions between the proposed VCS AFOLU project activity and similar activities have been found. The proposed VCS AFOLU project activity is not the baseline scenario and, hence, it is additional.

3.6 Methodology Deviations

As specified in paragraph 3.18 of *VCS-Standard v. 4.3: "Projects may deviate from the procedures set out in methodologies in certain cases, where alternative methods may be more efficient for project-specific circumstances, and where the deviation will achieve the same level of accuracy or is more conservative than what is set out in the methodology."*

Validation of the forest inventory (baseline scenario emissions)

In order to calculate the carbon stocks in commercial timber volumes in the baseline scenario, it is acceptable to use pre-existing forest inventory data for this purpose. However, when the forest inventory data is more than 10 years old, the volume estimate derived from the pre-existing data need to be validated with limited sampling within the project area through the use of the CDM tool "*Tool for Calculation of the Number of Sample Plots for Measurements within A/R CDM Project Activities"* (Section 8.1.1 of the VCS VM0010 methodology, v.1.3). Moreover, the methodology sets that if the data collected from the sampling does not differ by the accepted 90% confidence interval (±10% from the average value to be validated), it is possible to accept the inventory for the project estimates.

Forest inventory for the UFA 10-064 was carried out in 2005[61]. This inventory is thus more than 10-years old at the project start date (2018) and must be validated through limited sampling (Section 8.1.1 of the methodology).

The project proponent proposes a methodological deviation for the validation of this forest inventory. In accordance with the Cameroonian Law (Arrêté n° 0222/A/MINEF du 25/05/2002, Art.41), the forest inventory for the annual logging activities (AAC) must be carried every one or two years on 100% of the AAC surface (*"inventaire en plein"*). This inventory must be carried out using the same methodologies as those used for the inventory of the UFA.

These censuses, once carried out, are used to organise the logging plan in each AAC and are certified by MINFOF (Cameroonian's Forestry Ministry). These documents are issued by the Ministry as Annual Operation Permission (Permìs Annuel d'Operation – PAO), presenting the allowable exploitable volumes for each tree species, above the Administrative Minimum Management Diameters (DME). The outputs of each PAO is the extractable volume of wood in each AAC. These volumes are used by the logging company to draw up an internal guideline called the Annual Operations Plan (Plan Annuel d'Operation).

The proposed methodological deviation is to use the abovementioned censuses (Annual Operation Permissions, PAO) instead of the limited samplings (from the CDM Tool's sample plots)

[61] Rapport d'Inventaire d'aménagement (R.I.A.), 2006

to validate UFA 10-064 forest inventory. The advantage of using these documents, instead of making sample plots, lies in the fact that PAO censuses record all the potentially exploitable trees for each species above a certain DME in the entire surface of the AAC, instead of limited sample plots.

Data on extractable volumes of wood from 2011 until 2017[62] (corresponding to the AACs 2-5, 3-1, 3-3, 3-4, 3-5, 4-1) was thus compared to those of UFA 10-064 forest inventory data. These data included all the forest productive strata, including the MIT stratum (which finally is not part of the project area). PAO documents accounted for a forest census that covers a cumulative 18% of the total UFA 10-064 surface. Furthermore, before AAC 4-2 was converted into a protected area (2018), an additional census was made by LFB, in order to ask for proceeding with the annual allowable cut in this area. PP proposes to include also this census, combined with the 2011-2017 ones, to reach a coverage of 22% of the total area of UFA 10-064 (about 25'500 ha). These censuses allowed to have a forest census rate that is complete, punctual, unequivocal and validated by the local authorities. These direct measurements are thus representative for an area which is about 66% of the size of the project area. Hence, limited sampling could not develop the same accuracy in the forest inventory validation as the data from the considered PAOs. For this reason, the proposed deviation will not negatively impact the conservativeness of the quantification of forest inventory, and thus the related GHG emission reductions or removals from the project. Forest inventory validation estimations are presented in the Excel spreadsheet '*Validation_forest_inventory-UFA-UFE*'.

Illegal logging monitoring (project scenario GHG emissions)

The *VCS VM0010* methodology *v.1.3* in Section 8.2.2.2 states that Participatory Rural Appraisal (PRA) are needed to state the presence of illegal logging activities into the project area. In the case that during these participatory surveys at least 10% of the participants confirm the presence of illegal logging activities, the methodology indicates the need to carry out sampling areas to quantify the damaging event (option B).However, footnote n°31 (p. 44 of the *VCS VM0010* methodology *v.1.3*) states that project proponents "should use techniques that are suitable to their specific situation and that have been published in peer-reviewed papers". So the methodology suggests that it is possible to use remote sensing techniques to assess and quantify forest cover loss (illegal logging) in the project area.

However, several databases from remote sensing data are now used to spot illegal deforestation. For example, the Hansen Global Forest Change version 1.9 datasets[63] is extensively used to assess illegal logging. The datasets were developed by Hansen et al. (2013) in their paper "High-

[62] PAOs documents will be available to VVB during validation process.

[63] Available at https://glad.earthengine.app/view/global-forest-change

resolution global maps of 21st-century forest cover change"[64]. This dataset has been used extensively to monitoring and reporting forest loss in the literature[65,66].

The project proponent thus proposes here to investigate the potential presence of illegal logging in the project area through the analysis of spatio-temporal dataset from remote sensing data. Specifically, the project proponent uses a multi-temporal remote sensing analysis (using LANDSAT satellite-based related dataset).

Below the rationale of the analysis:

Maps of annual tree cover loss at 30x30m resolution for the project area will be produced at each monitoring period, using the most updated data by Hansen et al. (2013). Even though this research is dated 2013, the database is updated every year, and data up to the year 2021 are currently available (new data are made available each year). These maps are used to assess the presence of illegal logging in the project area during each monitoring period. Each detected tree cover loss pixel will be considered as a 30x30m=0.09 ha of forest subjected to illegal logging during the monitoring period. The output of this calculation will be associated to the area potentially impacted by illegal logging (A_{dist_LI}). The total influence of potential illegal logging will be tested for significance over the entire project area with the application of the CDM Tool for significance[67]. The methodology (Section 8.2) states that illegal logging below de minimis should be considered negligible, following the rule set up in the *VCS AFOLU Requirements* (*VCS Methodology Requirements v4.2*). This document states that a specific project or leakage GHG emissions source "may be deemed de minimis and do not have to be accounted for if together the omitted decrease in carbon stocks (in carbon pools) or increase in GHG emissions (from GHG sources) amounts to less than five percent of the total GHG benefit generated by the project". It the illegal logging in the project area spotted during monitoring period appears to be significant, Option B (limited and permament sample plots) of the Section 8.2.2.2 of the *VCS VCM0010* methodology will be put in place in the concerned area by the project proponent.

These remote sensing analyses are more conservative with respect to ground-based measurements since they can spot illegal logging areas even when PRA surveys do not result in the potential presence of illegally logged areas. Moreover, the monitoring scheme presented here includes a higher frequency compared to the one required by both Option A (PRA) of the methodology, since the study will be carried out each year. In addition, they are more accurate than participatory surveys since they are able to cover the forest canopy change with a more granular time rate across the whole project area.

[64] https://doi.org/10.1126/science.1244693

[65] Environ. Res. Commun. 4 071004; https://doi.org/10.1088/2515-7620/ac82de

[66] Remote Sens. 2020, 12(11), 1790; https://doi.org/10.3390/rs12111790

[67] http://cdm.unfccc.int/EB/031/eb31_repan16.pdf

This method assures a complete and trustful analysis of the phenomenon of illegal forest loss. Moreover further measures are already been putted in place by the project proponent in the project area to tackle illegal logging:

- monitoring reports have been and will be produced every year, after patrolling activities of the project area (see Section 5.3 for more information). These are also mandatory and report all illegal activities within the UFA that are monitored by the LFB from year to year;
- UFA 10-064 is part of the Cameroonian forest domain. As a state-owned forest, there are legislative references that require concessionaires (in this case LFB) to set up facilities to control entry and exit from the forest, along the main route at the two access points. This requirement is necessary in order to counteract any illegal removals from the forest, such as poaching, but also illegal logging[68,69]. In the UFA 10-064, access points are monitored with two gates controlled by guards. On the field, it takes the form of a level crossing, monitored 24 hours a day by a private security company, which controls access and the opening/closing of the level crossing at each entrance/exit (evidences will be provided to the VVB).

4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The calculation of baseline emissions was carried out as described in the methodology from *Section 8.1.1* to *Section 8.1.6*. Baseline projections are calculated ex-ante and are not adjusted throughout the project lifetime.

As described, the equations in *Section 8.1.1* are dedicated to estimating the calculation of carbon in commercial timber. The next estimation required by the methodology in *Section 8.1.2* relates to residual dead wood in the forest from logging slash (a), standing trees damaged during the harvest of other trees (b), residual wood material from the realisation of infrastructures required for logging activities (c). *Section 8.1.3* deals with the calculation of carbon sequestered by wood products made from harvested wood, according to the category of product made: short-life or long-life cycle. Then, in *Section 8.1.4*, the carbon sequestered by forest regrowth after logging operations is considered. *Section 8.1.5* assesses the part due to emissions from the use of fossil fuels for all cutting, skidding, loading, transport, hauling and processing operations from the machineries used in the project area and from the factory machinery. Finally, *Section 8.1.6*

[68] Arrêté n° 0222/A/MINEF/ 25 mai 2002 – art. 11(3)

[69] Paragraph 4.8.7, UFA 10-064 Management Plan

provides the net amount of carbon in the baseline scenario from the factors calculated with previous equations.

The following table lists the baseline emissions modelled by the methodology (From *Table 3* of *VM0010, Version 1.3*):

Included in modelling
All projects: 1. Emission from wood product conversion 2. Decomposition of deadwood from harvested trees 3. Emissions from wood product retirement 4. Stock change due to regrowth following timber harvest 5. Decomposition of trees incidentally killed during tree felling
Conservatively excluded from modelling
1. Emissions through subsequent forest re-entry

The baseline emissions are calculated in the sub-sections below, according to the *VM0010 methodology (v.1.3)*.

It is recommended to read the following sections in conjunction with the Excel document named 'ExAnte_BoumbaAndNgoko_VM0010'. This spreadsheet has been made available to VVB.

Calculation of carbon stocks in commercial timber volumes

These equations are used to quantify the commercial volumes present within the project area. The *Section 8.1.1* of the methodology allows the use of existing inventories if they fall within certain parameters. The inventory must:

a) Represent the project strata;

b) Be no more than 10 years old;

c) Where forest inventory data is more than 10 years old, the volume estimate, derived from the pre-existing data must be validated with limited sampling within the project area (please refer to the Section 3.6 about methodology deviation).

The value of the extractable volumes of wood in the project area for the baseline scenario was calculated from the Forest Inventory and the Forest Management Plan of the UFA 10-064. The

assumptions and calculations can be verified in the '*BoumbaAndNgoko-ExtractableVolume'* spreadsheet.

The estimate of merchantable volume for each species *j* at the sample plot level was calculated as:

$$V_{j,i,sp} = \sum_{l=1}^{L} V_{l,j,i,sp} \quad (1)$$

Where:

$V_{j,i,sp}$	Merchantable volume for species *j* in stratum *i* in sample plot *sp*, m^3;
$V_{l,j,i,sp}$	Merchantable volume for tree *l* of species *j* in stratum *i* in sample plot *sp*; m^3;
l	1,2,3…*L* sequence of individual trees in sample plot;
i	1,2,3…*M* strata;
SP	1,2,3… SP sample plots; and
j	1,2,3…*J* tree species.

The pre-existing forest inventory data were based on volume per area of each tree species *i* that could be found in each stratum *j*. For this reason, equation 1 from the methodology was not used in the calculations.

The values for this variable, for all the strata *i* in the project area, can be found in the sheet '*Volumes (project area)*' of the '*BoumbaAndNgoko-ExtractableVolume*' spreasheet. This variable is also the basis for the calculations of baseline scenario GHG emissions and removals ('*ExAnte_BoumbaAndNgoko_VM0010_v4*' Excel, eq. 1 in the '*BSL*' sheet).

Therefore, the merchantable volume per unit area of species *j* in stratum *i* will be calculated as the mean merchantable volume in all sample plots in stratum *i*:

$$V_{j,i|BSL} = \frac{1}{SP} \sum_{SP}^{sp} \frac{V_{j,i,sp}}{A_{sp}} \quad (2)$$

Where:

$V_{j,i\|BSL}$	Mean merchantable volume per unit area of species *j* in stratum *i* in the baseline scenario, $m^3 \cdot ha^{-1}$;
$V_{j,i,sp}$	Merchantable volume for species *j* in stratum *i* in sample plot *sp*, m^3;
A_{sp}	Area of sample plot *sp*, ha;
i	1,2,3…*M* strata;
SP	1,2,3… SP sample plots; and
j	1,2,3…*J* tree species.

Estimations of the GHG emissions and removals in the baseline scenario can be found in the '*ExAnte_BoumbaAndNgoko_VM0010_v4*', '*BSL*' and '*BSL_total*' sheets).

In Cameroon, minimum logging diameters are specified by law, depending on the species. These diameters are called Administration Minimum Management Diameters (Diamètre minimum d'exploitation administration – DME/ADM also Mentioned in this document as DMA)[70]. It is forbidden to harvest trees which have smaller diameters than those listed in the mentioned document. However, in determining the Management Minimum Exploitation Diameter (Diamètre minimum d'exploitation aménagement –DME/AME also mentioned in this document as DME) for each species, it is necessary to carry out species-specific studies to assess the "replacement rate". In other words, it is necessary to determine the minimum number of plants to be left for each species, so that these are sufficient in number to ensure the continuation of new-born seedlings for future years[71]. This DME value, scientifically obtained and species-specific[72] for each UFA, is always greater than or at most equal to the DMA[73]. Therefore, as far as the implementation of the Management Plan in the field is concerned, this is the value applied to determine whether a tree is suitable for felling. It is important to specify that DME is estimated and applied only for commercially valuable species. For the purposes of the project estimates, the DMA value would be the one applicable to the mean merchantable volume of timber ($V_{j,i|BSL}$) for all species present in UFA 10-064, while the DME value is the one adopted to estimate the mean volume of extracted timber ($V_{EX,j,i}$). Thus the value of $V_{EX,j,i}$ is equal to $V_{j,i|BSL}$ (see '*BSL*' sheet in the '*ExAnte_BoumbaAndNgoko_VM0010_v4*' spreadsheet.

The carbon stock of timber harvested per unit area for species j in stratum i was calculated from this mean volume of extracted timber:

$$C_{HB,j,i|BSL} = \left(V_{EX,j,i|BSL} + V_{EX,INF,j,i|BSL}\right) * BCEF_R * CF_j \quad (3)$$

Where:

$C_{HB,j,i\|BSL}$	Mean carbon stock of harvested biomass per unit area for species *j* in stratum i, $tC \cdot ha^{-1}$;
$V_{EX,j,i\|BSL}$	Mean volume of extracted timber per unit area for species *j* in stratum *i*, $m^3 \cdot ha^{-1}$;
$V_{EX,INF,j,i\|BSL}$	Mean volume of extracted timber for forestry infrastructure per unit area for species *j* in stratum *i*, $m^3 \cdot ha^{-1}$;
$BCEF_R$	Biomass conversion and expansion factor applicable to wood removals in the project area, $t\ d.m \cdot m^{-3}$;

[70] Arrêté n° 0222/A/MINEF/ 25 mai 2002 – art. 6, pt. j

[71] Arrêté n° 0222/A/MINEF/ 25 mai 2002 – art. 9, par. 1

[72] Paragraph 4.3.4 of UFA 10-064 Management Plan – pag.27

[73] Idem footnote 40

CF_j	Carbon fraction of biomass for species *j*, tC · t d.m.$^{-1}$;
i	1,2,3…*M* strata; and
j	1,2,3…*J* tree species.

The PP did not account for forestry infrastructure. The mean extracted volume that is harvested for the purpose of building forestry infrastructure ($V_{EX,INF,j,i|BSL}$) was thus not calculated. Thus, $V_{EX,INF,j,i|BSL}$ = 0. This measure is deemed conservative.

Not all of the harvested biomass leaves the forest because the timber harvested has two components: 1) wood removed to market (extracted timber) and 2) wood remaining in the forest as a result of harvest.
Therefore, the mean carbon stock of extracted timber per unit area for species *j* in stratum *i* was calculated from the mean volume of extracted timber multiplied by density and carbon fractions:

$$C_{EX,j,i|BSL} = \left(V_{EX,j,i|BSL} + V_{EX,INF,j,i|BSL}\right) * D_j * CF_j \quad (4)$$

Where:

$C_{EX,j,i\|BSL}$	Mean carbon stock of extracted timber per unit area for species *j* in stratum *i*, tC · ha^{-1};
$V_{EX,j,i\|BSL}$	Mean carbon stock of extracted timber per unit area for species *j* in stratum *i*, tC · ha^{-1};
$V_{EX,INF,j,i\|BSL}$	Mean volume of extracted timber for forestry infrastructure per unit area for species *j* in stratum *i*, m^3 · ha^{-1};
D_j	Basic wood density of species *j*; t d.m · m^{-3};
CF_j	Carbon fraction of biomass for species *j*, tC · t d.m.$^{-1}$;
i	1,2,3…*M* strata; and
j	1,2,3…*J* tree species.

<u>Calculation of dead wood (logging slash) generated in the process of timber harvest</u>

This section calculates $\Delta C_{DWSLASH,i,p|BSL}$, the change in carbon stock in dead wood resulting from timber harvest in stratum *i* in land parcel *p*, using $C_{EX,j,i|BSL}$ (Equation 3) and $C_{HB,j,i|BSL}$ (Equation 4), as calculated previously.
Therefore, the change in carbon stock in the dead wood pool in stratum *i* in land parcel *p* was calculated as the difference between the total carbon stock of the harvested biomass and the carbon stock of the extracted timber:

$$\Delta C_{DWSLASH,i,p|BSL} = \sum_{j=1}^{J}\left[\left(C_{HB,j,i|BSL} - C_{EX,j,i|BSL}\right) + C_{RSD,j,i|BSL} + C_{notHB,inf,j,i|BSL}\right] \quad (5)$$

Where:

$\Delta C_{DWSLASH,i,p\|BSL}$	Change in carbon stock of dead wood as logging slash resulting from timber harvest per unit area in stratum *i* in land parcel *p*, in tC · ha^{-1};
$C_{HB,j,i\|BSL}$	Mean carbon stock of harvested biomass per unit area for species *j* in stratum *i*, tC · ha^{-1};
$C_{EX,j,i\|BSL}$	Mean carbon stock of extracted timber per unit area for species *j* in stratum *i*, tC · ha^{-1};
$C_{RSD,j,i\|BSL}$	Mean carbon stock in timber from residual stand damage per unit area for species *j* in stratum *i*, tC · ha^{-1};
$C_{notHB,inf,j,i\|BSL}$	Mean carbon stock of biomass that is not harvested during the establishment of forestry infrastructure per unit area for species *j* in stratum *i*, tC · ha^{-1};
i	1,2,3…*M* strata;
j	1,2,3…*J* tree species; and
p	1,2,3…*P* land parcels.

The mean carbon stock in timber from residual stand damage ($C_{RSD,j,i|BSL}$) was calculated as follows:

$$C_{RSD,j,i|BSL} = C_{EX,j,i|BSL} * F_{RSD|BSL} \quad (6)$$

Where:

$C_{RSD,j,i\|BSL}$	Mean carbon stock in timber from residual stand damage per unit area for species *j* in stratum *i*, tC · ha^{-1};
$C_{EX,j,i\|BSL}$	Mean carbon stock of extracted timber per unit area for species *j* in stratum *i*, tC · ha^{-1};
$F_{RSD\|BSL}$	Factor for residual stand damage, dimensionless;
i	1,2,3…*M* strata; and
j	1,2,3…*J* tree species.

The mean carbon stock of biomass that is not harvested during the establishment of forestry infrastructure ($C_{notHB,INF,j,i|BSL}$) is calculated as follows:

$$C_{notHB,inf,j,i|BSL} = V_{notEX,inf,j,i|BSL} * BCEF_R * CF_j \quad (7)$$

Where:

$C_{notHB,inf,j,i\|BSL}$	Mean carbon stock of biomass that is not harvested during the establishment of forestry infrastructure per unit area for species j in stratum i, tC · ha^{-1};
$V_{notEX,inf,j,i\|BSL}$	Mean volume of timber that is not extracted for wood processing during the establishment of forestry infrastructure per unit area for species j in stratum i, m^3 ·ha^{-1};
$BCEF_R$	Biomass conversion and expansion factor applicable to wood removals in the project area, t.d.m m^{-3};
CF_j	Carbon fraction of biomass for species j, tC t d.m.$^{-1}$
i	1,2,3…*M* strata; and
j	1,2,3…*J* tree species.

Since the baseline scenario does not account for the construction of forestry infrastructure (deemed to be conservative), the mean carbon stock of biomass that is not harvested during the establishment of forestry infrastructure ($C_{notHB,INF,j,i|BSL}$) was set as zero for all the tree species *i* and stratum *j*.

Calculation of baseline carbon sequestered in wood products

This section calculates the net carbon stock change resulting from wood product conversion and retirement. In all cases where wood is harvested for conversion to wood products, carbon stock in the wood products pool must be included in the baseline case. Carbon stocks treated here are those stocks entering the wood products pool at the time of harvest.

The carbon stock of extracted timber across species was calculated as follows:

$$C_{EX,i|BSL} = \sum_{j=1}^{J} C_{EX,j,i|BSL} \quad (8)$$

Where:

$C_{EX,i\|BSL}$	Change in carbon stock of extracted wood products resulting from timber harvest per unit area in stratum *i* in land parcel *p*, in tC · ha^{-1};
$C_{EX,j,i\|BSL}$	Mean carbon stock of extracted wood per hectare, tC · ha^{-1};
i	1,2,3…*M* strata; and
j	1,2,3…*J* tree species.

The wood product class(es), k, (sawnwood, wood-based panels, other industrial roundwood, paper and paper board, and other) that are the anticipated end use of the extracted timber must now be selected. It is acceptable practice to assign gross percentages of volume extracted to wood product

classes on the basis of local expert knowledge of harvest activities and markets. Both log-wood and sawn-wood were considered as wood products, with a percentage of 5% and 95%. These values were calculated as average of production registry data of the SEFAC group sawmill (in Libongo), regarding the 5 years previous to the project start date (2013-2017). These data are available to the VVB, if requested.

In accordance with the *VCS AFOLU Requirements*, the amount of carbon stored in wood products that would decay within 3 years after harvest (i.e., the Wood Waste (WW) and the Short Lived Fraction (SLF)), are assumed to be emitted at the time of harvest.

Therefore, the carbon stock of extracted timber that is immediately emitted to the atmosphere at the time of harvest was calculated as:

$$C_{WP0,i|BSL} = \sum_k C_{EX,i,k|BSL} * (WW_k + SLF_k) \quad (9)$$

Where:

$C_{WP0,i\|BSL}$	Carbon stock of extracted timber from stratum *i* that is assumed to be emitted immediately at the time of harvest, tC · ha^{-1};
$C_{EX,i,k\|BSL}$	Mean carbon stock of extracted timber per unit area in stratum *i*, for wood product type *k*, tC · ha^{-1};
WW_k	Fraction of biomass carbon from wood waste that is assumed to be emitted to the atmosphere immediately at the time of harvest for wood product *k*, dimensionless;
SLF_k	Fraction of biomass carbon from the shortlived wood product pool that is assumed to be emitted to the atmosphere immediately at the time of harvest for wood product *k*, dimensionless;
i	1,2,3…*M* strata; and
k	Wood products (sawn-wood, wood base products, etc.).

The amount of extracted carbon stock that is assumed to enter the wood products pool that is not immediately emitted at harvest was calculated as per Equation 8 below:

$$C_{WP,i|BSL} = \sum_k C_{EX,i,k|BSL} - C_{WP0,i|BSL} \quad (10)$$

Where:

$C_{WP,i\|BSL}$	Carbon stock of extracted timber from stratum *i* that is assumed to enter the wood products pool that is not immediately emitted at the time of harvest, in tC · ha^{-1};
$C_{EX,i,k\|BSL}$	Mean carbon stock of extracted timber per unit area in stratum *i*, for wood product type *k*, tC · ha^{-1};

$C_{WP0,i\|BSL}$	Carbon stock of extracted timber from stratum *i* that is assumed to be emitted immediately at the time of harvest, tC · ha^{-1};
i	1,2,3…*M* strata; and
k	Wood products (sawn-wood, wood base products, etc.).

Wood products that are retired between 3 and 100 years after harvest (i.e., the Additional Oxidized Fraction, *OF*), must be accounted according to a 20 year linear decay function. This decay function is applied when the net greenhouse gas emissions/removals are calculated on an annual basis in Equations 11 and 12 below.

Therefore, the carbon stock of wood products assumed to be retired between 3-100 years following harvest was calculated as:

$$C_{WP100,i|BSL} = C_{WP,i|BSL} * OF_k \quad (11)$$

Where:

$C_{WP100,i\|BSL}$	Carbon stored in wood products that are assumed to be retired between 3-100 years after harvest from stratum *i* in land parcel *p*, tC · ha^{-1};
$C_{WP,i\|BSL}$	Carbon stock of extracted timber from stratum *i* that is assumed to enter the wood products pool that is not immediately emitted at the time of harvest, in tC · ha^{-1};
OF_k	Fraction of biomass carbon for wood product type *k* that is assumed to be emitted to the atmosphere between 3 and 100 years of timber harvest, dimensionless;
i	1,2,3…*M* strata; and

All other wood product pools are considered to permanently store carbon.

Change in carbon stocks due to forest regrowth after harvest

The carbon sequestration in the baseline scenario resulting from forest regrowth after timber harvest up to year *t* is equal to the forest regrowth rate of each stratum.

Therefore, carbon sequestration resulting from forest regrowth after timber harvest is calculated as:

$$C_{RG,i,p|BSL} = \sum_i RGR_i \quad (12)$$

Where:

$C_{RG,i,p\|BSL}$	Carbon sequestration resulting from forest regrowth after timber harvest and establishment of forestry infrastructure in stratum *i* in land parcel *p*, tC · ha^{-1} · yr-1;

RGR_i	Regrowth rate of forest post timber harvest post forestry infrastructure establishment for stratum *i*, tC · ha-1 · yr-1; and
i	1,2,3…*M* strata.

Regrowth rate was calculated from the IPCC default values for above-ground net biomass growth in African tropical moist deciduous forest in Africa, considering a young secondary forest for the whole project area (in order to be conservative)[74]. The calculations leading to this parameter can be found in the 'Bibliography' in the '*ExAnte_BoumbaAndNgoko_VM0010_v4*' spreadsheet.

Calculation of baseline emissions from the combustion of fossil fuels in forestry and wood processing machinery

The PP has decided not to account for baseline emissions from the combustion of fossil fuels in forestry and wood processing machinery. This measure is deemed conservative. Therefore, equations 13-22 of the VM0010 methodology (v.1.3) were not used in the present project and are not presented here.

Calculation of baseline scenario greenhouse gas emissions from change in carbon stocks

This section calculates $GHG_{NET|BSL}$, the net greenhouse gas emissions in the baseline scenario, in tCO_2e. These calculations are presented in details in the '*BSL_total*' sheet of the *'ExAnte_BoumbaAndNgoko_VM0010_v4'* spreadsheet.

The transformation to total GHG emissions and removals in each year of the project was estimated through the surface area of the planned timber harvest schedule (for each forest stratum), which is presented in the '*Areas_TimberHarvestSchedule*' sheet ('*ExAnte_BoumbaAndNgoko_VM0010_v4*' spreadsheet).The net carbon stock change to be converted to emissions is equal to the carbon stock change as a result of timber harvest plus the carbon stock change resulting from conversion and retirement of wood products minus carbon sequestration from forest regrowth after harvest.

In order to generate the annual carbon stock change in the baseline scenario, the total net change in carbon stocks for parcels is multiplied by the area of forest in the particular age class (i.e., years since harvest in the baseline), estimated in the '*Areas_TimberHarvestSchedule*' sheet ('*ExAnte_BoumbaAndNgoko_VM0010_v4*' spreadsheet). The annualized calculations vary between years 1, 2-10, 11-20, and all years since the start of the project activity, depending on which decay functions apply.

Therefore, the net change in carbon stock from wood products and logging slash across all parcels within the first year of harvest in the baseline was calculated as:

$$\Delta C_{NET|BSL(1)} = \sum_{i,p} A_{1,i,p} * \sum_{i=1}^{M} \left(\Delta C_{DWSLASH,i,p|BSL}/10\right) + \Delta C_{WP0,i,p|BSL} + \left(\Delta C_{WP100,i,p|BSL}/20\right) \quad (23)$$

[74] 2019 Refinement of IPCC Guidelines for National Greenhouse Gas Inventories (2019), Chapter 4, Table 4.9

Where:

$\Delta C_{NET\|BSL(1)}$	Net change in carbon stock across all parcels in the baseline scenario in the first year since harvest in the baseline scenario, in tC;
$\Delta C_{DWSLASH,i,p\|BSL}$	Change in carbon stock of dead wood as logging slash resulting from timber harvest per unit area in stratum *i* in land parcel *p*, in $tC \cdot ha^{-1}$;
$\Delta C_{WP0,i,p\|BSL}$	Change in carbon stock resulting from wood product conversion and retirement from stratum *i* in land parcel *p*, that is assumed to be emitted in the first year of harvest in the baseline $tC \cdot ha^{-1}$;
$\Delta C_{WP100,i,p\|BSL}$	Carbon stored in wood products that is assumed to be retired between 3 – 100 years after harvest from stratum *i* in land parcel *p*, $tC \cdot ha^{-1}$;
$A_{1,i,p}$	Area of stratum *i* in land parcel *p* that was harvested 1 year ago, ha;
i	1,2,3…*M* strata; and
p	1,2,3…P land parcels harvested within the project crediting period.

The net change in carbon stock from wood products and logging slash across all parcels in the years 2 – 10 since harvest in the baseline was then calculated as:

$$\Delta C_{NET|BSL(2-10)} = \sum_{i,p} A_{2-10,i,p} * \sum_{i=1}^{M} \left(\Delta C_{DWSLASH,i,p|BSL}/10\right) + \left(\Delta C_{WP100,i,p|BSL}/20\right) \quad (24)$$

Where:

$\Delta C_{NET\|BSL(2-10)}$	Net change in carbon stock across all parcels in the baseline scenario in years 2-10 since harvest in the baseline scenario, in tC;
$\Delta C_{DWSLASH,i,p\|BSL}$	Change in carbon stock of dead wood as logging slash resulting from timber harvest per unit area in stratum *i* in land parcel *p*, in $tC \cdot ha^{-1}$;
$\Delta C_{WP100,i,p\|BSL}$	Carbon stored in wood products that is assumed to be retired between 3 – 100 years after harvest from stratum *i* in land parcel *p*, $tC \cdot ha^{-1}$;
$A_{2-10,i,p}$	Area of stratum *i* in land parcel *p* that was harvested between 2 and 10 years ago, ha;
i	1,2,3…*M* strata; and
p	1,2,3…P land parcels harvested within the project crediting period.

The net change in carbon stock from wood products across all parcels in the years 11-20 since harvest in the baseline was calculated as:

$$\Delta C_{NET|BSL(11-20)} = \sum_{i,p} A_{11-20,i,p} * \sum_{i=1}^{M} (\Delta C_{WP100,i,p|BSL}/20) \quad (25)$$

Where:

$\Delta C_{NET\|BSL(11-20)}$	Net change in carbon stock across all parcels in the baseline scenario in years 11-20 since harvest in the baseline scenario, in tC;
$\Delta C_{WP100,i,p\|BSL}$	Carbon stored in wood products that is assumed to be retired between 3 – 100 years after harvest from stratum *i* in land parcel *p*, $tC \cdot ha^{-1}$;
$A_{11-20,i,p}$	Area of stratum *i* in land parcel *p* that was harvested between 11 and 20 years ago, ha;
i	1,2,3…*M* strata; and
p	1,2,3…P land parcels harvested within the project crediting period.

The net change (sequestration) in carbon stock due to forest regrowth across all parcels in all years since harvest in the baseline scenario is calculated according to Equation 26 below.

$$\Delta C_{NET|BSL(1+)} = \sum_{i,p} A_{t^*} * \sum_{i=1}^{M} (-\Delta C_{RG,i,p|BSL}) \quad (26)$$

Where:

$\Delta C_{NET\|BSL(1+)}$	Net change in carbon stock due to forest regrowth in all parcels that have been harvested in the baseline scenario, in tC;
$\Delta C_{RG,i,p\|BSL}$	Carbon sequestration resulting from forest regrowth after timber harvest in stratum i in land parcel p, $tC \cdot ha^{-1}$;
A_{t^*}	Cumulative area harvested until time t^*, ha;
t^*	1, 2,….10, time elapsed since the start of the project, in years;
i	1,2,3…*M* strata; and
p	1,2,3…P land parcels harvested within the project crediting period.

Finally, net change in carbon stock across all parcels harvested over each year of the project crediting period in the baseline scenario since the start of the project activity, was calculated from the previous equations as:

$$\Delta C_{NET|BSL,t^*} = \sum_{p=1}^{P} [\Delta C_{NET|BSL(1)} + \Delta C_{NET|BSL(2-10)} + \Delta C_{NET|BSL(11-20)} + \Delta C_{NET|BSL(1+)}] \quad (27)$$

The net carbon stock change in the baseline scenario calculated in Eq. 27 was then converted to net greenhouse gas emissions:

$$GHG_{NET|BSL,t^*} = \Delta C_{NET|BSL,t^*} * {}^{44}/_{12} \quad (28)$$

Where:

$GHG_{NET\|BSL,t^*}$	Net greenhouse gas emissions in the baseline scenario in the year t^* since the start of the project activity, tCO_2e;
$\Delta C_{NET\|BSL,t^*}$	Net change in carbon stock across all parcels in the baseline scenario in the year t^* since the start of the project activity, tC;
${}^{44}/_{12}$	1, 2,….10, time elapsed since the start of the project, in years;

The total greenhouse gas emission derived from baseline scenario was = 7'241'892 tCO_2e.

4.2 Project Emissions

In this section of the document, the steps taken to estimate emissions from project activities are outlined, reported in tCO_2e. Calculations can be found in the '*PRJ*' sheet of the *'ExAnte_BoumbaAndNgoko_VM0010_v4'* spreadsheet).

The greenhouse gas emissions from Improved Forest Management (IFM) activities implemented in the project scenario were accounted following the application of the *de minimis* rule, as prescribed by the *VCS AFOLU Requirements*. Specifically, project emissions include the change in carbon stocks of ongoing forest growth, forest disturbances, and illegal logging.

The type and extent of the activities implemented in the project scenario were described in *Section 3.2*. As commercial timber harvest and activities that result in forest degradation are not eligible under the methodology in the project scenario, emissions sources from combustion of fossil fuels from vehicles, machinery and equipment are *de minimis* and not accounted by the methodology in the project scenario. Moreover, in accordance with the applicability conditions, the project scenario does not allow commercial timber harvest. As a result, carbon stock changes due to vegetation management and fuel removal are negligible.

Net greenhouse gas emissions in the project scenario are thus equal to any emissions resulting from forest disturbance both illegal logging and natural disturbances (fire and pests outbreaks).

At all subsequent verifications, data collected for monitored parameters for natural disturbance and illegal logging will be included.

Ongoing forest growth in the project scenario

The carbon stock change in aboveground biomass in the undisturbed forest under the project scenario was not considered in the project. This choice was made to maintain a conservative

approach. Moreover, the calculation of this carbon pool is not a requirement of the applied methodology. Hence, equations from 29 to 32 of the VCS VM0010 methodology are omitted.

Forest disturbance in the project scenario

Natural disturbance

This section calculates $\Delta C_{DIST\_FR,t|PRJ}$, the carbon stock change due to fire disturbance in the project scenario (in tCO_2e) and $\Delta C_{DIST,t|PRJ}$, the carbon stock change due to non-fire natural disturbance in the project scenario (in tCO_2e).

In this section, it is requested to include any estimated contribution to the GHG emissions balance in the project scenario. Disturbance due to fire is discussed in the Option A, and all non-fire natural disturbances (eg, wind, disease, pest events) are discussed in the Option B.

Option–A - Natural Disturbance – Fire:

For fire damage it is assumed that a fire burning in the project scenario would also have burned in the baseline scenario. Project emissions are therefore equal to the fire damage to biomass absent in the baseline scenario (harvested and removed) but present in the project scenario. Where fires occur *ex-post* in the project area, the area burned will be delineated. The dense humid forest clearly bounds the burning front and fires affect only a small fraction of this ecosystem[75]. It should also be noted that fires do not really impact dense rainforests[76]. In addition, as also reported in the land-use plan[77] and from sociological studies[78], the project area is scarcely inhabited except for sporadic temporary camps, which decreases the risk of man-made fires. Moreover, from the analysis of a global wildfires database, the project area falls within a value of 36 out of a maximum score of 180 for the incidence of wildfires with a return time of 10 years[79].

In addition, VIIRS active fires data database will be used to identify the eventual presence of fire in the project area. This database is a fire monitoring product of NASA's FIRMS (Fire Information for Resource Management System) and identifies global fire locations in near-real time. Information is collected from the Visible Infrared Imaging Radiometer Suite (VIIRS) sensor, and processed with a fire detection algorithm to flag active fires[80]. Data with the aggregated annual fire data will be downloaded from the NASA EarthData platform[81] and cropped for the project area (computations

[75] Bucini and Lambin (2002), 'Fire impacts on vegetation in Central Africa: a remote-sensing-based statistical analysis', *Applied Geography 22*, pp. 27–48, https://doi.org/10.1016/S0143-6228(01)00020-0

[76] FAO – Évaluation des resources forestières mondiales 2020, par.5b

[77] Paragraph 4.8.2 of UFA 10-064 Management Plan – pag. 43

[78] Socio-economic survey report (2005)

[79] Source: https://www.geonode-gfdrrlab.org/layers/hazard:csiro_wf_max_fwi_rp10

[80] https://www.earthdata.nasa.gov/learn/find-data/near-real-time/firms/viirs-i-band-375-m-active-ss-data

[81] https://www.earthdata.nasa.gov/learn/find-data/near-real-time/firms/active-fire-data

are available to the VVB for verification). VIIRS data from the project area will be compared with the annual tree cover loss data by Hansen et al. (2013)[82], collected from the GFW database[83]. This operation should identify forest cover loss related to fire during the monitoring periods. The results of these analyses will be available to the VVB for verification.

Option–B - Natural Disturbance – Non-fire (e.g. wind, disease, pest events):

For non-fire natural disturbance, it is assumed that a disturbance event in the project scenario would also have occurred in the baseline scenario. Project emissions are therefore equal to the non-fire natural disturbance to biomass absent in the baseline scenario (harvested and removed) but present in the project scenario. Where non-fire natural disturbances occur *ex-post* in the project area, the area disturbed will be delineated. Given the volatility and uncertainty with which such these events would have to be estimated in an *ex-ante* scenario, it is not possible for us to estimate precisely the occurrence and magnitude of these ones. However, it has been demonstrated that natural tropical forests, as the one that covers the project area, are considered as stable ecosystems and are free from pest outbreaks[84]. Moreover, the increase in pests of forest plants occurs mainly in forests with a low biodiversity index, such as planted forests[85].

Literature points out that the incidence of logging, if carried out over large areas, makes the stand *sui generis* more vulnerable to pests and diseases in forests[86]. Given the low-impact exploitation of logging activities in the management of the project area by LFB, in conformity to the forestry law in force in Cameroon[87], the occurrence of these parasitic episodes should thus be absent in the project area[88].

Illegal logging

[82] Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." Science 342 (15 November): 850–53

[83] Data available on-line from:http://earthenginepartners.appspot.com/science-2013-global-forest

[84] Nair, K.S.S., Mathew, G., Mohanadas, K. and Menon, A.R.R. (1986). A study of insect pest incidence in natural forest. Research Paper 44. KFRI, Peechi, India.

[85] Foahom, B. Insect pest incidence on timber tree species in natural forest in south Cameroon. Tropenbos-Cameroon Programme, 2002, ISSN 1566-2152 (pag.40)

[86] Way, M.J. (1977). Pest and diseases status in mixed stands vs. monocultures: the relevance of ecosystem stability. In: Cherret, J.M. and Sagar, G.R. (eds.). Origins of pest, parasite, disease and weed problems. Blackwell Scientific Publications, Oxford, United Kingdom.

[87] Arrêté n° 0222/A/MINEF/ 25 mai 2002 – art. 11, par. 1

[88] FAO – Évaluation des resources forestières mondiales 2020, par.5a

It is a requirement that any greenhouse gas emissions from illegal logging above *de minimis* that may occur in the project area ($\Delta C_{DIST\_IL,i,t|PRJ}$) are monitored.

The government of Cameroon is historically engaged in fighting illegal logging related to international and national trade and market. In 2010 Cameroon signed a Voluntary Partnership Agreement (VPA) with the European Union (EU) inside the EU Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan[89,90]. This agreement aimed to strengthen forest governance and at tackling illegal logging in Cameroon and ensuring the legality of trade to the EU. The VPA entered into force in December 2011. In the internal market, an inter-ministerial decree signed in 2020[91] introduced a legality clause to all public procurement procedures requiring the use of sawn wood and wood products that come from legal origins. In the recent years there were also substantial improvements in the public availability of information and enhanced participation of all stakeholders in decision-making processes in the forestry sector[92], which can be used to track illegal logging. One example used to prove the absence of illegal logging in the project area is the OBSTER platform developed by the Centre pour l'Environnement et le Développement Camerounaise (CED Cameroun, Centre for Environment and the Development)[93]. This platform enables the analysis of land occupation and use in Cameroon, Gabon, Congo and Central Africa. The observatory provides a framework for analysing existing and potential threats to forests. The illegal logging report (available since 2017) spots no observations in the project area.

Remote sensing methods will be used to monitor illegal logging in the forest area. Data will be retrieved from the Global Forest Change database (annual Tree Cover Loss)[94]. Moreover, Please see the Section 3.6 on Methodology Deviation for more information.

In addition, in order to tackle illegal logging in the project area, the forest manager (LFB), in collaboration with SEFAC group, planned to monitor and patrol the surface of the UFA 10-064[95]. Information and clues regarding the presence of illegal activities are collected. To this end, control barriers are present at the entrance of the UFA to limit access to the forest to any person not belonging to the company. The forestry administration will also carry out monitoring actions

[89] EU FLEGT Facility (2014). VPA Countries: Cameroon. Retrieved from http://www.euflegt.efi.int/cameroon

[90] Law n° 2011/014 of 15th July 2011

[91] Arrête conjoint 0162/MINFOF/MINTP/MINMAP, 15 December 2020

[92] Chatham House, 2018, *Forest Policy Assessment | Cameroon* Retrieved from https://forestgovernance.chathamhouse.org/media/data-download/Forest-Policy-Assessment-Cameroon.pdf

[93] Source: http://www.bd-obster.org/, http://signalement.bd-obster.org/

[94] Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." Science 342 (15 November): 850–53; https://glad.earthengine.app/view/global-forest-change

[95] Paragraph 4.8.7 of UFA 10-064 Management Plan – pag. 46

each year along the boundaries in order to ensure compliance with the standards and regulations in force. LFB will also collaborate with the forestry administration to facilitate its field control missions (logistical support, provision of site documents or any other useful information concerning the company's activities). The monitor of illegal activities (logging, hunting, mining) will be used as evidence to prove the absence of illegal logging from the project area. These monitoring activities will be presented in detail in *Section 5.3*.

Therefore, under the conditions presented above, for the *ex-ante* project scenario it is assumed that:

$$\Delta C_{DIST-IL,t|PRJ} = 0 \quad (36)$$

Net greenhouse gas emission in the project scenario

This section calculates $\Delta C_{NET,t|PRJ}$, the net greenhouse gas emissions in the project scenario in year t, in tCO_2e. Calculations can be found in the '*PRJ*' sheet of the *'ExAnte_BoumbaAndNgoko_VM0010_v4'* spreadsheet).

The net greenhouse gas emissions in the project scenario are the sum of net greenhouse gas emissions resulting from fire and non-fire forest disturbance, plus any carbon stock changes that occur as a result of illegal logging, minus the annual carbon stock change in the aboveground biomass of trees due to forest growth.

Therefore, net greenhouse gas emissions in the project scenario in year t, is calculated as:

$$\Delta C_{NET,t|PRJ} = \left(\Delta C_{DIST-FR,t|PRJ} + \Delta C_{DIST,t|PRJ} + \Delta C_{DIST-IL,t|PRJ}\right) - \Delta C_{AB,t|PRJ} \quad (38)$$

Where:

$\Delta C_{NET,t\|PRJ}$	Net greenhouse gas emissions in the project scenario in year *t*, tCO_2e;
$\Delta C_{DIST-FR,t\|PRJ}$	Net greenhouse gas emissions resulting from fire disturbance in year *t*, tCO_2e;
$\Delta C_{DIST,t\|PRJ}$	Net greenhouse gas emissions resulting from non-fire natural disturbance in year *t*, tCO_2e ;
$\Delta C_{DIST-IL,t\|PRJ}$	Net carbon stock changes as a result of illegal logging at time *t*, tCO_2e;
$\Delta C_{AB,t\|PRJ}$	Annual carbon stock change in aboveground biomass of trees in year *t*, $tCO_2e \cdot y^{-1}$; and
t	1, 2, 3, … t^* years elapsed since start of the project activity.

The net greenhouse gas emissions across in the project scenario since the start of the project is calculated as:

$$GHG_{NET|PRJ} = \sum_{t=1}^{t^*} \Delta C_{NET,t|PRJ} \quad (39)$$

Where:

$GHG_{NET\|PRJ}$	Net greenhouse gas emissions in the project scenario since the start of the project activity, tCO_2e;
$\Delta C_{NET,t\|PRJ}$	Net greenhouse gas emissions in the project scenario in year t, tCO_2e;
t	1, 2, 3, … t^* years elapsed since start of the project activity.

Ex-ante projections of $GHG_{NET|PRJ}$ after 20 years were thus **= 0 tCO_2e**.

4.3 Leakage

Leakage calculations are presented in the *'ExAnte_BoumbaAndNgoko_VM0010_v4'* spreadsheet).

Activity shifting leakage

The VCS VM0010 v1.3 Methodology requirements states that *"[…] When the project proponent has control only over resource use in the project area and has no access to other forest resource, then the only type of leakage emissions calculated is GHG emissions due to market effects that result from project activity."* Since the only forestry concession held by LFB is the 1060 related to the forestry resource rights of UFA 10-064[96], the only leakage to be considered is the market leakage.

Market Leakage

Leakage due to market effects is equal to the net emissions from planned timber harvest activities in the baseline scenario multiplied by an appropriate leakage factor:

$$GHG_{LK|LtPF,t^*} = LF_{ME} * GHG_{NET|BSL,t^*} \quad (40)$$

Where:

$GHG_{LK\|LtPF,t^*}$	Total market leakage as a result of IFM LtPF activities, in the year t^* since the start of the project activity, tCO_2e;
LF_{ME}	Leakage factor for market-effects calculations, dimensionless; and
$GHG_{NET\|BSL,t^*}$	Net greenhouse gas emissions in the baseline scenario in the year t^* since the start of the project activity, tCO_2e.

The leakage factor is determined by considering where in the country logging will be increased as a result of the decreased timber supply caused by the project.

If the ratio of merchantable biomass to total biomass is higher in the project area, it is likely that additional logging will be performed in these areas as a result of reduced logging in the project area in the project scenario.

[96] Cameroon's Forest Estate - 2021

The leakage factor is thus defined as a dimensionless number with values between 0 and 1 assigned ex ante on the basis of a comparison between the ratio of merchantable biomass to total biomass across all strata in the base year, and the ratio of merchantable biomass to total biomass of the country's forest estate where harvesting would likely be displaced to.

Therefore, LF_{ME} = 0 if it can be demonstrated that no market-effects leakage will occur within national boundaries, that is if no new concessions are being assigned and annual extracted volumes cannot be increased within existing national concessions and illegal logging is absent (or *de minimis*) in the host country. In the next paragraphs, the PP provides presents some information which could be important in assessing that the project implementation should not lead to market leakage in Cameroon.

- As evidenced by the posters published annually by the MINFOF about the Cameroon's Forest Estate[97], the Government of the Republic of Cameroon has implemented a program to improve regulation and improved management of its forest domain through the establishment of new UFAs, protected areas and communal forests. The total number of Forest Management Unit (UFA) in the Permanent Forest Estate (PFE) increase from 101 in 2011 to 117 in 2017 (Table 9), and reaches 121 UFAs in 2021 (at the end of the first monitoring period). As shown by data, the number of these new concessions started to increase well before the starting of the project start date (2018). Also the Community Forests areas, which are included in the Non-Permanent Forest Estate (nPFE), increased of 268 units between 2011 and 2017, with an increase in areas of about 1'022'000 ha. The increase in new logging concessions cannot thus be imputed to the project activities, since the trend was increasing steadily before project start date.

Table 9: Evolution of the number and surface area of productive forest concessions in Cameroon (data: : Atlas Forestier du Cameroun, Cameroon's Forest Estate)

	Concession number			Area (ha)			
Year	Forest Management Unit (UFA)	Sales of Standing Volume (SSV)	Community forests (Fcom)	UFA	SSV	Fcom	Total
2011	101	46	314	6 586 808	114 042	1 015 536	7 716 386
2012	111	57	342	7 005 550	132 912	1 182 624	8 321 086
2013	114	55	375	7 149 654	126 831	1 296 884	8 573 369
2014	115	84	392	6 785 464	187 539	1 364 203	8 337 206
2015	116	179	446	6 745 023	338 756	1 533 325	8 617 104
2016	115	186	544	6 803 483	319 735	1 864 388	8 987 606
2017	117	228	582	6 854 635	374 145	2 038 420	9 267 200
2018	117	163	624	7 030 484	210 111	2 143 702	9 384 297
2019	120	156	653	7 073 056	319 735	2 351 267	9 744 058
2020	120	144	686	7 079 079	210 111	2 351 267	9 640 457
2021	121	160	690	7 078 186	293 514	2 459 081	9 830 781

- Forest managers in Cameroon must comply with a set of regulations, in order to be able to exploit forest resources. The key document for starting utilization is the Management Plan (Pland d'aménagement, PDA), with a scenario of 30 years. This document, approved

[97] Data source: Atlas Forestier du Cameroun, Cameroon's Forest Estate (2011-2021), https://cmr-data.forest-atlas.org/

by the MINFOF[98], has the aim of guaranteeing the correct management of the forest, directed towards the maintenance for future generations. This plan is ppreceded by a mapping of the forest concession, via a forest inventory. Each year, prior to any exploitation activity, an Annual Operating Permit (Permis Annuel d'Opérations - PAO) must be prepared. This document shows the exploitable volumes for each managed species inside an AAC. This document is valid only for one year and defines the quota of timber that can be exploited in the annual logging area[99]. All trees harvested during logging activities must be recorded at the logging site. These volumes specifically record each harvested tree stump with the date of felling and UFA/UFE/AAC information. All reported information must then be entered into the national SIGIF database and is subject to control by ministry officials[100]. Therefore, no more trees than those that are determined annually by MINFOF through the PAOs can be logged, regardless of any external influences. Thus, inside each existing concession in Cameroon, the annual extracted volumes cannot be increased.

- Historically, Cameroon is one of the largest timber producers in the Congo Basin. Its products are destinated equally for internal consumption and for export[101], although the most valuable timbers are mainly exported via the main port of Douala. The trend in timber production has continuously risen in the years before project implementation (Figure 13). facing the increasing demand for alternative sources of tropical timber from China and Vietnam[102]. However, this increase is explained by the previously mentioned increase in forest concessions, as previously found in Cameroon[103]. From 2011 to 2019 (the year when the production reached the peak), the surface area of Sales of Standing Volume (SSV, Vente de Coupe) increased by 180%, and the Community Forest (Fcom) surface by 132%[104], for a total increase of about 1'540'000 ha. From these evidences, project activities will not influence the harvest plan in the other managed forests in Cameroon.

[98] Arrêté n° 0222/A/MINEF/ 25 mai 2002 – art. 22

[99] Arrêté n° 0222/A/MINEF/ 25 mai 2002 – art. 41

[100] Arrêté n° 0222/A/MINEF/ 25 mai 2002 – art. 42/43/44

[101] Data source: https://www.timbertradeportal.com/en/cameroon/23/timber-sector, ITTO (2019, data 2017)

[102] ITTO. 2019. Biennial Review and Assessment of the world timber situation 2017–2018. Yokohama, Japan. www.itto.int. ISBN 978-4-86507-049-1

[103] FAO/CIFOR, 2016. État du secteur forêts-bois du Cameroun (2015) – Rapport, par Cerutti P.O, Mbongo M et Vandenhaute M.

[104] [104] Data source: Atlas Forestier du Cameroun, Cameroon's Forest Estate (2011-2021), https://cmr-data.forest-atlas.org/

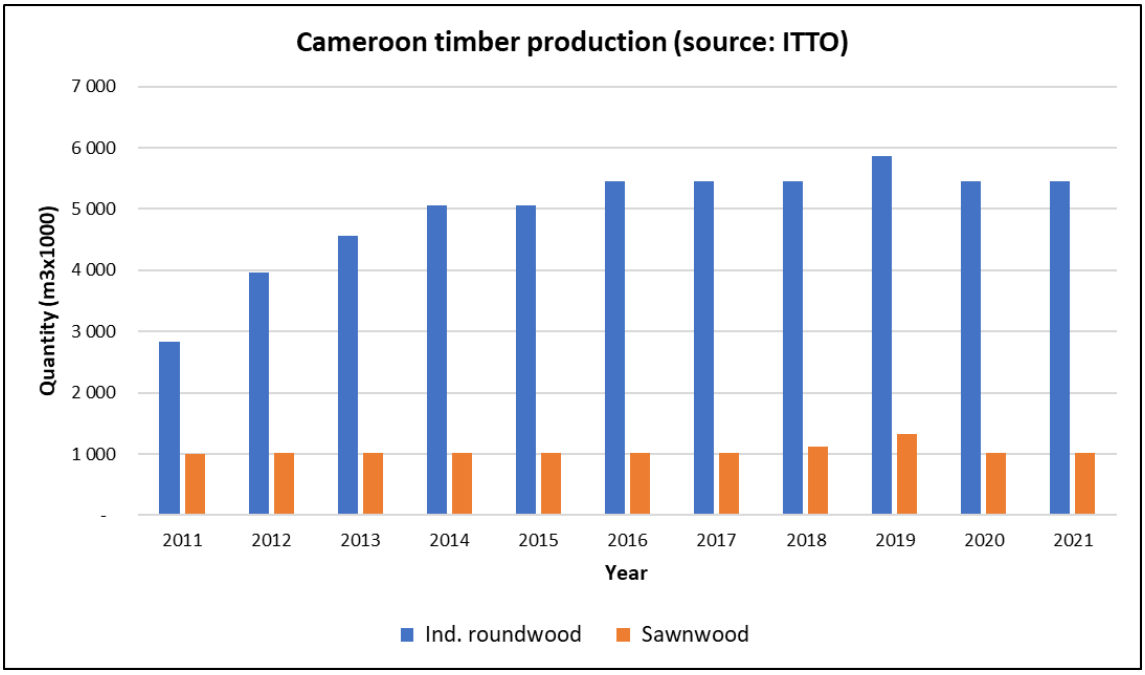

Figure 13: Cameroon's total production of timber for industrial roundwood and sawnwood (Source: ITTO Biennal Review Statitstics)[105]

Over the years, the forests that are part of the Cameroon permanent forestry estate (PFE) have increasingly adhered to a voluntary control of their production, in order to certify quality and transparency on the origin of the products. Certifications have therefore started to be more and more requested and exposed, especially those on the legal origin of wood (Origine et Légalité du Bois, OLB) and the FSC Timber Legality and Traceability Verification (TLTV) certifications[106]. This, in addition to other tools implemented by the local administration and MINFOF, are the means by which the Cameroon Government seeks to counteract illegal logging activities in order to safeguard and protect the national forest heritage. Moreover, as already mentioned in *Section 4.2*, an interministerial decree signed in 2020[107] introduced a legality clause to all public procurement procedures requiring the use of sawn wood and wood products that come from legal origins. Also, estimating the volume of illegal logging within Cameroon is quite complex, as the amount of timber entering the market, both locally and globally is extremely difficult to quantify. In fact, most of the timber from illegal logging comes from the informal sector[108] and community forests[109] and is consumed in domestic markets, while wood products from managed forest units (UFA) are mainly addressed for the export. Moreover, it is important to mention how different are

[105] https://www.itto.int/biennal_review - accessed on 18/04/2023

[106] Interactive forest atlas of Cameroon – Version 3.0 – p. 21

[107] Arrête conjoint 0162/MINFOF/MINTP/MINMAP, 15 December 2020

[108] Jianbang et al. (2016) - Quantifying Illegal Logging and Related Timber Trade - Chapter 3 p. 52,53

[109] WWF, 2020 - Deforestation front – Key Facts

the sizes of the UFAs, which are the main timber producing areas, and the community forests. While the first ones have an area of 7'078'186 ha for 121 UFA (58'497 ha on average), the community forests have 2'459'081 ha for 690 units (3'563 ha on average)[110]. Thus, with a comparative average surface area equal to almost one-twentieth of that of UFAs, the potential extracted timber from community forests can be considered much lower when compared to that of UFA forests. Therefore, we could assume that the decreased wood production derived from the project scenario should not stimulate illegal logging in other areas. Moreover, to counteract the phenomenon of illegal activities from tropical timber-producing countries, the European Union has put in place a collaboration strategy and surveillance tool, called Forest Law Enforcement, Governance and Trade (FLEGT)[111]. This strategy is implemented through bilateral cooperation pacts between exporting and importing countries, called Voluntary Partnership Agreements (VPAs). The VPA are thus legally binding trade agreements between the European Union and a timber-producing country outside the EU. In 2010 Cameroon signed a VPA with the EU. The aims of the VPA are to strengthen forest governance, promote Cameroon timber products and improve Cameroon competitiveness in the international marketplace. The VPA also encourages investment in sustainable forest management and improved public availability of information. The VPA also strengthens the capacity and the participation of forest stakeholders[112]. Among those capacities, the entry into force of this VPA also strengthen the independent forest monitoring by local communities. In Cameroon, a monitoring network has prompted increased government enforcement in the forest sector, with several examples[113,114]. These examples were also followed by the neighbour Central Africa States as the Republic of Congo and the Central African Republic[115]. In the light of the above considerations, any increase in illegal timber due to the implementation of project activities is not demonstrable.

The selected methodology requires to determine the leakage factor by considering where in the country logging will be increased as a result of the decreased timber supply caused by the project. The leakage factor is determined by considering where in the country logging will be increased as a result of the decreased supply of the timber caused by the project. If the areas liable to be logged have a ratio of merchantable biomass to total biomass higher than the one in the project area, it is likely that the proportional leakage is higher and vice versa. Therefore, each project must calculate within each stratum the ratio of merchantable biomass to total biomass (PMP_i). This shall then be compared to the ratio of merchantable biomass to total biomass for each forest type (PML_{FT}).

[110] Data source: Atlas Forestier du Cameroun, Cameroon's Forest Estate (2021), Retrieved from https://cmr-data.forest-atlas.org/

[111] Source https://www.euflegt.efi.int/illegal-logging-media

[112] Source https://www.euflegt.efi.int/cameroon

[113] Système Normalisé d'Observation Indépendante Externe (SNOIE), https://oiecameroun.org/

[114] Global Forest Watch (GFW), Fondation Camerounaise de la Terre Vivante (FCTV) et le Service d'Appui aux Initiatives Locales de Développement (SAILD), Retrieved from https://www.2s2d.org/

[115] https://forestgovernance.chathamhouse.org/publications/the-future-of-independent-forest-monitoring

The calculations of the ratios of merchantable biomass to total biomass for the two project strata are presented in the '*ExAnte_BoumbaAndNgoko_VM0010_v4*' spreadsheet ('*MarketLeakage_PA*' sheet). This merchantable biomass was calculated taking into consideration the wood densities for the tree species present in each forest stratum and a specific biomass expansion fraction to transform the wood volume to biomass (see the calculation file for more details on those parameters). The calculation of total biomass, both for the project areas and for the forest areas where the leakage could occur was carried out using a dataset of total above-ground biomass at 100-m resolution (version 4) developed through remote sensing measurements by ESA, for the year 2017[116] (the tile used for the calculation is provided as an evidence to the VVB).

For the ratio of merchantable biomass to total biomass for each forest type, since the South-Eastern portion of Cameroon is all covered by dense and moist forest[117], the analysis to define the leakage factor to apply to the current project was based on the forest management units (UFA) from the Cameroon production forest estate which are close to the UFA 10-064. To calculate market leakage factor, the PP considered the UFAs located in two *arrondissements* (administrative sub-divisions) of the Boumba-et-Ngoko *département* (administrative department): Moloundou, which is the sub-division where the UFA 10-064 is located, and Salapoumbé, where the Libongo sawmill is located. All the UFAs located, or even intersecting, in those administrative sub-divisions were used to calculate the potential market leakage factor; in total 10 UFAs were selected for the analysis. The information regarding the merchantable volumes and surface areas of the productive part of these forest units were retrieved from the forest management plans in the Cameroon forest atlas[118]. The wood volumes for these forest areas where transformed in biomass through an average wood density of the merchantable species located in the project area and a biomass expansion factor specific to south-east Cameroon. The calculation of the ratio of merchantable to total biomass in outside the project area are presented in the '*ExAnte_BoumbaAndNgoko_VM0010_v4*' spreadsheet ('*MarketLeakage_Cameroon*' sheet).

Finally, the leakage factor was calculated based on the above calculations. In summary:

PML_{Forest}/PMP_{DHC} = 18.5%

PML_{Forest}/PMP_{S} = 73.6%

Since, the PML_{Forest} is > 15% greater than the *PMP* in both forest stratum, the leakage factor is:

LF_{ME} = 20%

[116] ESA Biomass Climate Change Initiative. Data are accessible at: https://catalogue.ceda.ac.uk/uuid/af60720c1e404a9e9d2c145d2b2ead4e. Access data: 12/06/2023

[117] Verhegghen, A., Mayaux, P., de Wasseige, C., and Defourny, P.: Mapping Congo Basin vegetation types from 300 m and 1 km multi-sensor time series for carbon stocks and forest areas estimation, Biogeosciences, 9, 5061–5079, https://doi.org/10.5194/bg-9-5061-2012, 2012

[118] Atlas Forestier du Cameroun, https://cmr.forest-atlas.org/pages/domaine-forestier, accessed 12/06/2023

4.4 Estimated Net GHG Emission Reductions and Removals

The calculation of the estimated net GHG emission reductions and removals from the project implementation can be found in the '*VCU*' sheet of the '*ExAnte_BoumbaAndNgoko_VM0010_v*' spreadsheet).

Net GHG emission reductions are calculated as:

$$GHG_{CREDITS|LtPF,t^*} = GHG_{NET|BSL,t^*} - GHG_{NET|PRJ,t^*} - GHG_{LK|LtPF,t^*} \quad (41)$$

Where:

$GHG_{CREDITS\|LtPF,t^*}$	Project greenhouse gas credits associated with the implementation of improved forest management (IFM) activities in the year t^* since the start of the project activity, in the project scenario, tCO_2e;
$GHG_{NET\|BSL,t^*}$	Net greenhouse gas emissions in the baseline scenario in the year t^* since the start of the project activity, tCO_2e;
$GHG_{NET\|PRJ,t^*}$	Net greenhouse gas emissions in the project scenario in the year t^* since the start of the project activity, tCO_2e; and
$GHG_{LK\|LtPF,t^*}$	Total greenhouse gas emissions due to leakage arising outside the project boundary as a result of the implementation of improved forest management (IFM) activities in the year t^* since the start of the project activity, in the project scenario, tCO_2e

From the Excel Sheet '*VCU*', calculations resulted in $GHG_{CREDITS|LtPF,t^*}$ = 6'923'352 tCO_2 after 20 years. We provide here (Table 10) a summary of calculations of the estimated GHG emissions and reductions for each project year:

Table 10: Estimated net GHG emission reductions and removals from the introduction of the Boumba-et-Ngoko project

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2018	98'484	0	19'697	78'787
2019	148'510	0	29'702	118'808
2020	190'110	0	38'022	152'088
2021	234'181	0	46'836	187'345

2022	272’679	0	54’536	218’143
2023	324’049	0	64’810	259’239
2024	360’170	0	72’034	288’136
2025	426’554	0	85’311	341’243
2026	470’278	0	94’056	376’222
2027	524’612	0	104’922	419’689
2028	509’541	0	101’908	407’633
2029	517’300	0	103’460	413’840
2030	513 06’	0	102’613	410’451
2031	508’230	0	101’646	406’584
2032	419’361	0	83’872	335’488
2033	370’412	0	74’082	296’329
2034	326’353	0	65’271	261’082
2035	270’235	0	54’047	216’188
2036	219’616	0	43’923	175’693
2037	219’616	0	43’923	175’693
Total	**6’923’352**	**0**	1’384’670	**5’538’682**

Adjustment for uncertainty

Estimated greenhouse gas emissions and emission reductions from IFM activities have uncertainties associated with parameters and coefficients including estimates of area, carbon stocks, regrowth and expansion factors.

Uncertainty at all times is defined as the 95% confidence interval where the estimated variance exceeds ± 15% from the mean.

For both the baseline and the with-project case the total uncertainty is equal to the square root of the sum of the squares of each component uncertainty and it is calculated at the time of reporting through propagating the error in the baseline stocks and the error in the project stocks. Therefore, total uncertainty for LtPF project was calculated as:

$$U_{total|LtPF} = \sqrt{U^2{}_{|PRJ} + U^2{}_{|BSL}} \quad (42)$$

Where:

$U_{total\|LtPF}$	Total uncertainty for LtPF Project, dimensionless;
$U^2{}_{\|PRJ}$	Total uncertainty for the improved forest management activities in the project scenario, dimensionless; and
$U^2{}_{\|BSL}$	Total uncertainty for the baseline scenario, dimensionless.

Since emissions and removals in the project scenario have been estimated as zero, uncertainty for this scenario has been set to zero. Uncertainties associated to the baseline scenario are instead presented in the Table 11.

Table 11: Parameter uncertainties in the baseline scenario

Parameter/Variable	Uncertainty	Source
Mean extractable timber (m3/ha)	±22%	Nasi, Robert & Mayaux, Philippe & Devers, Didier & Bayol, Nicolas & Atyi, Richard & Mugnier, Antoine & Cassagne, Bernard & Billand, Alain & Sonwa, Denis. (2010). A First Look at Carbon Stocks and their Variation in Congo Basin Forests (https://doi.org/10.2788/32259), Table 12.8 (Error due to the use of allometric model in estimating biomass using a set of permanent sample plots)
Biomass expansion factor, $BCEF_R$	±30%	2000 IPCC Good Practice Guidance for LULUCF, Chapter 3.2
Regrowth factor	±48%	Requena Suarez, D, Rozendaal, DMA, De Sy, V, et al. Estimating aboveground net biomass change for tropical and subtropical forests: Refinement of IPCC default rates using forest plot data. Glob Change Biol. 2019; 25: 3609– 3624. https://doi.org/10.1111/gcb.14767

The uncertainty propagation in the project was presented in the spreadsheet '*ExAnte_BoumbaAndNgoko_VM0010_v4*' ('*Uncertainty*' sheet). Using the uncertainties presented above, the uncertainty resulted in $U_{total|LtPF}$ = 0.13. From the methodology, if $U_{total|LtPF}$ ≤ 0.15, then no deduction results for uncertainty. Thus, the uncertainty associated with this project was estimated as zero.

Adjustment for non-permanence risk

Following the application of the *VCS AFOLU Non-Permanence Risk Tool, v4.0*, the amount of GHG emission reductions was adjusted to account for risk. The buffer associated with non-permanence risk was set at 10%. The spreadsheet with calculations is provided to the VVB.

Therefore, the amount of VCU's that can be issued at time t=t2 (the date of verification) for monitoring period T=t2-t1, was calculated as:

$$VCU_{net|LtPF} = \left(Credits_{total,t2|LtPF} - Credits_{total,t1|LtPF}\right) - Bu_{|IFM-VCS} \quad (44)$$

Where:

$VCU_{net\|LtPF}$	Number of verified carbon units; dimensionless;
$Credits_{total,t1\|LtPF}$	Net anthropogenic greenhouse gas removals by sinks, as estimated for t*=t1 in tCO_2e;
$Credits_{total,t2\|LtPF}$	Net anthropogenic greenhouse gas removals by sinks, as estimated for t*=t2 in tCO_2e; and
$Bu_{\|IFM-VCS}$	Total number of credits withheld in VCS AFOLU pooled buffer account

From the Excel Sheet '*VCU*', a total of $VCU_{net|LtPF}$ = 4'984'814 tCO_2 was calculated a project crediting period of 20 years. We provide here (Table 12) a summary of the calculation of the annual VCUs from the introduction of the project:

Table 12: Estimated verified carbon units (VCUs) from the introduction of the Boumba-et-Ngoko project

Year	Verified carbon unit (tCO_2e)
2018	70'908
2019	106'927
2020	136'879
2021	168'611

2022	196’329
2023	233’315
2024	259’323
2025	307’119
2026	338’600
2027	377’720
2028	366’869
2029	372’456
2030	369’405
2031	365’925
2032	301’940
2033	266’696
2034	234’974
2035	194’569
2036	158’123
2037	158’123
Total	**4’984’814**

5 MONITORING

5.1 Data and Parameters Available at Validation

Since the project proponent demonstrated that it was not necessary to carry out sample plots within the project area, the parameters included in the following chapter have been chosen for their conservative nature, with the intention of not overestimating GHG emissions from anthropogenic activities.

Since we conservatively decided to not include in the baseline scenario the GHG emissions from the establishment of forestry infrastructure and the fuel consumption, the parameters related to these processes have been omitted from the monitoring.

Data / Parameter	$V_{j,i}$
Data unit	m^3
Description	Merchantable volume for species *j* in stratum *i*
Source of data	Estimated from the UFA 10-064 Forest Inventory, considering only the project area. The Forest Inventory was already formulated as total extractable volumes, so no allometric equations was used to calculate this variable for each species *j* in stratum *i*.
Value applied:	Various (see Excel 'BoumbaAndNgoko-ExtractableVolumes_v2', sheet 'Forest Management Plan')
Justification of choice of data or description of measurement methods and procedures applied	The UFA 10-064 Forest Inventory was carried out by a third part inventory team, in accordance with the provisions of the Cameroon forestry law, using the national approved software TIAMA[119,120]. These values already considered a minimum exploitable diameter that is fixed by governmental laws.
Purpose of Data	Determination of baseline scenario (timber harvest plan). These data were used to evaluate the amount of allowable timber volume in the project area.
Comments	N/A

Data / Parameter	$V_{EX,j,i\|BSL}$

[119] Loi n° 94/01 du 20 janvier 1994

[120] Décret n° 95/531/PM – Titre IV – Chapitre I; II

Data unit	$m^3\ ha^{-1}$
Description	Mean volume of extracted timber per unit area for species *j* in stratum *i*
Source of data	UFA 10-064 Forest Inventory and Project area stratification shapefile
Value applied:	Various (see Excel '*ExAnte_BoumbaAndNgoko_VM0010_v4*', sheet 'BSL')
Justification of choice of data or description of measurement methods and procedures applied	The data come from the UFA 10-064 Forest Inventory and the Forest Management Plan. Data were obtained from the net production capacity and the production area referred to the project area (divided by stratum). Since the merchantable volume of timber in the forest inventory ($V_{j,i\,\vert\,BSL}$) already considered legal limits (minimum DBH), the $V_{EX,j,i\,\vert\,BSL}$ has the same value.
Purpose of Data	Determination of baseline scenario
Comments	N/A

Data / Parameter	CF_j
Data unit	$tC \cdot t\ d.m.^{-1}$
Description	Carbon fraction of dry matter for species *j*
Source of data	From IPCC (2006), *Guidelines for National Greenhouse Gas Inventories*, Volume–4 - Agriculture, Forestry and Other Land Use, Table 4.3, for tropical wood
Value applied:	0.49
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Determination of baseline scenario

Comments	Parameter needs to be re-assessed and updated (if appropriate) as part of the baseline re-evaluation.

Data / Parameter	$BCEF_R$
Data unit	t d.m. · m^{-3}
Description	Biomass conversion and expansion factor applicable to wood removals in the project area
Source of data	Value from IPCC (2006), *Guidelines for National Greenhouse Gas Inventories*, Volume–4 - Agriculture, Forestry and Other Land Use, Table 4.5, for humid tropical natural forests
Value applied:	1.67
Justification of choice of data or description of measurement methods and procedures applied	The value is based on average productivity of 118 m^3/ha as reported in Table 3.3 of UFA 10-064 Management Plan. Since no precise and punctual data on Cameroonian forests regarding this parameter, its value was retrieved from the methodology's recommended source, inherent to the specific eco-region of the project area.
Purpose of Data	Determination of baseline scenario. This parameter was used to calculate the mean carbon stock in eq. 3
Comments	N/A

Data / Parameter	D_j
Data unit	tC · t d.m.$^{-3}$
Description	Basic wood density of species *j*
Source of data	Species-specific data sources (detailed in the Excel '*ExAnte_BoumbaAndNgoko_VM0010_v4*', sheet 'Bibliography', provided to VVB)
Value applied:	Various

Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Determination of baseline scenario. This parameter was necessary to calculate the carbon stock in eq. 4
Comments	N/A

Data / Parameter	$F_{RSD\|BSL}$
Data unit	dimensionless
Description	Residual Stand Damage Factor
Source of data	From: Brown et al. (2005), 'Impact of selective logging on the carbon stocks of tropical forests: Republic of Congo as a case study'.
Value applied:	1.74
Justification of choice of data or description of measurement methods and procedures applied	The area of the reference is contiguous to the project area. So, the RSD factor for the project area is assumed to be the same areas the one evaluated in the study.
Purpose of Data	Determination of baseline scenario
Comments	N/A

Data / Parameter	OF
Data unit	$kg \cdot kg^{-1}$
Description	Fraction of wood products that will be emitted to the atmosphere between 3 and 100 years after production

Source of data	Value from Winjum et al. (1998)[121]
Value applied:	0.86 (sawnwood), 0.99 (roundwood)
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Determination of baseline scenario
Comments	Parameters need to be reviewed as part of the baseline re-evaluation

Data / Parameter	SLF
Data unit	$kg \cdot kg^{-1}$
Description	Fraction of wood products that will be emitted to the atmosphere within 3 years of production
Source of data	Value from Winjum et al. (1998)
Value applied:	0.12 (sawnwood), 0.18 (roundwood)
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Determination of baseline scenario
Comments	Parameters need to be reviewed as part of the baseline re-evaluation.

Data / Parameter	WW
Data unit	$kg \cdot kg^{-1}$

[121] Source: https://doi.org/10.1093/forestscience/44.2.272

Description	Fraction of extracted biomass effectively emitted to the atmosphere during production
Source of data	Value from Winjum et al. (1998)
Value applied:	0.24 (sawnwood), 0.24 (roundwood)
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Determination of baseline scenario
Comments	Parameters need to be reviewed as part of the baseline re-evaluation.

Data / Parameter	RGR_i
Data unit	$tC \cdot ha^{-1} \cdot yr^{-1}$
Description	Forest regrowth rate post timber harvest for stratum *i*
Source of data	IPCC Refinement of 2006 Guidelines for National Greenhouse Gas Inventories (2019), Table 4.9 and Table 4.7 African tropical moist deciduous forest
Value applied:	0.49 (*DHC* stratum) and 1.07 (S stratum)
Justification of choice of data or description of measurement methods and procedures applied	Since selective logging was applied in the baseline scenario, only a share of the trees in the logged area is subjected to the regrowth after timber harvest. For this reason, the regrowth was calculated only on the share of biomass which should be subjected to logging: hence, this share was calculated by dividing the above ground biomass (AGB, t d.m./ha) logged by the one related to the natural forest (for each stratum). Then it was assumed that logged forest regrows with a RGR proper to the one of secondary forest (<20 years), in order to be conservative (since this type of vegetation have the higher regrowth rate). See calculation steps in the '*ExAnte_BoumbaAndNgoko_VM0010_v4*' spreadsheet ('Bibliography' sheet)

Purpose of Data	Calculation of baseline scenario
Comments	Default values must be updated whenever new guidelines are produced by the IPCC

Data / Parameter	PML_{FT}
Data unit	%
Description	Mean merchantable biomass as a proportion of total aboveground tree biomass for each forest type
Source of data	The calculation are presented in the Excel '*ExAnte_BoumbaAndNgoko_VM0010_v4*', sheet 'MarketLeakage_Cameroon'
Value applied:	8.91%
Justification of choice of data or description of measurement methods and procedures applied	This value has been chosen since no market-effect leakage was found following the implementation of the project, as explained in the Section 4.3 of this document
Purpose of Data	Leakage calculation
Comments	Parameters need to be reviewed as part of the baseline re-evaluation.

Data / Parameter	$A_{1,i,p}$
Data unit	Ha
Description	The area of stratum *i* in land parcel *p* that was harvested 1 year ago
Source of data	Project area shapefile (divided per stratum) and Excel '*ExAnte_BoumbaAndNgoko_VM0010_v4*', sheet 'Areas_TimberHarvestSchedule'
Value applied:	Various

Justification of choice of data or description of measurement methods and procedures applied	The surface areas have been taken from the Timber Harvest Plan of the UFA 10-064
Purpose of Data	Calculation of baseline scenario
Comments	N/A

Data / Parameter	$A_{2-10,i,p}$
Data unit	Ha
Description	The area of stratum *i* in land parcel *p* that was harvested between 2 and 10 years ago
Source of data	Project area shapefile (divided per stratum) and Excel '*ExAnte_BoumbaAndNgoko_VM0010_v4*', sheet 'Areas_TimberHarvestSchedule'
Value applied:	Various
Justification of choice of data or description of measurement methods and procedures applied	The surface areas have been taken from the Timber Harvest Plan of the UFA 10-064
Purpose of Data	Calculation of baseline scenario
Comments	N/A

Data / Parameter	$A_{11-20,i,p}$
Data unit	Ha
Description	The area of stratum *i* in land parcel *p* that was harvested between 11 and 20 years ago
Source of data	Project area shapefile (divided per stratum) and Excel '*ExAnte_BoumbaAndNgoko_VM0010_v4*', sheet 'Areas_TimberHarvestSchedule'

Value applied:	Various
Justification of choice of data or description of measurement methods and procedures applied	The surface areas have been taken from the Timber Harvest Plan of the UFA 10-064
Purpose of Data	Calculation of baseline scenario
Comments	N/A

Data / Parameter	A_{t+}
Data unit	Ha
Description	Cumulative area harvested until time t*
Source of data	Project area shapefile (divided per stratum) and Excel 'ExAnte_BoumbaAndNgoko_VM0010_v4', sheet 'Areas_TimberHarvestSchedule'
Value applied:	Various
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Calculation of baseline scenario
Comments	N/A

5.2 Data and Parameters Monitored

In addition to the parameters listed in the tables above, the following tables present parameters for which monitoring is necessary.

Data / Parameter	$A_{DIST\_IL,i}$
Data unit	ha

Description	Area potentially impacted by illegal logging in stratum *i*
Source of data	Analysis of remote sensing derived dataset from Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." Science 342 (15 November): 850-53. Data available on-line at: https://glad.earthengine.app/view/global-forest-change
Description of measurement methods and procedures applied	Please refer to Section 3.6, 'Illegal logging monitoring (project scenario GHG emissions)
Frequency of monitoring/recording	Annually cumulated values for each monitoring period
Value applied:	Ex-ante zero. International and national laws have been implemented to prevent the illegal logging (see Section 4.2, sub-section on illegal logging). The forest authority has also taken monitoring and prevention measures against this problem. LFB installed permanent observation points at key access points, (north and south of UFA 10-064, the two access points), to control the access and record any entry and exit from the project area. Moreover, during the monitoring period, the project proponent will provide information about illegal logging through monitoring reports (in-situ monitoring). As a complementary tool, remote sensing with processed satellite imagery data will be used to detect potential illegal logging areas.
Monitoring equipment	N/A
QA/QC procedures applied	N/A
Purpose of data	Calculation of project emissions (Forest disturbances – Illegal logging)
Calculation method	Remote sensing analysis. Please refer to Section 3.6, 'Illegal logging monitoring (project scenario GHG emissions)
Comments	*Ex ante* estimation must be made of illegal logging in the with-project case. If the belief is that zero illegal logging will occur within the project boundaries then this parameter may be set to

	zero if clear infrastructure, hiring and policies are in place to prevent illegal logging.

Data / Parameter	$A_{burn,i,t}$
Data unit	ha
Description	Area burnt in stratum *i* at time *t*
Source of data	Global Forest Watch: Burned Area MODIS[122,123], on-field monitoring reports[124]
Description of measurement methods and procedures applied	Analysis of the Global Forest Watch database concerning wildfires data on the project area region.
Frequency of monitoring/recording	Areas burnt must be monitored at least every five years
Value applied:	0 ha, based on fire event historic incidence on the study area
Monitoring equipment	N/A
QA/QC procedures applied	Standard quality control / quality assurance (QA/QC) procedures for forest inventory including field data collection and data management must be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or form the *IPCC GPG LULUCF 2003*, is recommended.
Purpose of data	Calculation of project emissions (Forest disturbances - Fire)
Calculation method	N/A
Comments	The applied value at the beginning of the project for areas burned are based on the most recent data available.

[122] Giglio, L., Boschetti, L., Roy, D. P., Humber, M. L., & Justice, C. O. (2018). The Collection 6 MODIS burned area mapping algorithm and product. Remote sensing of environment, 217, 72-85.
Retrieved from: https://www.sciencedirect.com/science/article/pii/S0034425718303705

[123] Data will be provided to VVB.

[124] Report documents will be provided to VVB.

Data / Parameter	$A_{dist,i,t}$
Data unit	ha
Description	Area disturbed from pest and disease outbreaks for stratum *i* at time *t*
Source of data	Bibliographic research (see *Section 4.2*)
Description of measurement methods and procedures applied	Several studies on world forest resources, listed in the notes in *Section 4.2*.
Frequency of monitoring/recording	Areas disturbed must be monitored at least every five years
Value applied:	0 ha, from the historic analysis of project area (see *Section 4.2 – Natural Disturbance, Non-Fire*)
Monitoring equipment	N/A
QA/QC procedures applied	N/A
Purpose of data	Calculation of project emissions (Forest disturbances – Non Fire)
Calculation method	N/A
Comments	*Ex-ante* estimations of areas disturbed was based on historic incidence of natural disturbance in the Project region. This value is applied according to the most recent data available.

Data / Parameter	A_i
Data unit	ha
Description	Area covered by stratum *i*
Source of data	Geodetic coordinates and/or remote sensing data and/or legal parcel records.
Description of measurement methods and procedures applied	N/A

Frequency of monitoring/recording	Every time each disturbance is recorded during the monitoring period
Value applied:	Various, see 'project-strata-AAC-v2' shapefile
Monitoring equipment	GIS analysis of project area and disturbance area highlighted during the monitoring period
QA/QC procedures applied	N/A
Purpose of data	Calculation of baseline emissions (strata surface area) and calculation of project emissions (strata surface area)
Calculation method	Not applicable, as no illegal logging occurs during the monitoring period within the project boundary.
Comments	In the baseline scenario strata areas must not change through time. In the project scenario it must be assumed *ex-ante* that stand boundaries and strata areas must not change through time. *Ex-post* adjustments of the project scenario strata may be needed if unexpected disturbances occur during the project crediting period, severely affecting different parts of an originally homogenous stratum. This disturbance will be delineated as a separate stratum for the purpose of monitoring the carbon stock changes.

Data / Parameter	PMP_i
Data unit	%
Description	Merchantable biomass as a proportion of total aboveground tree biomass for stratum *i* within the project boundaries.
Source of data	Within each stratum divide the summed merchantable biomass (defined as total gross biomass of a tree 15 cm DBH or larger) by the summed total of aboveground three biomass. The calculation are presented in the Excel '*ExAnte_BoumbaAndNgoko_VM0010_v4*', sheet 'MarketLeakage_PA'
Description of measurement methods and procedures applied	N/A, since the leakage factor of this project is zero

Frequency of monitoring/recording	Not more than five years
Value applied:	0, since the leakage factor of this project is zero
Monitoring equipment	N/A
QA/QC procedures applied	Standard quality control / quality assurance (QA/QC) procedures for forest inventory including field data collection and data management must be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or form the IPCC GPG LULUCF 2003, is recommended
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	Ex-ante a time zero measurement must be made of this factor. The timber harvest plan sets the allowable mean extracted volume from the merchantable volume of timber in the forest inventory ($V_{j,i\,\vert\,BSL}$), based on legal limits.

5.3 Monitoring Plan

Monitoring is required to:

a) Determine changes in forest carbon stocks and greenhouse gas emissions from project activity;

b) Confirm project activity; and

c) Determine changes in forest carbon stocks and greenhouse gas emissions from disturbance and illegal logging (if applicable).

The monitoring plan includes the monitoring of project implementation, the monitoring of actual carbon stock changes from project activities and estimation of *ex-post* changes derived from disturbances to the forest. The description of the monitoring plan in the project documents will include the following for each of these monitoring tasks:

a) Technical description of the monitoring task;

b) A list of data and parameters to be collected;

c) Overview of data collection procedures;

d) Quality control and quality assurance procedure;

e) Data archiving; and

f) Organization and responsibilities of the parties involved in all the above.

The monitoring activities are aimed at checking the data reported on the document at the project planning stage. The data collected are therefore intended to confirm the accuracy of what has been reported, both in terms of the data concerning the physical nature of the site and the estimates made through what has been observed by the surveys.

The project proponent (Carbonsink S.r.l., CSG) and the project implementer (La Filière Bois, LFB) collaborated for the realisation of this monitoring plan and will conduct the monitoring. CSG is responsible for the provision of evidences regarding activity shifting leakage and market leakage. LFB (through the SEFAC group monitoring team) is in charge of the monitoring of disturbances that could occur in the project area (fire, pest and disease outbreaks, illegal logging and non-productive area). Together, they will are in charge of collecting, monitoring and verifying the data to prepare for each verification. Verification events will occur every two to five years.

Data related to the variables/parameters listed in the Section 5.2 of this Joint PDD will be collected during the monitoring.

Data archiving and handling of non-conformances

All data collected as part of monitoring will be archived electronically and be kept at least for 2 years after the end of the project crediting period. Data archiving will take both electronic and paper forms, and copies of all data must be provided to each project proponent. All electronic data and reports will also be copied on external hard drives and will be stored in multiple locations.

The archives will include:

- Copies of all original field measurement data, laboratory data, data analysis spreadsheets;
- Estimates of the carbon stock changes in all pools and non-CO2 GHG and corresponding calculation spreadsheets;
- GIS products; and
- Copies of the measuring and monitoring reports.

Therefore, if non-conformances with a validated monitoring plan arise, the project proponent will be able to access and update the monitoring plan to comply with the satisfaction of the VVB and VCS program officers.

Monitoring and Quality assurance/Quality control (QA/QC) of project implementation

Information are provided, and recorded in the VCS-PD, to establish that:

- The geographic position and coordinates of the project boundary (and any stratification inside the boundary) are established, recorded and archived. This has been and will be by using geo-referenced spatial data (e.g. maps, GIS datasets, aerial photography, or geo-referenced remote sensing images);
- Commonly accepted principles of forest inventory and management are implemented;
- Standard operating procedures (SOPs) and quality control/quality assurance (QA/QC) procedures for forest inventory including field data collection and data management will be applied. SOPs already applied in national forest monitoring or available from published handbooks or from the IPCC GPG LULUCF 2003 will be used;
- The project plan, together with a record of the plan as actually implemented during the project, shall be available for validation or verification as appropriate.

Stratification

The *VCS VM0010* methodology requires that an ex-ante stratification of the project area in the project scenario is described in the project documents as documented in the timber harvest plan, or developed by the project proponent through sampling in the project area.

For the project area, forest stratification has been carried out during the UFA 10-064 forest inventory (presented in Section 1.13 and 3.4 of this document).

Monitoring of actual carbon stock changes from project activities

Since the accounting of actual stock changes for the ongoing forest growth during the project scenario was not taken into account, as a conservative choice (see Section 4.2 of this document), no monitoring of actual stock changes in forest is needed. However, in-situ patrolling annual patrols and remote sensing analysis are put in place to verify the absence of illegal logging in the project area.

Changes in forest carbon stocks and greenhouse gas emissions from disturbance and illegal logging

Project area permanent access points control and *in-situ* monitoring patrol

As a Cameroonian State forest, national legislative references require that concessionaires (La Filière Bois, in this case) to set up facilities to control entry and exit from the forest, along the

main route at the two access points. This requirement is necessary in order to counteract any illegal removals from the forest, such as poaching, but also illegal logging. This is required by Order 222, Article 11(3), and taken from the Forest Management Plan, approved by MINFOF, concerning forest control devices, Chapter 4.8.7.

LFB installed permanent observation points at key access points[125], (north and south of UFA 10-064, the two access points), to control the access any entry and exit from the project area.

On the field, it takes the form of a level crossing, monitored 24 hours a day by a private security company, which controls access and the opening/closing of the level crossing at each entrance/exit. The security company also takes care of collecting information on all crossings persons, incoming and outgoing, by type of means of transport, the reason for access, and what is transported out of the UFA.

Moreover, an *in-situ* monitoring survey is carried out each year on the forest borders, in order to gather information on the illegal activities located in the project area. This monitoring is carried out by SEFAC group monitoring team. Each patrol has the aim to record observations (location, description, pictures) of human activity and disturbances, particularly about illegal logging, fires, conversion, poaching, building, etc. A monitoring report is produced after a patrolling survey (these documents can be provided to VVB during the verification process).

The material required for each patrolling survey is:

- Pick-up vehicle;
- GPS tracking system;
- Machetes, sharpening files, sleeping equipment, kitchenware
- Maps of areas/limits to be monitored, notepads and document holders.

Data collection in the field involves the use of a monitoring team to patrol the AACs supposed to be exploited in that year and the areas identified as sensitive within the UFA. The sensitive areas were identified through a joint study in 2019 with the CRESA (Centre Régional d'Enseignement spécialisé en Agriculture, Forêt Bois - CRESA).

QA/QC for the monitoring policies

The monitoring of annual logging areas (AACs) is included as mandatory within the UFA's Management plan as indicated by the Cameroonian law 94/01 (defining forest management practices) and framework law 96/12 (regarding the management of the environment).

Monitoring practices are described in the LFB internal manual[126] for the control of illegal activities related to the disturbance of flora and fauna within the UFA. This document outlines the practices

[125] Strategies LAB – Anti-poaching activities

[126] 'strategies pour la lute contre les activités illégales dans concessions forestiére du groupe SEFAC', 2020

for the correct identification of illegal activities within the area to be monitored and is available to the VVB for consultation.

The division of tasks and responsibilities of the project area monitoring is set out in the diagram below (Figure 15).

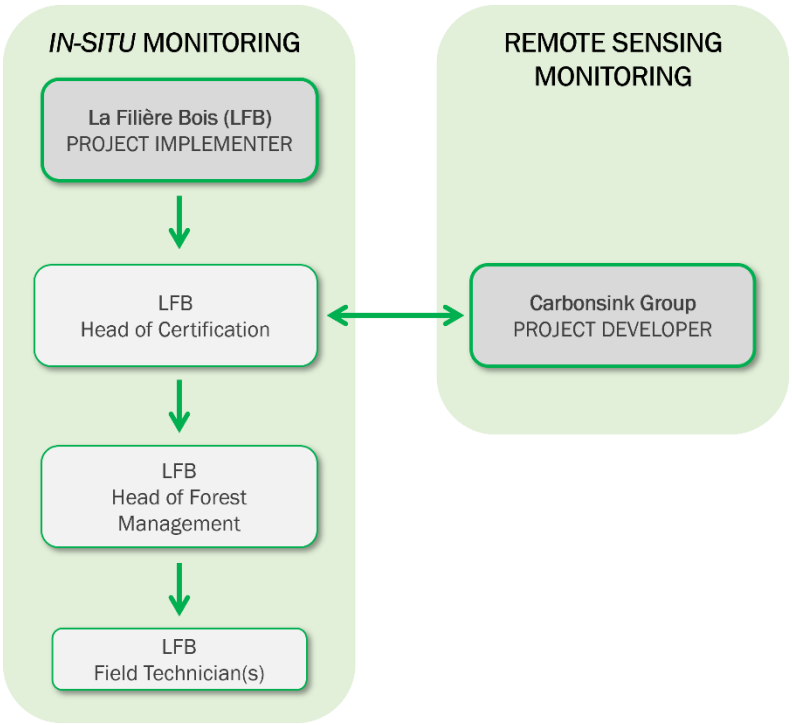

Figure 14: Organizational structure of monitoring activities

The head of forest management is entrusted to organise the monitoring patrols, along with the monitoring team leader (who is part of LFB field technicians). Monitoring team are generally composed by[127]:

- 1 monitoring team leader;
- 1 orientation responsible;
- 3 choppers;
- 2 porters;
- 1 cook.

Trainings on field data collection for the personnel is entrusted to the Head of Forest Management and the monitoring team leader, who explain to technicians what parameters to report and how to identify signs of illegal activity. The team leader has also the responsibility for the oversight and accountability of monitoring activities. This activity is carried out annually, in

[127] For more information, see the annual monitoring reports, available to the VVB upom

order to train the team on the importance of collecting data in a univoque, correct and compliant manner, so that data can be compared between years.

Each monitoring patrol starts with a check of the equipment required to carry out measurements and field checks. Technicians must check for the condition of writing instruments (notepads, pens), and must control the GPS device, the condition of the batteries, the correct sharpening of machetes, the condition of safety boots, and camping equipment. This activity is supervised by the team leader. Monitoring team proceeds then to sieve the hunting tracks, looking for traces of illegal activity, such as marks on vegetation, traps, rifle cartridges, signs of the encampment, etc. When evidence of illegal activity is found, the event is described in the notepad, photos are collected for the area and GPS coordinates are collected. At the end of the monitoring mission, data gathered are entered into the monitoring report, prepared by the team leader in order to report all illegal events that have been reported in the area. This report must be checked by the Head of Forest Management, who once validated, submits it to the local Chef de Poste, to proceed with the reporting of any illegal activities. Even though the risk of fire, pest and plant disease is low in the project area, recurrent trainings will be planned during the project implementation to update personnel on the data collection and reporting of these disturbances.

Remote Sensing

Remote sensing with processed satellite imagery data has been and will be used to track for the presence and the significance of illegal logging in the whole project area. The methodology used for spatio-temporal remote sensing data analysis is presented in Section 3.6 of this document.. Maps of annual tree cover loss at 30x30m resolution for the project area will be produced at each monitoring period, using the most updated data by Hansen et al. (2013)[128]. These maps will be used to assess for the presence of illegal logging in the project area during each monitoring period. Each detected tree cover loss pixel will be considered as a 30x30m=0.09ha of forest subjected to illegal logging during the monitoring period, and the total influence of potential illegal logging will be tested for significance. The analysis will be carried out at every verification, and the calculations will be transparently reproduced on a spreadsheet, available to VVB at every verification.

[128] https://earthenginepartners.appspot.com/science-2013-global-forest/download_v1.2.html. Visited on 30/06/2022, retrievable also from the Global Forest Watch database

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

The values provided below were used to quantify actual GHG emissions and removals achieved for the monitoring period 2018-2021. Data and parameters determined or available at validation which remain fixed throughout the project crediting period are included in Section 5.1 (Data and Parameters Available at Validation) above.

Data / Parameter	$A_{DIST\_IL,i}$
Data unit	ha
Description	Area potentially impacted by illegal logging in stratum *i*. Result of multi-temporal analysis of remote sensing data for Illegal logging identification in the project area
Value applied:	50 ha (below *de minimis*)
Comments	Disturbances related to illegal logging were detected during the monitoring period in the project area. By *in-situ* patrol and remote sensing data, deforested area ($A_{\_DIST,IL}$) was calculated. However, it's value is considered below *de minimis*, hence not significant (0.12% of the total project area). See Section 6.3 of this document for more information.

Data / Parameter	$A_{burn,i,t}$
Data unit	ha
Description	Area burnt in stratum *i* at time *t*
Value applied:	0 ha
Comments	The *ex-post* value of the burnt area is zero, since monitoring reports showed the absence of fire during the monitoring period in the project area. Moreover, analysis from remote sensing

	related data aggregation made from VIIRS sensor and tree cover loss data (see Section 4.2 for more information) showed no significant presence of burnt area during the monitoring period.

Data / Parameter	$A_{dist,i,t}$
Data unit	ha
Description	Area disturbed from pest and disease outbreaks for stratum *i* at time *t*
Value applied:	0 ha
Comments	The *ex-post* value of the area disturbed by pest and disease is zero, since monitoring reports showed the absence of these disturbances during the monitoring period in the project area

Data / Parameter	A_i
Data unit	ha
Description	Area covered by stratum *i*
Value applied:	N/A
Comments	*Ex-post* adjustments of the project scenario strata may be needed if unexpected disturbances occur during the project crediting period, severely affecting different parts of an originally homogenous stratum. Since no disturbance were delineated during the monitoring period, the strata areas did not changed with respect to the *ex-ante* values

Data / Parameter	PMP_i
Data unit	%
Description	Merchantable biomass as a proportion of total aboveground tree biomass for stratum *i* within the project boundaries.

Value applied:	7.84% (for *DHC* stratum) and 5.18 % (*S* stratum)
Comments	Calculations for these parameters are presented in the '*ExPost_BoumbaAndNgoko_VM0010_v5*' spreadsheet ('*MarketLeakage_PA*' tab)

6.2 Baseline Emissions

In this section, the baseline emissions and removals are quantified for the 2018-2021 monitoring period (January 1st 2018 – December 31th 2021)[129,130]. Calculations can be retrieved in the '*ExPost_BoumbaAndNgoko_VM10_v5* spreadsheet ('*BSL_ExPost*' and '*BSL_ExPost_total*' sheet). The values for these calculations were taken from the '*ExAnte_BoumbaAndNgoko_VM10-*v3' and referred to the monitoring period (2018-2021). The values of the GHG emissions and removals for the baseline scenario during the monitoring period were expressed in tCO_{2e} for each project stratum area.

A table with the summary of calculation of the total GHG emissions and removals for the baseline scenario is attached below:

Project year	*Parcel, p*	$\Delta C_{NET\|BSL(1)}$	$\Delta C_{NET\|BSL(2-10)}$	$\Delta C_{NET\|BSL(11-20)}$	$\Delta C_{NET\|BSL(1+)}$	$\Delta C_{NET\|BSL,t*}$	$GHG_{NET\|BSL,t*}$
		tC	tC	tC	tC	tC	tCO_{2e}
2018	4-2	28'342	0	0	-1'483	26'859	**98'484**
2019	4-3	28'747	14'638	0	-2'882	40'503	**148'510**
2020	4-4	26'656	29'485	0	-4'293	51'848	**190'110**
2021	4-5	26'367	43'252	0	-5'751	63'868	**234'181**

6.3 Project Emissions

The calculations are presented in the '*PRJ-ExPost*' sheet of the '*ExPost_BoumbaAndNgoko_VM10_v5*' spreadsheet. Since PP decided to not account for forest growth of undisturbed forest (considered as a conservative assumption), carbon removals in the project scenario were set to zero. Moreover, it was demonstrated that emissions resulting from forest disturbance (both illegal logging and natural disturbances) were not present in the project area during the monitoring period. Thus, GHG emissions and reductions for the project scenario during the monitoring period can be considered as zero.

[129] MINFOF Attestation de non activité - 2020-002176

[130] MINFOF Attestation de non activité - 2022-000787

Remote sensing calculations (see '*ExPost_BoumbaAndNgoko_VM10_v5*', 'Illegal_Logging' sheet were carried out to find the project area interested by these disturbances (Figure 16).

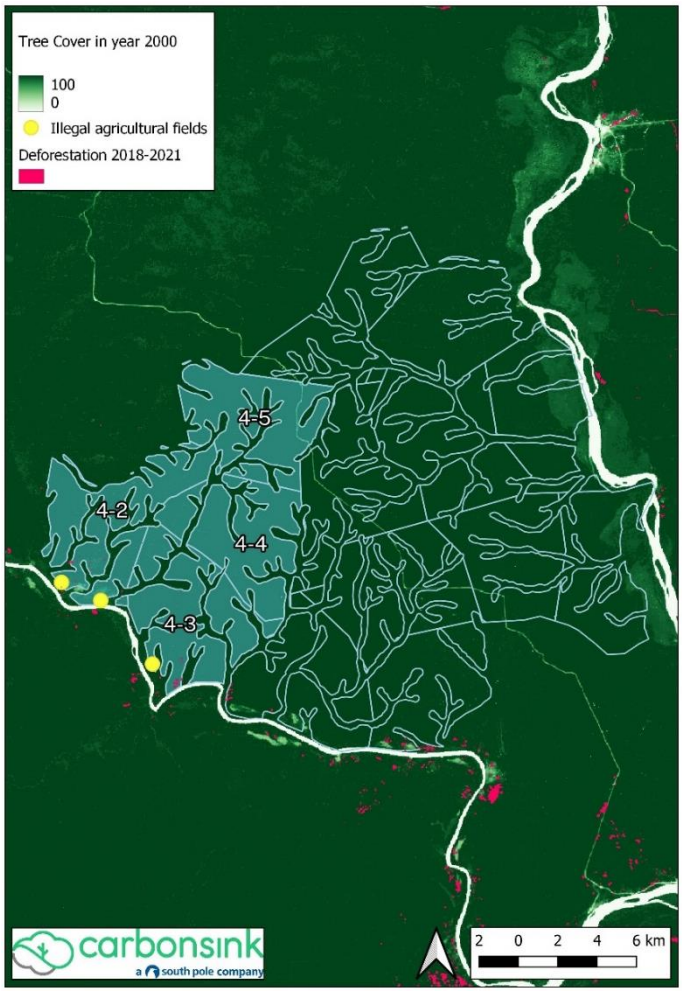

Figure 15 Project area where illegal logging and forest loss were detected during the monitoring period (2018-2021), according to the Global Forest Loss database (Hansen et al., 2013)

The methodology is presented in the Section 3.6 of this document. Analyzing the public data provided by Hansen et al. (2013), it has been possible to assess a forest loss of about 50ha in the project area, between 2018 and 2021.

To corroborate these remote sensing based analyis during the 2018-2021 monitoring period, the forest manager carried out in-situ monitoring on the monitored area borders that were identified as the most sensitivesensible to the illegal logging problem. Even though *in-situ* monitoring resulted in traces of illegal logging activities, particularly regarding human settlements and agricultural fields, it was considered not significant, having a total surface equal to 0,01% of the total project area (see '*ExPost_BoumbaAndNgoko_VM10_v5*', 'Illegal_Logging' sheet). The *in-situ* monitoring reports are available at any moment to the VVB during validation. The project area potentially interested by illegal logging ($A_{\_DIST,IL}$) is below *de minimis*, hence not significant (almost 0.10% of the total project area).

6.4 Leakage

In Section 4.3 of this Joint PDD, the rational beyond market leakage calculations were presented. For the monitoring period 2018-2021, the analysis are presented in more details in the '*ExPost_BoumbaAndNgoko_VM10_v5*' spreadsheet, 'MarketLeakage' tabs. The resulting leakage factor is:

LF_{ME} = 20%

6.5 Net GHG Emission Reductions and Removals

These calculations are presented in the '*VCU*' sheet of the '*ExPost_BoumbaAndNgoko_VM10_v5*' spreadsheet. The total net greenhouse gas emissions for the baseline scenario during the 2018-2021 monitoring period was 671'285 tCO_2e. The total project emissions and removals was instead set to zero. The leakage amounted to 134'257 tCO_2e. Thus, the net GHG emissions and removals are 537'028 tCO_2e.

PP calculated uncertainty for the monitoring period an uncertainty of 13% (*ex-post* value for the monitoring period, '*Uncertainty*' sheet of the '*ExPost_BoumbaAndNgoko_VM10_v5*' Excel file), which do not apply for deductions. According to the *VCS AFOLU Non-Permanence Risk Tool (v4.0)*, the non-permanence risk rating for the AFOLU project was calculated as 10% (the calculation tool and the report are available to the verification agent for the monitoring period).

For the monitoring period, the total number of buffer credits were thus calculated as 53'703 tCO_2e.

Applying the previous deductions, the total VCUs eligible for issuance for the monitoring period 2018-2021 are 483'325 tCO_2e.

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)	Buffer pool allocation (10%)	VCUs eligible for Issuance
2018	98'484	0	19'697	78'787	7'879	70'908
2019	148'510	0	29'702	118'808	11'881	106'927
2020	190'110	0	38'022	152'088	15 209	136'879
2021	234'181	0	46'836	187'345	18 735	168'611
Total	**671'285**	**0**	**134'257**	**537'028**	**53'703**	**483'325**