

# Summary Report Submitted for HCS Approach Peer Review Process

## **HCS Study Project Title:**

HCSA assessment for Bindo Bifoun  
concession, Gabon

**Company/Organisation:** Olam Palm Gabon

**Contact person:** Quentin Meunier

**Date:** 05/12/18

## TABLE OF CONTENTS

1. Project description.....	5
1.1 Location and size of study area.....	5
1.2 Overview of proposed plantation development .....	5
1.3 Description of surrounding landscape .....	8
1.4 Map of the site within the region .....	9
1.5 Relevant data sets available.....	11
1.6 List of any reports/assessments used in the HCS assessment.....	11
2. HCS assessment team and timeline .....	11
2.1 Names and qualifications.....	11
2.2 Time period for major steps in the study .....	12
3. Community engagement/ FPIC .....	13
3.1 Summary of community engagement, FPIC, participatory mapping.....	13
3.2 Summary of Social Impact Assessment (if any) .....	19
3.A Supplemental information provided to peer reviewers.....	22
3.3 Full Social Impact Assessment (if any) .....	22
3.4 Details of meetings held and findings.....	23
3.5 Shape files of community land use maps .....	28
4. High Conservation Value assessment.....	29
4.1 Summary and link to public summary report .....	29
4.A Supplemental information provided to peer reviewers .....	30
4.2 Full HCV report.....	31
5. Environmental Impact Assessment .....	31
5.1 Summary .....	31
5.A Supplemental information provided to peer reviewers .....	31
5.2 Full Environmental Impact Assessment (if any).....	31
6. Land cover image analysis.....	31
6.1 Area of Interest and how it was defined .....	31
6.2 Description of images used for classification.....	32
6.3 Sample image.....	32
6.4 Method of stratification and software used .....	33

# High Carbon Stock Approach

6.5	Map of initial vegetation classes, with legend .....	34
6.6	Table of total hectares per vegetation class .....	36
6.7	Summary of which areas are potential HCS forest, subject to further analysis .....	36
<b>6.A Supplemental information provided to peer reviewers .....</b>		<b>36</b>
6.8	Images, with sufficient resolution to re-do analysis .....	37
<b>7. Forest inventory results .....</b>		<b>37</b>
7.1	Inventory sample design and plot rational .....	37
7.2	Map indicating plots .....	40
7.3	Forest inventory team members and roles .....	40
7.4	Methodology used for forest sampling .....	41
7.5	Methodology used for carbon calculations .....	42
7.6	Indicative photos of each vegetation class .....	42
7.7	Statistical analysis (allometric used, confidence tests, justification) .....	47
7.8	Summary of statistical analysis of carbon stock results per vegetation class .....	47
7.9	Forest inventory results .....	48
<b>7.A Supplemental information provided to Peer Reviewers .....</b>		<b>50</b>
7.10	Complete forest plot data .....	50
<b>8. Land Cover Classification .....</b>		<b>50</b>
8.1	Refined land cover map with title, date, legend and any HCS forest patches identified .....	50
<b>8.A Supplemental information provided to Peer Reviewers .....</b>		<b>52</b>
8.2	Shape files of land cover map and forest patches .....	52
<b>9. Patch Analysis Result .....</b>		<b>52</b>
9.1	Results of Decision Tree .....	52
9.2	Comments on Decision Tree outcome .....	53
<b>10. Indicative Land Use Plan .....</b>		<b>54</b>
10.1	Summary of results of final ground verification (if any) .....	54
10.2	Final HCS map .....	54
10.3	Overview of forest conservation management and monitoring activities to be included in the Conservation and Development (land use) Plan .....	56
10.4	List of activities still to be carried out before Conservation and Development Plan can be finalised .....	57
<b>11. Annex 1: Methods and results of Gabon high carbon stock definition .....</b>		<b>59</b>

## High Carbon Stock Approach

## 1. Project description

### 1.1 Location and size of study area

**Name:** Bindo-Bifoun (BB) concession

**Location:** The concession is approximately 140 km from Libreville and 35 km north of the provincial town of Lambaréné in Gabon, straddling both the Abanga-Bigne and Ogooue et des Lacs Departments, in the Moyen Ogooué Province. The northern boundary of the concession is located at 10°25'11.557"E, 0°18'2.643"S, and southern boundary at 10°24'52.557"E, 0°24'42.675"S (Figure 1).

**Size:** 5,488 ha

**Development:** Industrial oil palm plantation

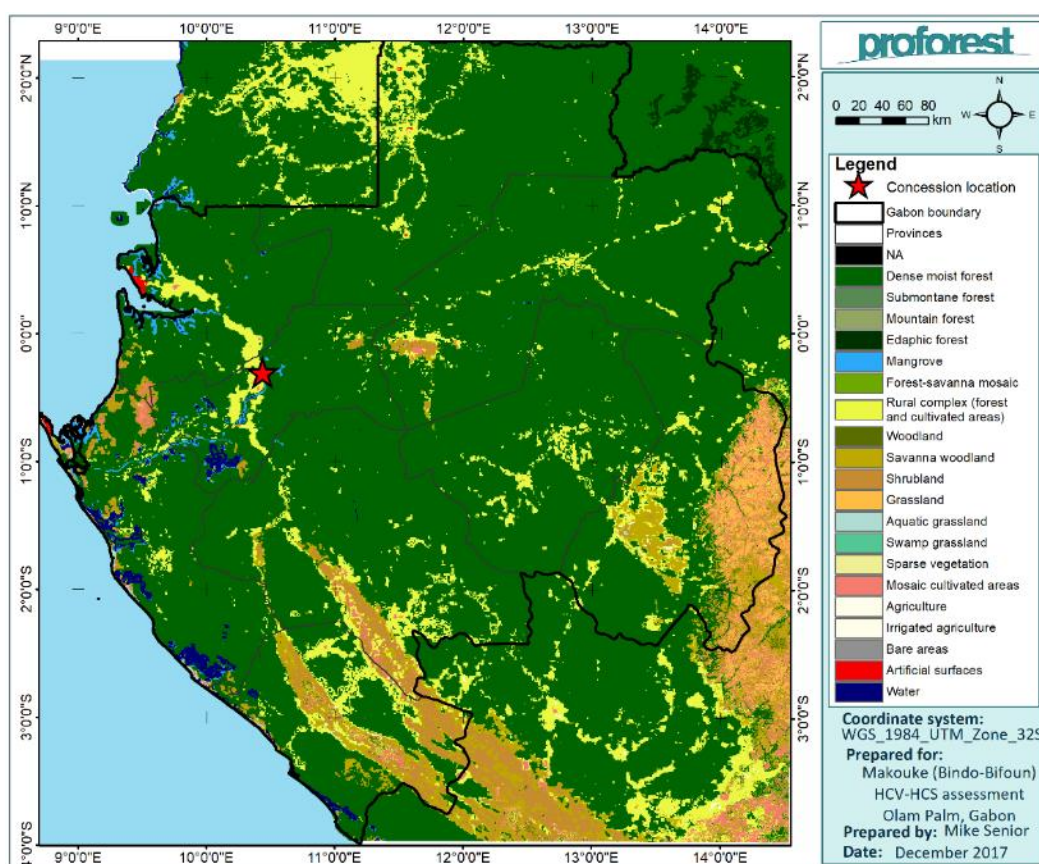


Figure 1. Location of the BB concession in Gabon, overlaid with 2012 land cover map for Gabon (Verhegghen et al 2012)<sup>1</sup>.

### 1.2 Overview of proposed plantation development

BB concession is one of three concessions acquired by Olam in the Lambaréné area in 2016, previously owned by SIAT (Société d'Investissement pour l'Agriculture Tropicale). The two other concessions had already been developed for oil palm by SIAT at the time of the acquisition, and Olam are now looking

<sup>1</sup> Verhegghen et al 2012. Mapping Congo Basin vegetation types from 300m and 1km multi-sensor time series for carbon stocks and forest areas estimation. Biogeosciences, 9, 5061–5079, 2012

# High Carbon Stock Approach

to develop the BB concession. Olam have legal title to use the land in the BB concession, in the form of a long-term lease (“bail emphytéotique”) that was acquired from SIAT.

The majority of the BB concession is undeveloped, except for approximately 600 ha in the southeast part of the concession that was cleared by SIAT between 2007 and 2013 and is now under palm in various states of management or scrub/young regrowth.

The undeveloped part of the BB concession is a mosaic of diverse vegetation types including for the most part young secondary forest, some areas of older secondary forest, as well as some scattered village plantations, young natural regrowth and fallow lands. The forest becomes more intact as you move from west to east towards the Ogooué River and into the more inundated areas. It is clear from the land cover analysis and the field recces, that the concession area has a history of moderate intensity logging by communities (although this area has never been attributed as a legal forestry concession), and a high intensity of slash and burn agriculture by Gabonese standards.

There are 27 villages and settlements from 8 regroupements surrounding the concession on all sides, and a couple of non-permanent and now abandoned camps located within the concession (Figure 2). Of these 21 villages (or 22 depending on how they are grouped) were included in the socio-economic survey and 14 in the participatory mapping study, as villages that will potentially be impacted by the development. A full explanation of why villages were included and the potential impact of the development is provided in section 3.

# High Carbon Stock Approach

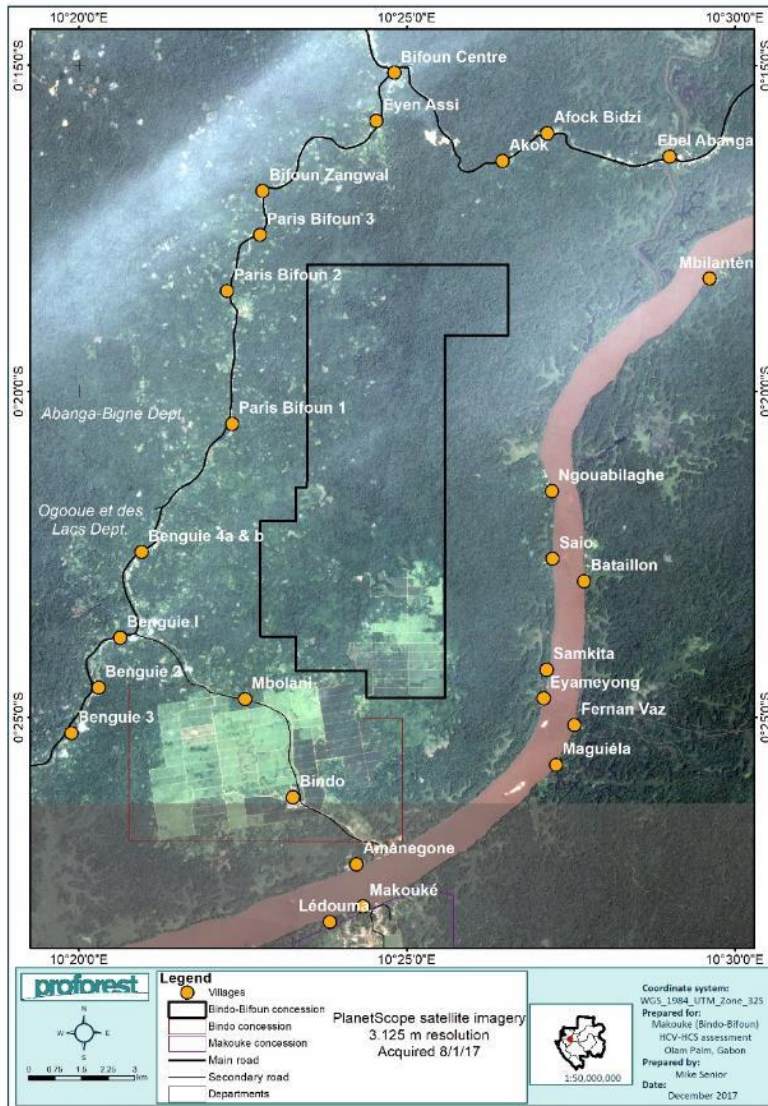


Figure 2. Location of the BB concession overlaid with 3m resolution PlanetScope imagery (acquired January 2017).

New planting for commercial oil palm plantation development is planned for 2018 in the concession, following completion of necessary due diligence assessments. Olam is an RSPO member and so is required to comply with the RSPO's New Planting Procedure – which requires a High Conservation Value (HCV) assessment (amongst others) prior to development. In line with **Olam's new Forest Policy**, they are also required to conduct a High Carbon Stock (HCS) assessment (see Olam's Living Landscape Policy for explanation of high carbon stock methodologies employed in different contexts).

Furthermore, Olam is abiding by a **moratorium on land clearance until January 2019** and will furthermore continue its protection of HCV and HCS forests according to the HCV Network guidance and HCS Approach, or an agreed/adapted HCS approach for the Gabonese context endorsed by national stakeholders and RSPO (as per the Olam Living Landscape Policy commitments, 2018).

**Therefore, this assessment was conducted as an integrated HCV-HCSA-FPIC assessment to identify HCV areas, HCS forest and community use areas. The assessment also included a comparison of**



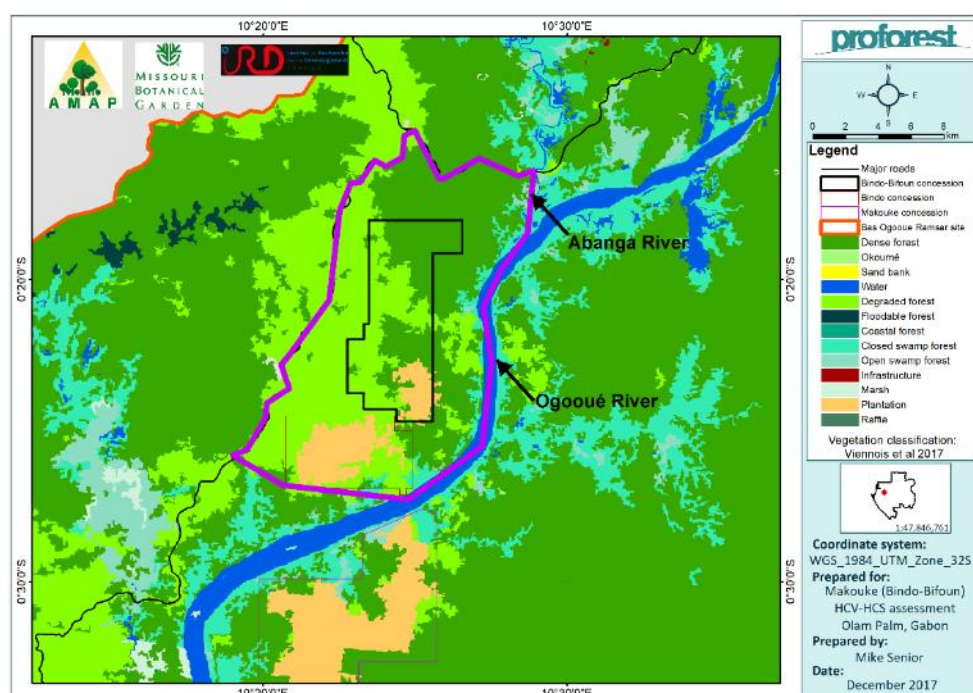
# High Carbon Stock Approach

**HCSA defined HCS forest with High Carbon Stock areas as defined by the draft Gabonese forest definition and national Palm Oil development guidelines (see Annex 1).**

This report follows the HCSA (only) reporting template, because the assessment was completed before the HCVRN and HCSA had developed HCV-HCSA-FPIC report quality review procedures. The HCV methodology and results are written up in full in a separate report.

## 1.3 Description of surrounding landscape

The BB concession is sandwiched between the Libreville-Lambaréné highway 1-2 kms to the west of the concession, the highway to the interior of Gabon 2-3 km north of the concession up to the Abanga river and the Ogooué River 2-3 kms to the east of the concession (Figure 3).



**Figure 3. Wider landscape or Area of Interest (Aoi) considered for the assessment shown as a purple polygon.**

The National Highway (N1) and the Ogooué river have been the major transport routes throughout Gabon's recent history. At a national scale this means that the concession's immediate landscape is essentially fragmented and poorly connected from an ecological perspective, with both the national roads and the Ogooué river representing major dispersal barriers to wildlife. This lack of ecological connectivity at a macro-scale is also coupled with the effects of being entirely surrounded by 22 villages that rely upon the forest resources and their subsistence plantations. Whilst the forest quality improves as you move away from the road, it is clear that the landscape is of negligible importance for ecological connectivity at the scale of Gabon.

This is well illustrated by looking at the location of the concession overlaid with an oil palm suitability map developed by Austin et al (2017)<sup>2</sup>. The BB concession falls within an area defined almost exclusively as suitable for oil palm, with minimal coverage of HCV and HCS *as defined by the authors* (Figure 4).

<sup>2</sup> Austin, et al. January 2017. An assessment of high carbon stock and high conservation value approaches to sustainable oil palm cultivation in Gabon. Environmental research letters.



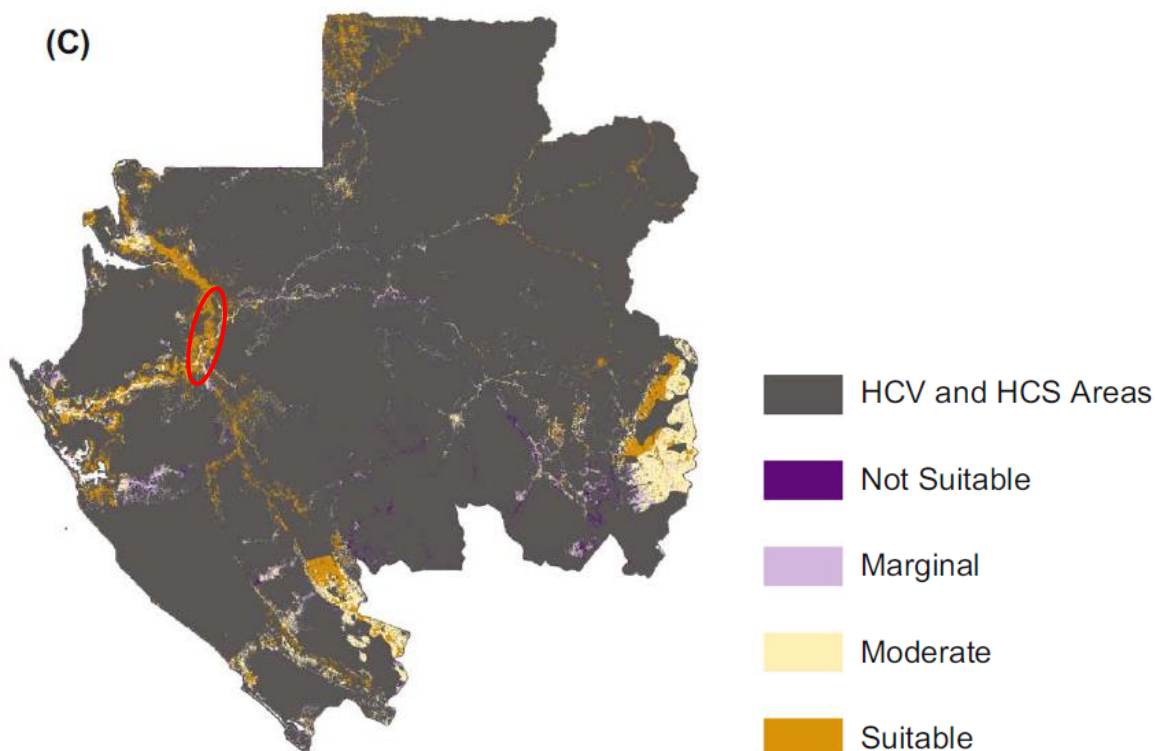


Figure 4. Oil palm suitability maps for Gabon proposed by the National Agency for National Parks (ANPN), based on crop suitability, indicative HCV and high carbon stock areas (Austin et al. 2017).

The concession falls within a high forest cover landscape (HFCL), with >80% forest cover as defined by the HCS Approach toolkit. This designation holds whether defined at a national scale (~88% forest cover<sup>3</sup>) or at the scale of the wider landscape: 89.7% forest cover calculated based on a land cover map developed by Viennois et al (2017)<sup>4</sup>.

Consequently, there is a divergence between the national importance of the landscape and the global importance as defined by the HCSA methodology. This cuts to the heart of the debate around applying the 'No deforestation' concept in High Forest Cover contexts like Gabon.

For more information about the biological, demographic and socio-economic context of Gabon, including its deforestation drivers and history, please refer to the HCV public summary report (Sections 4.1 and 4.2).

## 1.4 Map of the site within the region

The BB concession is 45 km away from the nearest protected area (Wonga Wongue Presidential Reserve) in the west. However, there are several broader conservation designations that either overlap the BB concession or occur within the wider landscape. The concession does not overlap any Intact Forest Landscapes (IFL), although there is an IFL on the eastern side of the Ogooué river. The Mont Alen-Monts de Cristal CARPE (Central African Region Program for the Environment) landscape is found to the north of the concession, but does not overlap.

<sup>3</sup> [http://www.poulsenlabduke.com/uploads/1/9/3/6/19363955/poulsen\\_fl\\_1208\\_english\\_r7\\_0u.pdf](http://www.poulsenlabduke.com/uploads/1/9/3/6/19363955/poulsen_fl_1208_english_r7_0u.pdf)

<sup>4</sup> Viennois, et al. 2017. Cartographie de la végétation in Le delta de l'Ogooué (Vande weghe J.P. & Stévant T. eds) : 198-221.

# High Carbon Stock Approach

The concession is located within the Bas Ogooué Ramsar site (Figure 5), which was **gazetted in 2008**, well after allocation of Olam's three Makouké concessions – originally dating back to AgroGabon in the **1960s**.

For more discussion about the definitions of these conservation designations, and their significance in terms of HCV please refer to the HCV public summary report (section 4.2 and 4.3).

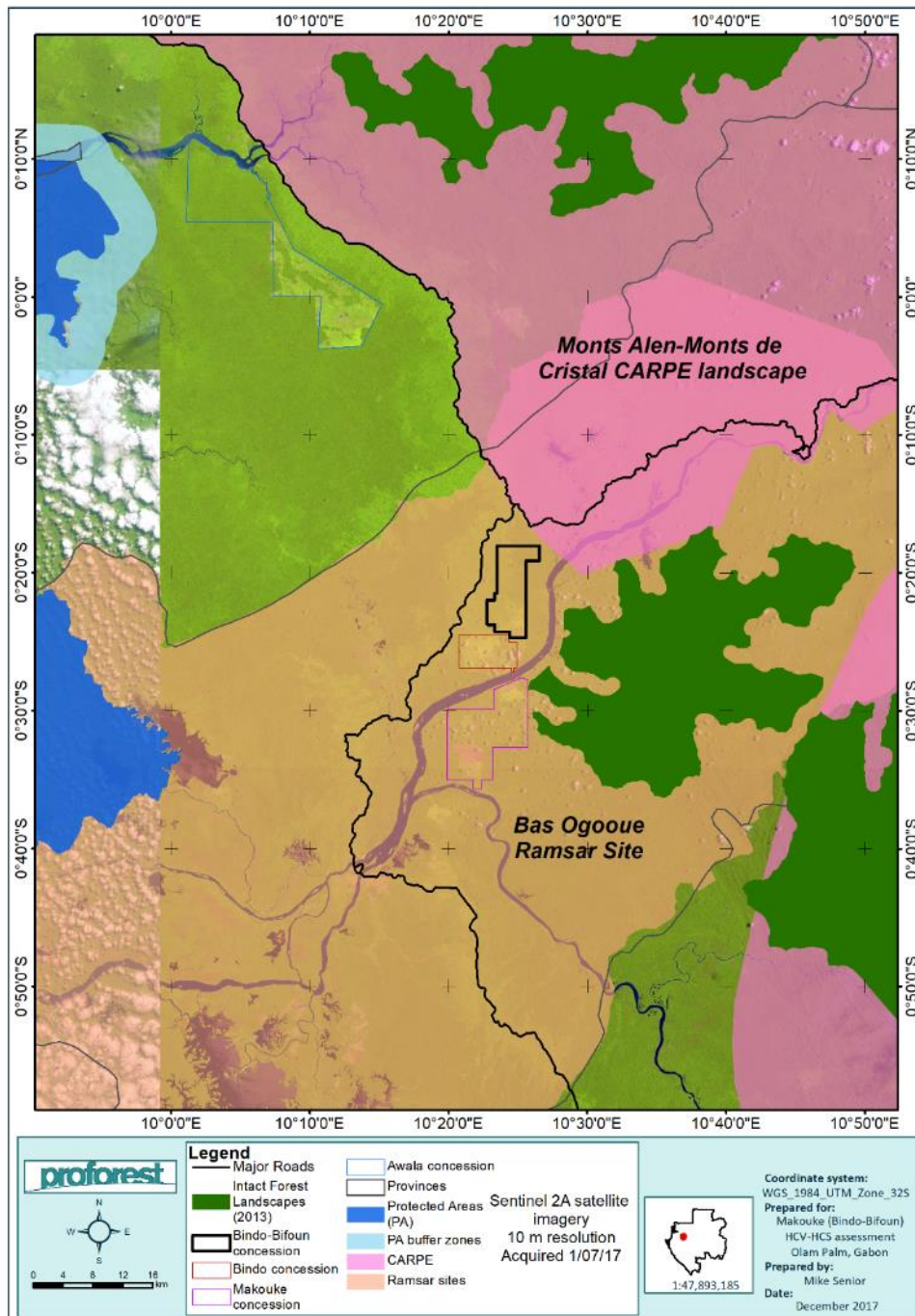


Figure 5. Protected areas and other conservation landscapes in the Makouké landscape. The full extent of the Bas Ogooué Ramsar site is shown in Figure 14.

## 1.5 Relevant data sets available

The assessment was conducted as a joint HCV-HCSA-FPIC and produced the following datasets:

- Land cover classification,
- Forest inventory (carbon stock, forest structure, species composition etc),
- Mammal survey,
- Fish and aquatic invertebrate survey,
- Participatory mapping of community use areas,
- Socio-economic survey and other surveys included in the Environmental and Social Impact Assessment (ESIA), and
- Physical environment survey (including water quality and soil type assessment).

These comprehensive datasets build on numerous other existing datasets collecting during previous EIA, FPIC and HCV studies conducted by SIAT prior to Olam's acquisition of the concession.

## 1.6 List of any reports/assessments used in the HCS assessment

The following assessments were conducted for the BB concession:

- Botanical assessment and forest inventory,
- Mammal assessment,
- Fish and aquatic invertebrate assessment,
- Participatory mapping study,
- Environmental and Social Impact Assessment (ESIA), including socio-economic survey,
- High Conservation Value assessment.

Again, these build on studies previously conducted by SIAT. Please refer to the HCV assessment report for a full list of previously conducted studies.

## 2. HCS assessment team and timeline

### 2.1 Names and qualifications

The team members of the HCV-HCSA-FPIC assessment team are listed below.

Table 1. HCV team members

Name	Institution	Role	Expertise
Dr. Mike Senior	Proforest	Lead assessor, ALS licensed assessor and HCSA registered practitioner	Conservation, Landscape ecology, GIS
Dr. Sebastiaan De Smedt	Proforest	Team member	Conservation, GIS
Dr Louis Defo	Proforest	Team member	Social, community engagement

# High Carbon Stock Approach

Ellen Brown	Proforest	Assessor & internal quality review	Conservation, Quality review
Dr. Olivia Scholtz	Consultant (Independent)	Team member	Conservation, Mammals
Aubin Mboumba	Consultant (TEREA)	Team member and ESIA lead	Environment, Social issues
Laura Bachellerie	Proforest	Team member	GIS

This HCV-HCSA-FPIC assessment was carried out from April 2017 to January 2018. The assessment was carried out by Proforest in collaboration with Gabonese experts both from TERE A and other expert institutions (Table 2).

Table 2. Team of experts involved in the BB HCV-HCSA-FPIC assessment

Name	Institution	Expertise
<b>ESIA</b>		
Aubin Mboumba	TEREA	ESIA coordination
<b>Botanical inventory</b>		
Prof. Alfred Ngomanda	IRET (Research Institute for Tropical Ecology) /CENAREST	Lead and quality control
Prof. Judicaël Lebamba	IRET	Field coordinator
Yves Issembe	Herbier National du Gabon	Botanist, para taxonomist
<b>Fauna studies</b>		
Pr. Alfred Ngomanda	IRET/CENAREST	Lead and quality control
Dr. Etienne François Akomo Ookoue	IRET/CENAREST	Field coordinator, Mammals
Dr Fred Loïc Nguet	IRET/CENAREST	Mammals
Blaise Mboye	IRET/CENAREST	Fish, Aquatic fauna
<b>Social studies</b>		
Eyang Effa Edwige	Research affiliate of IRET	Social Lead, participatory mapping, community engagement
Owono Mbeng Ophélie	IRET	Social, participatory mapping
Guy-Roger Mbatouila	TEREA	Socio-economic studies

## 2.2 Time period for major steps in the study

Note that this table only includes the time line for components of the study conducted by the assessment team. It does not include the company's (Olam's) activities as part of the FPIC process conducted prior to the assessment team's activities, which are outlined in section 3.

# High Carbon Stock Approach

Phase		Task	Date
Pre-assessment		Information gathering	Mar-Apr 2017
		Scoping visit	May 2017
		Initial consultations	May 2017
		Preparation and planning	Jun-Sept 2017
Full assessment	HCV-HCSA identification	Botanical study	Aug-Sept 2017
		Mammal study	Aug-Nov 2017
		Aquatic study	Oct-Dec 2017
		Participatory mapping study	Aug-Dec 2017
		Socio-economic study	Oct-Dec 2017
		Physical environmental assessment (inc soil, water quality etc)	Nov-Dec 2017
	HCV-HCSA findings and recommendations	Analysis and recommendations	Nov-Dec 2017
		Final national and community stakeholder consultations	Dec 2017
	Reporting	Reporting (including reviews)	Jan-Apr 2018

## 3. Community engagement/ FPIC

### 3.1 Summary of community engagement, FPIC, participatory mapping

Community engagement involved different, mutually supportive activities before, during and alongside the assessment. This is summarised below:

- Community engagement and FPIC:** the FPIC process is being led by the company (Olam). It was started prior to the assessment and is ongoing. The FPIC consultation conducted by Olam included informing populations and local authorities on the consultation process, and requesting consent from local communities to proceed to the HCV-HCSA assessment. A summary of the process is provided below and full details of meetings provided in section 3.4 (in French).
- Socio-economic survey:** This was conducted by TERE as part of the ESIA and included village interviews, focus group discussions and social transects to determine community needs and livelihoods. The results of the survey were also presented and validated in each village to confirm the accuracy of findings. For more information refer to:
  - Methods summary: Section 4.3.4 of the full HCV report
  - Full methods and results: socio-economic report
- Participatory mapping survey:** Participatory mapping was conducted for all villages around the concession by IRET, this built on several previous participatory mapping exercises conducted with the villages by SIAT and for a government project. The results (maps) of the

# High Carbon Stock Approach

survey were presented and **validated** in each village to confirm their accuracy. Participatory maps covered all **community use activities including farmland, hunting, fishing, collection and cultural sites**. For more information refer to:

- a. *Methods summary: Section 4.3.5 of the full HCV report*
  - b. *Full methods and results: participatory mapping report*
4. Note that social HCVs 5-6 were identified based on a combination of the results from the socio-economic and participatory mapping surveys.

## Summary of community engagement meetings and FPIC process

Activity	Date	Lead actor
Initial engagement with communities, request for consent to conduct scoping study and information about proposed consultation during the scoping	15/5/17	Olam
Consultation and initial data collection during scoping visit	22/5/17- 26/5/17	Proforest, Terea and Olam
Prospection and initiation of participatory mapping	July 2017	IRET
Full HCV-HCSA assessment	Aug-Sept 2017	Proforest, Terea
Validation of participatory maps with villages	Nov-Dec 2017	IRET
Final consultation on HCV results with villages*	16/12/17-22/12/17	TEREA, IRET

\* Note that:

- *Olam social team regularly conduct village visits to share on Olam development status and ongoing processes, at least once a week for the direct neighbours.*
- *Olam and the assessment team decided to do final community consultation only on the HCV maps and not the HCSA maps. This is because Olam is abiding by a moratorium on land clearance until January 2019 and will furthermore continue its protection of HCV and HCS forests according to the HCV Network guidance and HCS Approach, or an agreed 'adapted' Gabon-relevant HCS approach endorsed by national stakeholders and RSPO (as per the Olam Living Landscape Policy commitments, 2018). This decision was taken to avoid potential confusion if new HCS areas were later defined/agreed in line with a "Gabon approach" to HCS. The final consultation with villages will only be done on the 'new' HCS areas when agreed.*

## Summary of social context



## High Carbon Stock Approach

There are 27 villages and settlements from 8 regroupements along the main Libreville-Lambaréné road to the west, Libreville, along the Libreville-Ndjolé road to the north and along the Ogooué river to the east. There are also a couple of non-permanent and now abandoned camps located within the concession. Of these 21 villages (or 22 depending on how they are grouped) were included in the socio-economic survey and 14 in the participatory mapping study, as villages that will potentially be impacted by the development.

The communities in this zone are **not** considered to be **indigenous or native** to the area, but are **migrants** from elsewhere in Gabon that migrated to the area at different points over the past **140 years**. This migration was driven by various factors ranging from the policy of ‘regroupement’ during the French colonial era to economic migration over the past 50 years.

The main sources of income and livelihoods for the villages in the zone are **small-scale food crop plantations (plantains, cassava, maize, vegetables, etc)**, **fishing, hunting, collection of non-timber forest products (NTFPs) (inc. marantaceae leaves, Odika)**, **timber extraction** for construction and energy, and **employment** on Olam’s plantations (Bindo and Makouke). **Agricultural production, bushmeat, fish and NTFPs** are all used both for **domestic consumption and sale**.

The history of rubber and palm plantations in the Makouké area has strongly influenced the growth and dynamics of the villages in the area. **Two** of the three Olam management units in the area are allocated to Olam as **long-term leases (“baux emphytéotique”)** by the government of Gabon, and **one** is owned as a **land title (Bindo)**. Two of these management units (Makouké and Bindo concessions) have been **active since at least the 1960s as rubber or palm plantations operated by PalmHevea, AgroGabon and most recently SIAT**. As a result, some worker camps created in the 1960’s are now established villages.

Olam has also inherited the legacy of community relationships with SIAT and even their predecessors, each of which had different approaches to community engagement and social agreements with the villages. **Prior to SIAT**, it appears there was **little to no community engagement**. These relationships relate primarily to the two already developed concessions but also affect the nature of Olam’s engagement with villages around the proposed development of the BB concession. Principal examples relate, firstly, to the **former legal requirement** in Gabon for there to be 5km “green bands” around all villages that were reserved for community use and secondly, to green bands later proposed by SIAT to the villages. The original forestry law has since been scrapped and these “green bands” are no longer legally required. However, despite Olam communicating the change to villages, several of them still refer to and to some extent abide by either the legal “green bands” or green bands agreed with SIAT. Therefore, it was important for the assessment team to reiterate that the green bands no longer applied – rather that Olam will be **respecting participatory maps of actual community use areas and subsequent negotiation processes**.

### Summary of community use in the BB concession

A large number of participatory mapping and impact assessments had already been conducted for the villages around the concession that could be used for the study. To be precautionary the assessors and company agreed that additional updates or improved data were required for some but not all villages (e.g. for villages very far from the concession or known not to be using land inside

## High Carbon Stock Approach

or near the concession). A summary of villages in the landscape and their inclusion in the socio-economic and participatory mapping studies is provided in Table 3.

In total 21 villages (or 22 depending on how they are grouped) were included in the socio-economic survey and 14 in the participatory mapping study. More villages were included in the socio-economic survey than the participatory mapping study **because no SIA or socio-economic baseline data was available for these villages**, but these villages had been covered by previous participatory mapping exercises. Note that Olam has also been updating SEIA and FPIC processes for all three Makouke concessions – meaning that some of the villages included in the socio-economic survey are those near to Bindo and Makouke concessions (not BB).

The participatory mapping studies revealed that **six** of the 27 villages in the Aol **conduct livelihoods activities** (fishing, farming, hunting, timber extraction or gathering) inside the BB concession. These villages are Paris Bifoun 1, Paris Bifoun 2, Paris Bifoun 3, Benguie 4a & b, Bindo and Amanegone. An additional one village (Ngouabilaghe) had a cultural site inside the concession, but did not conduct any livelihood activities inside the concession. Other villages were not found not to directly impacted, although villages downstream of the concession along the Ogooué river would be indirectly impacted if negative impacts on water quality and water quantity are not effectively controlled.

Prior to Olam's acquisition of the site when SIAT held the lease, it was agreed with the communities that they would **not conduct any activities** within the concession boundaries, and re-orient their farming activities **within the green belt drawn during the participatory mapping**. When SIAT did not develop the land, the road-side communities progressively moved back into the concession area for slash and burn activities (see discussion in the HCV report about drivers of this).

# High Carbon Stock Approach

Table 3. List of villages in the wider landscape, their inclusion in social studies and summary of whether impacted by BB concession.  
P mapping = participatory mapping

Villages	Included in socio-economic study?	Included in p mapping study?	Status
Afok Bidzi	Y		<b>Not impacted.</b> Previous p mapping study showed not using concession area. Reaffirmed during socio-economic baseline study
Akok	Y		<b>Not impacted.</b> Previous p mapping study showed not using concession area. Reaffirmed during socio-economic baseline study
Amanegone	Y	Y	<b>HCV 5 and community land present</b>
Bataillon (Edjé djéne)	Y	Y	<b>Not impacted.</b> Included in new p mapping study on precautionary basis. P mapping and socio-economic study showed not using concession area.
Benguie 1			<b>Not impacted.</b> Previous participatory mapping showed that Benguie 1 has no activities or use areas northeast of the Makouke/Bindo junction
Benguie 2			<b>Not impacted.</b> Previous participatory mapping showed that Benguie 2 has no activities or use areas north of the Makouke/Bindo junction. Therefore, use areas close to Bindo concession, not Bindo Bifoun
Benguie 3			<b>Not impacted.</b> Previous participatory mapping showed that Benguie 3 has no activities or use areas north of the Makouke/Bindo junction. Therefore, use areas close to Bindo concession, not Bindo Bifoun
Benguie 4 a & b	Y	Y	<b>HCV 5, community land and HCV 6 present</b>
Bifoun	Y		<b>Not impacted.</b> Previous p mapping study showed not using concession area. Reaffirmed during socio-economic baseline study
Bifoun Zangwal	Y	Y	<b>Not impacted.</b> Included in new p mapping study on precautionary basis due to proximity to concession. But p mapping and socio-economic study showed not using concession area.
Bindo	Y	Y	<b>HCV 5, community land and HCV 6 present</b>
Ebel Abanga, (rive droite et gauche)	Y		<b>Not impacted.</b> Included in new p mapping study on precautionary basis. P mapping and socio-economic study showed not using concession area.
Eyameyong (& Samkita)	Y	Y	<b>Not impacted.</b> Included in new p mapping study on precautionary basis. P mapping and socio-economic study showed not using concession area.
Fernan Vaz (Abo Okam)	Y	Y	<b>Not impacted.</b> Included in new p mapping study on precautionary basis. P mapping and socio-economic study showed not using concession area.

## High Carbon Stock Approach

Ledouma			<b>Not impacted.</b> >5 km away from concession and on east of Ogooue river. Previous p mapping showed not using land west of river. Closer to Makouke concession.
Maguiéla	Y	Y	<b>Not impacted.</b> Included in new p mapping study on precautionary basis. P mapping and socio-economic study showed not using concession area.
Makouké	Y		<b>Not impacted.</b> >5 km away from concession and on east of Ogooue river. Previous p mapping study showed not using concession area. Closer to Makouke concession. Reaffirmed during socio-economic baseline study
Massoui-Eyen Assi	Y		<b>Not impacted.</b> Previous p mapping study showed not using concession area. Status reaffirmed during socio-economic baseline study
Mbilanten			<b>Not impacted.</b> >5 km away from concession, east of Ogooue river and further north - not using land in concession area
Mbolani	Y	Y	<b>Not impacted.</b> Included in new p mapping study on precautionary basis due to proximity to concession. P mapping and socio-economic study showed not using concession area.
Ngosso	Y		<b>Not impacted.</b> >5 km away from concession (not shown on map) and on east of Ogooue river. South of Bindo concession and activities close to Bindo not BB concession. Status reaffirmed during socio-economic baseline study
Ngouabilaghe	Y	Y	<b>HCV 6 present</b>
Paris Bifoun 1	Y	Y	<b>HCV 5, community land and HCV 6 present</b>
Paris Bifoun 2	Y	Y	<b>HCV 5 and community land present</b>
Paris Bifoun 3	Y	Y	<b>HCV 5 and community land present</b>
Saio	Y	Y	<b>Not impacted.</b> Included in new p mapping study on precautionary basis. P mapping and socio-economic study showed not using concession area.
Samkita			Part of Eyameyong village/regroupement

### 3.2 Summary of Social Impact Assessment (if any)

A combined Social and Environmental Impact assessment was conducted simultaneously with the HCV-HCSA assessment. A translated summary of the main potential impacts and proposed mitigation measures identified in the ESIA are presented in the following table.

Project phase	Social actor	Source of impact	Potential impact	Rating	Significance	Mitigation measures (or enhancement)	Rating after mitigation	Significance after mitigation	Time of impact	Monitoring indicators
1 Land preparation (vegetation clearing ; earthworks/land preparation ; wood extraction)	Communities	Employment	Increased income for local communities from jobs in the operations	9	Moderate to important	Prioritise employment of locals and guarantee contracts, where adequately qualified			Ongoing	Payslips; contracts; worker register
	Employees/Communities	Land preparation	Destruction of cultural sites	11,25	Moderate to severe	Map/demarcate community use/cultural sites identified during the participatory mapping; Monitor protection of HCVS and any local heritage sites			Before and during land preparation	Grievance/conflict resolution procedure; File monitoring the progress of works ; Environmental Management Plans (PGE); social contract; signboards
	Company/Communities	Land preparation	Loss of community use areas and resources	23,75	Severe	Conserve buffer zones for community use areas	9	Moderate to severe	Before and during land preparation	Grievance/conflict resolution procedure; File monitoring the marking of community use areas; File monitoring the progress of works
	Company/Communities	Land preparation	Damage to soil and waterbodies	14	Severe	Check the monitoring of HCV areas during land preparation	8	Moderate to severe	Ongoing	Grievance/conflict resolution procedure; File monitoring the progress of works

## High Carbon Stock Approach

2 Mise en place d'infrastructures temporaires et permanentes du projet (routes, ponts, base-vie, bureaux, etc.)	Company/ Communities	Land preparation	Changes to diet	18,7 5	Severe	Monitor the establishment of social contracts in their role in compensating for asset losses of the communities	9	Moderate to severe	Ongoing	Social Management Plans (PGS); social contract; consultation platform
	Communities	Employment	Increased income for local communities from jobs in the operations	15	Important	Prioritise employment of locals and guarantee contracts, where adequately qualified			Ongoing	Payslips; contracts; worker register
	Employees/ Communities	Road construction	Improved accessibility to villages in the project area	18,7 5	Important	Ensure access of local communities to their villages and use areas and control access of outsiders			Ongoing	Access passes for local communities; entry protocols at concession entrance gates; register of entry-exits at gates; HSE committee
	Company/ Communities	Implement social programme	Establishment social contract and monitoring programme	17,5	Important	Monitor implementation of social programme and activities as defined in the social contract			Ongoing	Social Management Plans (PGS); social contract; consultation platform
	Company/ Employees	Waste generation	Waste generation and management	9	Moderate to severe	Monitor waste management across all operations in across the whole area			Ongoing	Environmental Management Plans (PGE); HSE procedures; Grievance/conflict resolution procedure; HSE committee; signboards
	Employees/ Communities	Health, worker and community safety	Health, worker and community safety	15	Severe	Monitor medical examinations when hiring workers and set up a sensitization program for local populations to health risks and other	8,2 5	Moderate to severe	Ongoing	Environmental Management Plans (PGE); HSE procedures; Grievance/conflict resolution procedure; HSE committee; social contract; programme to implement national health recommendations



## High Carbon Stock Approach

						common diseases in the project area				
	Company/ Communities	Controlled access to villages areas	Restriction of villagers' access to their land	12	Moderate to severe	Establish a system of access for communities to their land agreed with communities and specified in the social contract			Ongoing	Social Management Plans (PGS); social contract; Access passes for local communities; entry protocols at concession entrance gates; register of entry-exits at gates

### **3.A Supplemental information provided to peer reviewers**

*Note that this information will not be included in the public summary report.*

#### **3.3 Full Social Impact Assessment (if any)**

The completed Social Impact Assessment will be shared as a separate report.

### 3.4 Details of meetings held and findings

Summary of consultation and meetings held with communities before and during the assessment. *Note that final negotiation and development of social contracts for the villages directly impacted by the BB development have not yet been conducted and will only happen after approval of the HCV and HCS reports.*

Activities	Date	Actors	Place
Informing communities about the start of the HCV, HCS and ESIA studies	15 <sup>th</sup> May 2017	OPG	Departmental prefect, Benguie 4 a and b, Paris Bifoun 1 and 2, Bifoun 3, Eyameyong, Sayo, Ngouabilaghe, Samkita, Mbolani
Preliminary data collection related to HCV studies in villages and in the permit Bindo Bifoun	22 <sup>nd</sup> to 26 <sup>th</sup> May 2017	Proforest, OPG and TERE A	Mbolani, Bindo, Benguie 4, Paris Bifoun 1 and 2, Bifoun 3, Sayo, Eyameyong, Ngouabilaghe
Prospecting and data collection for participatory mapping	13 <sup>th</sup> to 18 <sup>th</sup> July 2017	Institut de Recherche en Ecologie Tropicale ( <b>IRET</b> )	Mbolani, Bindo, Makouke, Amanengone, Benguie 4 a & b, Bifoun Zangwal, Paris Bifoun 1 and 2, Eyameyong, Sayo, Ngouabilaghe, Bataillon, Fernand vaz, Maguiela
Site visit and communities information tour about the Bindo Bifoun permit project extension	22 <sup>nd</sup> to 23 <sup>rd</sup> July 2018	Direction Générale de l'Environnement and de la Protection de la Nature de ( <b>DGEPN</b> ) and TERE A	Paris Bifoun 1, Benguie 4 & b, Mbolani, Botinane, Bataillon, Fernand Vaz, Eyameyong, Ngouabilaghe
Explanation of CSDV (Comité de Suivi et de Développement Villageois) implementation	3 <sup>rd</sup> August 2017	Team CR&S OLAM	Ngosso, Nzamata, Lessobelina
Explanation of CSDV implementation	11 <sup>th</sup> August 2018	Team CR&S OLAM	Amanegone, Bindo, Mbolani
HCV data collection	25 <sup>th</sup> August to 5 <sup>th</sup> September 2018	Proforest	Permis Bindo Bifoun
Participatory maps validation with communities	28 <sup>th</sup> to 29 <sup>th</sup> November 2017	IRET	Mbolani, Bindo, Makouke, Amanengone, Benguie 4 a & b, Bifoun Zangwal, Paris Bifoun 1 & 2, Eyameyong, Sayo, Ngouabilaghe, Bataillon, Fernand vaz, Maguiela
Public consultation about Bindo-Bifoun project	16 <sup>th</sup> to 22 <sup>nd</sup> December 2017	DGEPN, TERE A, ADMINISTRATION , AUTORITES LOCALES AND OLAM	Akok, Afock bidzi, Ebel abanga, Rive droite, Bifoun centre, Akik lam, Bifoun 3, Bifoun zangwal, Massoui-eyen assi, Mbolani, Bindo, Makouke, Amanengone, Benguie 4 a & b, Bifoun zangwal, Paris Bifoun 1 and 2, Eyameyong, Sayo, Ngouabilaghe, Bataillon, Fernand vaz, Maguiela

## High Carbon Stock Approach

Participatory writing and explanation of communication procedures, dispute settlement proceedings, customary and statutory rights and priority hiring for communities	12 <sup>th</sup> to 13 <sup>th</sup> and 28 <sup>th</sup> December 2017	Team CR&S OLAM	Amanengone, Bindo, Mbolani, Makouke, Ngosso, Lessobelia, Nzamata
Establishment of the committee on gender and elimination of sexual harassment in the workplace	15 <sup>th</sup> December 2017	OLAM	Administrative pool Makouké
CSDV role and objective explanation	15 <sup>th</sup> to 16 <sup>th</sup> March 2018	Team CR&S OLAM	Mbolani, Bindo, Amanengone, Ngosso, Makouke, Nzamata, Lessobelia
Autorités locales-Populations-OLAM Tripartite concertation platform establishment	20 <sup>th</sup> March 2018	Meeting with CSDV members of every villages	Salle polyvalente de Makouke
Explanation of communication procedures, dispute settlement proceedings, customary and statutory rights and priority hiring for communities	27 <sup>th</sup> to 28 <sup>th</sup> March 2018	Team CR&S OLAM	Makouke, Amenegone, Mbolani, Lessobelia
Reminder about communication procedures, dispute settlement proceedings, customary and statutory rights and priority hiring	4 <sup>th</sup> to 5 <sup>th</sup> April 2018	Team CR&S OLAM	Nzamata, Ngosso, Bindo

Olam has also developed an FPIC action plan for future engagement as follows:

Steps	Expected results	Actions to be implemented	Date	Leaders
1	<b>Environmental and Social Impact Assessment (ESIA) validated</b>  <b>DEADLINE</b>  <b>31<sup>st</sup> May 2018</b>	<b>1.1. Environmental and Social Impact Assessment</b>  <b>1.2. Potential stakeholders information through press and other ways</b>	May 2018	DGE

## High Carbon Stock Approach

2	Inform potential stakeholders about FPIC process	2.1 Identify stakeholders	<i>April 2018</i>	Murielle and Stève
	DEADLINE	2.2 Inform local authorities about FPIC process (DGE, Eaux and Forêts, conseils départementaux, services agricoles andc.)	<i>April.2018</i>	Tatiana-Eboua/ Social team Makouké
	21 <sup>st</sup> April 2018	2.3 Inform local communities in every village impacted by FPIC process	<i>April.2018</i>	Tatiana- Eboua / social team Makouké
	DEADLINE	2.4 : Creating and keeping register about information requests, questions, claims, complaints in Olam office, Makouke sub-prefecture, Lambaréné prefecture, Ogooué and Lakes departmental board, in all impacted villages.	<i>April.2018</i>	Fatoumata and Social team Makouké
	DEADLINE	2.5 : Keeping of stakeholders listing, all communications and actions taken to address stakeholders' inputs	<i>Avril.2018</i>	Fatoumata and Social team Makouké
	A- Define in a participatory way modes of consultation, representation and negotiation.	2.6 : Land titles/ users rights publicly available (Criteria 1.2& 2.2).	<i>May 2018</i>	Fatoumata and Social team Makouké
	DEADLINE	3.1 : Identify consultation approaches in villages (monitoring committee permit Bindo-Bifoun)	<i>May 2018</i>	
	31 <sup>st</sup> May 2018	3.2 Steering committee establishment		Tatiana and Social team Makouké

## High Carbon Stock Approach

		3.3 : Participatory writing and validation of a consultation and communication process with communities.	May 2018	
3	<p>B- Participatory development of procedures</p> <p>DEADLINE June 2018</p>	<p>3.4 : Development with administration (Direction Provinciale des Eaux and Forêts) and participatory validation of a statutory and customary rights identification process</p> <p>3.5 : Development with administration (Direction Provinciale de l'Agriculture) and participatory validation of procedure for those entitled to indemnity and/or compensation</p> <p>3.6 : Negotiation procedure writing and participatory validation.</p> <p><i>Every procedure must, amongst others, list unacceptable and non-negotiable social impacts by parties (e.g., no sacred sites degradation, no population displacement, no food insecurity.....)</i></p> <p>3.7 Dispute settlement procedures development and participatory validation</p> <p>3.8: Inform communities about plantation projects expected impacts (based on ESIA), with adapted didactic tools ( images, photos etc.)</p>	<p>June 2018</p> <p>June 2018</p> <p>June 2018</p>	<p>Villages affected</p> <p>Olam and stakeholders</p> <p>Tatiana – Eboua /Fatoumata/ Social team Makouké</p> <p>DPEF/ Olam/ Comités de suivi</p> <p>Olam/ stakeholders</p>



## High Carbon Stock Approach

				Tatiana/ Social team Makouké
4	<p><b>Identify people and estimate assets under administrative compensations</b></p> <p>DEADLINE</p> <p><b>June 2018</b></p>	<p>4.1 : Identify farming owners, plantation, specific permits and pit-sawing and estimate in the field the indemnity amount</p> <p>4.2 : Inform beneficiaries about dissemination of legislation process (reminder of steps 3.3 &amp; 3.4)</p> <p>4.3 Indemnity of plantations owners</p>	<i>June 2018</i>	DPA/DPEF /Olam HVC
5	<p>Consultation and negotiation with local communities and stakeholders in the FPIC framework</p> <p>DEADLINE</p> <p><b>31<sup>st</sup> August 2018</b></p>	<p>5.1 : Negotiation through plenary meetings in all villages</p> <p>5.2 : Establish of specifications/procedures for all villages</p>	<i>August 2018</i>	Olam/ DPEF, DPA, DAP, DRS.
6	<p>Formalise contracts and agreements</p> <p>DEADLINE</p>	<p>6.1 : Negotiated agreements copies are available and indicate content process (requirements: Criteria 2.3, 7.5 and 7.6)</p>	<i>August 2018</i>	

## High Carbon Stock Approach

	<b>31<sup>st</sup> August 2018</b>	<b>6.2 : Process and results of all negotiated agreements and indemnity claims documented and published</b>  <b>6.3 : Public reading/notification and formalisation of agreements</b>		
--	------------------------------------	---	--	--

DPEF : Direction Provinciale des Eaux et Forêts, DPA : Direction Provinciale de l'Agriculture, DAP : Direction d'académie provinciale, DRS : Direction Régionale de la santé

### 3.5 Shape files of community land use maps

*Please provide separately.* Shapefiles to be provided.

## 4. High Conservation Value assessment

### 4.1 Summary and link to public summary report

The HCV assessment was conducted between March 2017 and January 2018, consisting of the pre-assessment (scoping) and full assessment phases. HCV assessments were previously commissioned for the BB concession by SIAT in 2007 and 2009, but Olam have commissioned a new HCV assessment to update the original assessments done before 2010 as required by the ALS.

This assessment was conducted as an integrated HCV-HCSA assessment to identify both HCV and HCS areas. This report follows the HCV-only reporting template, because the assessment was completed before the HCVRN and HCSA had developed HCV-HCSA report quality review procedures.

Overall, 3,736 ha of HCV areas were identified out of the BB concession of 5,488 ha. This includes 2,795 ha of final HCV1 and HCV4 management areas and an additional 941 ha of provisional HCV5 and HCV6 areas that are yet to undergo negotiation. These are shown in Figure 6.

The HCV assessment report is currently undergoing ALS quality review. The report was first submitted on 22/3/18, and is now back with the ALS after a first resubmission. Once approved by ALS the public summary report will be available [here](#). The draft report will be made available to the HCSA peer reviewer.

Table 4. Summary table of HCVA and HCVMA identified for the concession

Type of HCV	Status	Size (ha)
HCV1	Final MA	2,031.9
HCV4	Final MA	1,032.6
HCV5 Benguie4	Provisional (Pre-negotiation)	316.0
HCV5 Paris Bifoun 1	Provisional (Pre-negotiation)	381.2
HCV5 Paris Bifoun 2	Provisional (Pre-negotiation)	733.3
HCV5 Paris Bifoun 3	Provisional (Pre-negotiation)	17.9
HCV5 Bindo	Provisional (Pre-negotiation)	149.0
HCV5 Amanegone	Provisional (Pre-negotiation)	18.1
HCV6 old village buffer (Bindo)	Precautionary buffer zone	0.8
HCV6 old village buffer (Benguie 4ab)	Precautionary buffer zone	0.8
HCV6 old village buffer (Paris Bifoun 1)	Precautionary buffer zone	0.8
HCV6 sacred site buffer (Paris Bifoun 1)	Precautionary buffer zone	0.8
HCV6 sacred site buffer (Paris Bifoun 1)	Precautionary buffer zone	0.8
HCV6 sacred site buffer (Paris Bifoun 1)	Precautionary buffer zone	0.8
HCV6 sacred site buffer (Benguie 4ab)	Precautionary buffer zone	0.8
HCV6 sacred site buffer (Benguie 4ab)	Precautionary buffer zone	0.8
HCV6 sacred site buffer (Ngouabilaghe)	Precautionary buffer zone	0.8
HCV6 old village buffer (Ngouabilaghe)	Precautionary buffer zone	0.8
HCV6 old village buffer (Paris Bifoun 1)	Precautionary buffer zone	0.8
HCV6 old village buffer (Paris Bifoun 1)	Precautionary buffer zone	0.8
<b>Total (all HCVs – no overlap)</b>		<b>3,736.4</b>
<b>Total (Final HCV 1 &amp; 4 only – no overlap)</b>		<b>2,794.8</b>

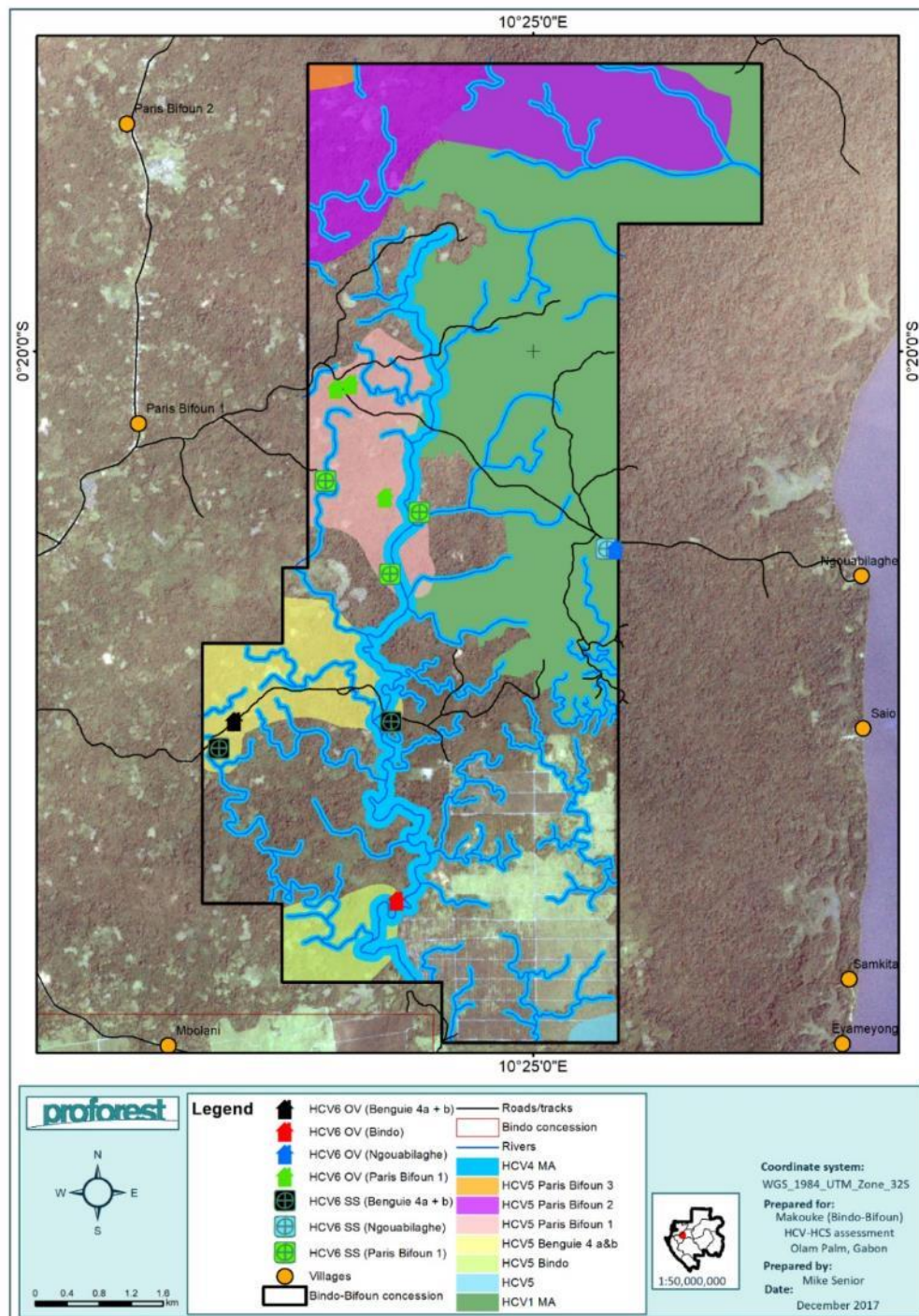


Figure 6. Map of final HCV1 and HCV4 MAs and provisional HCV5 and HCV6 areas. OV=Old village, SS=sacred site.

## 4.A Supplemental information provided to peer reviewers

Note that this information will not be included in the public summary report.

## 4.2 Full HCV report

The report will be provided.

## 5. Environmental Impact Assessment

*If there is no EIA, please explain why, or when it will be available. Note that in some countries, an EIA is not required for smaller sites.*

### 5.1 Summary

The summary findings from the integrated ESIA are presented in [section 3.3](#).

## 5.A Supplemental information provided to peer reviewers

*Note that this information will not be included in the public summary report.*

### 5.2 Full Environmental Impact Assessment (if any)

The report will be provided.

## 6. Land cover image analysis

### 6.1 Area of Interest and how it was defined

The BB concession is sandwiched between the Libreville-Lambaréné highway 1-2 kms to the west of the concession, the highway to the interior of Gabon 2-3 km north of the concession up to the Abanga river and the Ogooué River 2-3 kms to the east of the concession (Figure 7). This landscape (shown in purple below) is defined as the [Area of Interest \(Aoi\)](#) for the assessment given its distinct demarcation through anthropogenic and natural barriers.

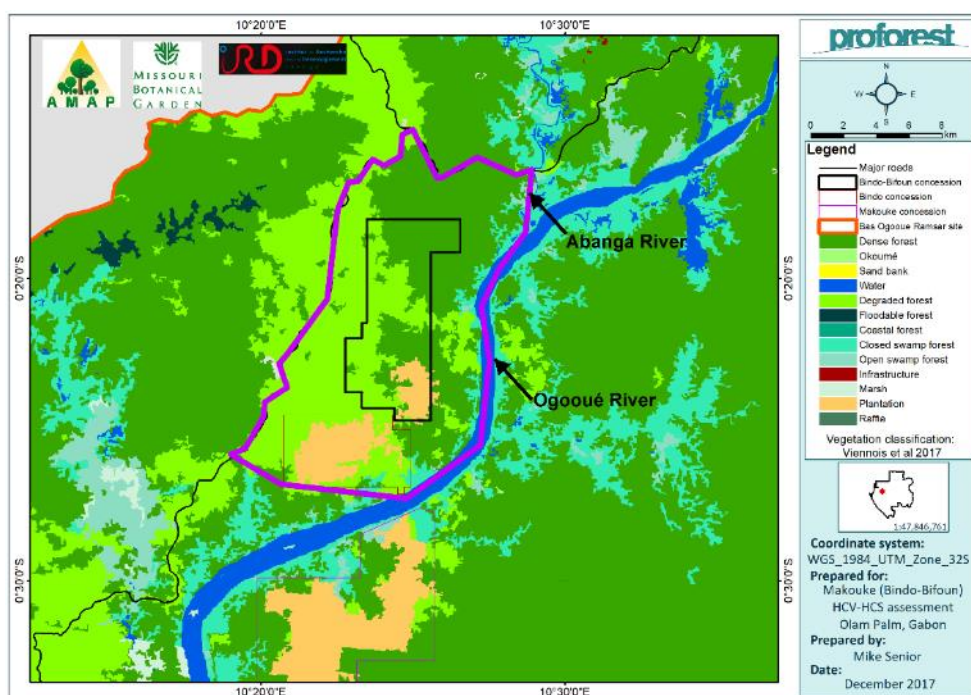


Figure 7. Wider landscape or Aoi for the assessment. Indicative Aoi is shown as a purple polygon

## 6.2 Description of images used for classification

### 6.3 Sample image

*Please provide one sample image of land cover (300 dpi).*

A preliminary land cover mapping of the proposed expansion site was produced using 3m resolution PlanetScope Ortho Tile Product (Level 3A, Figure 8) imagery purchased by Olam. The imagery was acquired on 08/01/17 and had already undergone pre-processing and radiometric enhancement.



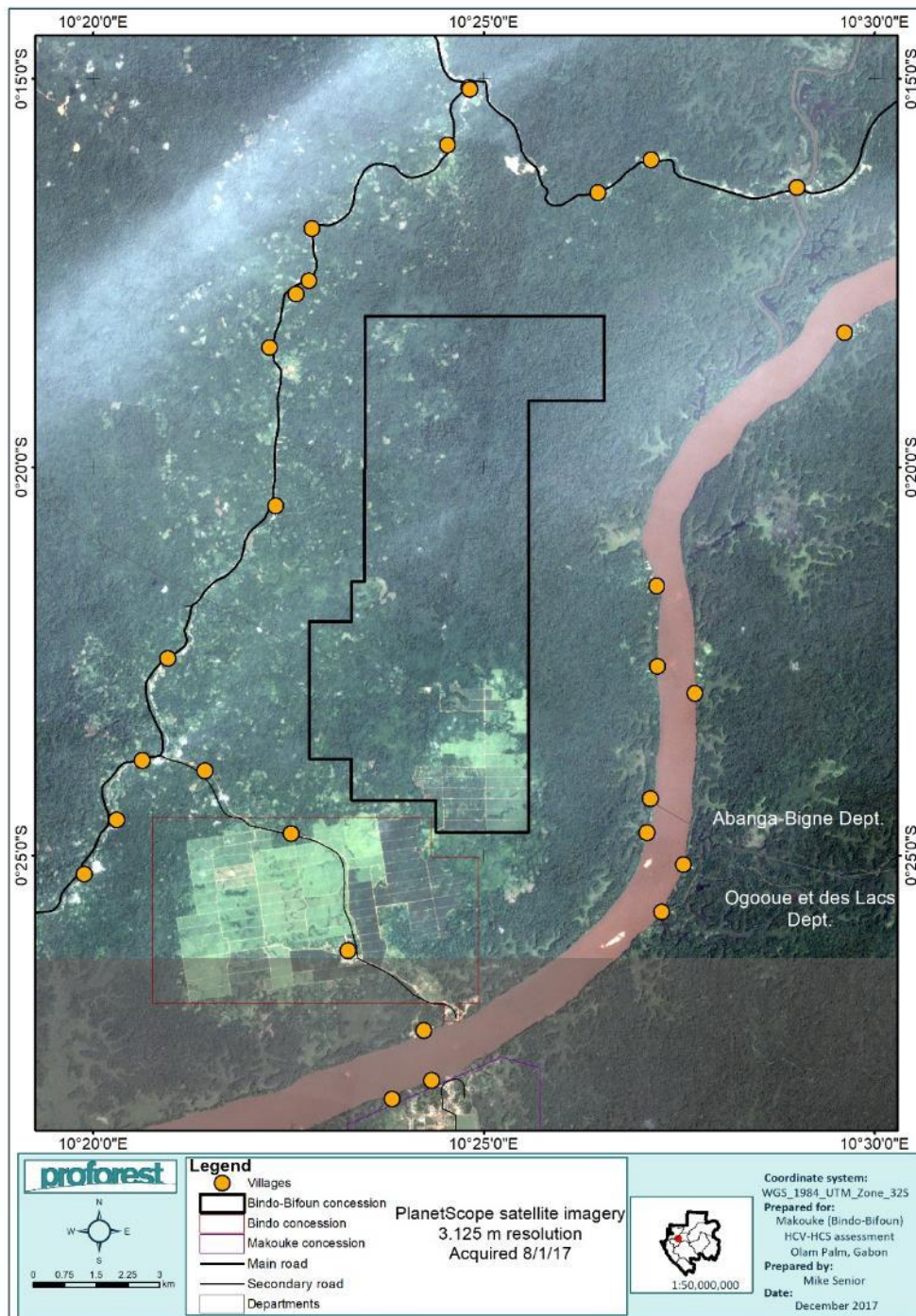


Figure 8. Sample for the Aol of the PlanetScope 3m imagery used for the classification

## 6.4 Method of stratification and software used

*Supervised, unsupervised, visual etc.*

The "Analytic" 4-band multispectral image was used for the **classification**, including Red, Green, Blue and Near-Infrared bands. Prior to the scoping study, the initial classification was done as a supervised pixel-based classification using ArcMap 10.5's Image Classification toolbar.

# High Carbon Stock Approach

This preliminary classification is shown in Figure 9 and was developed using the vegetation classes from the High Carbon Stock Approach<sup>5</sup>: Open land (OL), Scrub, Young Regenerating Forest (YRF), Low Density Forest (LDF), plantations and water.

Please note that a more accurate reclassification was done after the forest inventory during the full assessment, to incorporate this new information acquired during the field surveys. The new classification was done as an object-based classification using ArcMap 10.5's Segmented Mean Shift and Maximum Likelihood Classification function.

## 6.5 Map of initial vegetation classes, with legend

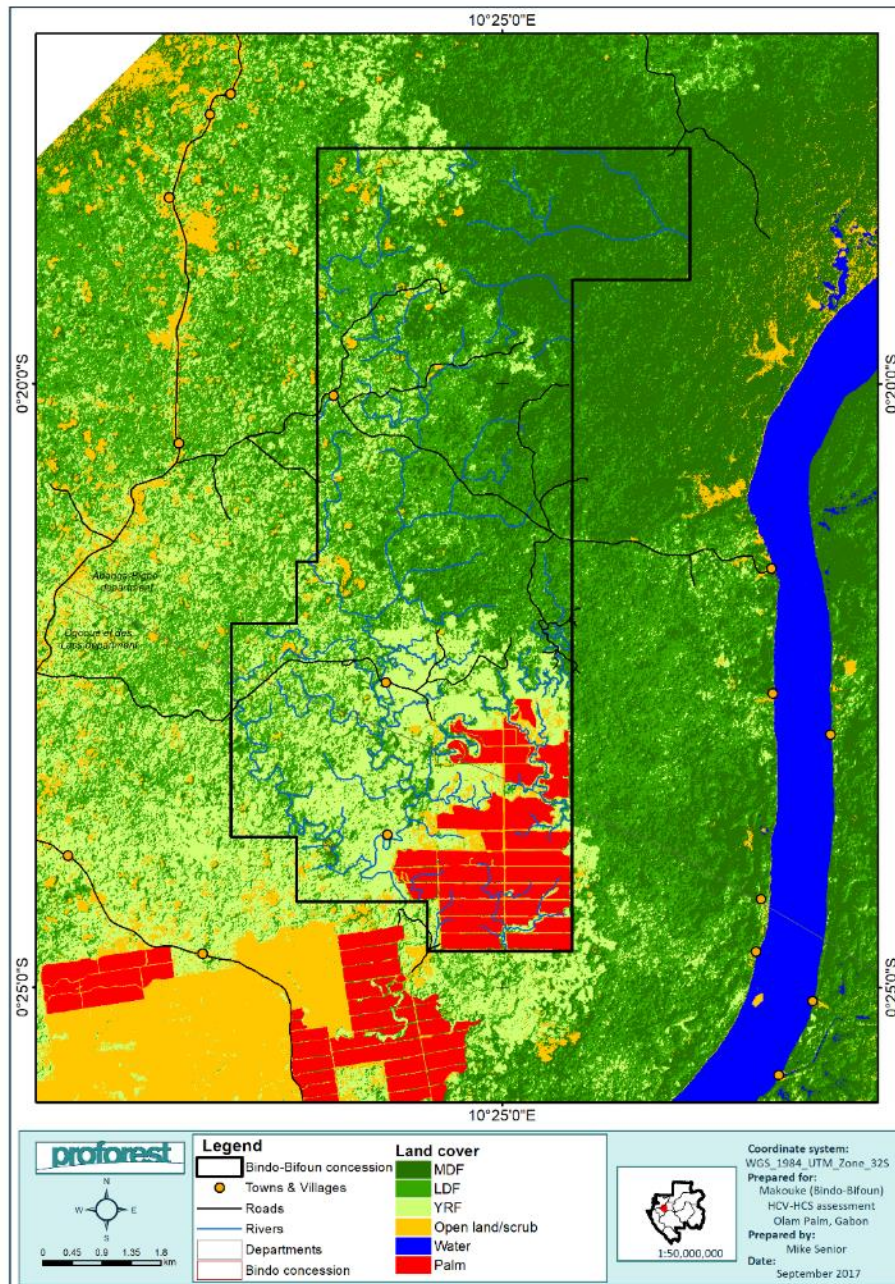


Figure 9. Preliminary land cover classification conducted before scoping study.

<sup>5</sup> <http://highcarbonstock.org/the-hcs-approach-toolkit>





# High Carbon Stock Approach

## 6.6 Table of total hectares per vegetation class

Preliminary classification:

Land cover class	Number of Hectares	% of total concession
Potential HCS classes:		
High Density Forest		
Medium Density Forest	1,363	24.8
Low Density Forest	2,077	37.8
Young Regenerating Forest	1,353	24.7
<b>Sub-total</b>	<b>4,793</b>	<b>87.3</b>
Non-HCS classes, e.g.:		
Scrub	195	3.6
Open Land	-	-
Mines, smallholder agriculture, plantation, etc.	498	9.1
<b>Sub-total</b>	<b>694</b>	<b>12.7</b>
<b>TOTAL</b>	<b>5,488</b>	<b>100</b>

Final classification:

Land cover class	Number of Hectares	% of total concession
Potential HCS classes:		
High Density Forest		
Medium Density Forest	2,065.4	37.6
Low Density Forest	1,874.5	34.2
Young Regenerating Forest	821.9	15.0
<b>Sub-total</b>	<b>4,761.8</b>	<b>86.8</b>
Non-HCS classes, e.g.:		
Scrub	307.9	5.6
Open Land	70.6	1.3
Mines, smallholder agriculture, plantation, etc.	346.9	6.3
<b>Sub-total</b>	<b>725.4</b>	<b>13.2</b>
<b>TOTAL</b>	<b>5,488</b>	<b>100</b>

## 6.7 Summary of which areas are potential HCS forest, subject to further analysis

The forest is fully contiguous in the BB concession (including through riparian forest) meaning that even after applying the provisional patch analysis **all forest of YRF** or higher is considered as potential HCS.

## 6.A Supplemental information provided to peer reviewers

*Note that this information will not be included in the public summary report.*

## 6.8 Images, with sufficient resolution to re-do analysis

*Please provide separately and include geo-coordinates.*

## 7. Forest inventory results

### 7.1 Inventory sample design and plot rational

The forest inventory was carried out by IRET in the field from 23th August to 6<sup>th</sup> September 2017, consisting of two main survey methodologies: 1) systematic forest inventory plots also used for the High Carbon Stock assessment, and 2) opportunistic habitat observations taken during fieldwork.

A pre-classification of the vegetation was done to pre-identify the main vegetation types in the concession and inform the sampling methodology. The classification followed the HCSA methodology<sup>6</sup>. The HCSA methodology was designed for use in low-medium forest cover contexts, but was used for this assessment because Olam wished to understand the applicability of the HCSA methodology in a high forest cover context like Gabon, and compare with the national approach that has been used in other Olam concessions so far – informed by a national-level analysis of carbon stock (Burton 2017).

The classifications revealed that virtually all of the concession is considered HCS forest under the HCSA methodology, even areas of near monospecific stands of Musanga regrowth of <10 years old – considered by most Gabonese stakeholders to be of little to no conservation value. Explanation of how the results of the HCSA assessment were used are given elsewhere

Although the sampling design was developed based on the original pre-classification, the plot locations are shown overlaid (Figure 11) with the new (final) classification because it better represents the forest strata and quality in the BB concession. Six different classes were identified in the final classification: Medium Density Forest (MDF), Low Density Forest (LDF), Young Regenerating Forest (YRF), Scrub (S), Open land (OL) and Oil palm. This classification system is not widely used in Gabon and so it was also aligned with locally relevant classes (alignment is given in Table 5).

The sampling design for the forest inventory plots was developed using the preliminary classification and following the HCSA methodology. 99 plots were established spanning the four main forest classes identified in the preliminary classification (Table 5).

The intended methodology was to establish inventory plot locations based on an initial stratified grid (1x1 km) of 33 points (purple circles in Figure 11) designed to cover the range of vegetation types in the concession. Each grid point was assigned to a vegetation class and in the field between 2-4 independent forest inventory plots were established around each grid point. Exact plot locations were semi-randomly chosen by the field team to be placed in the pre-assigned forest type, and to be at least 200m apart.

The final methodology used in the field differed from the original plan due to: 1) inaccuracies of the original classification that made it impossible to sample the intended vegetation classes, 2) the need

---

<sup>6</sup> (High Carbon Stock Approach Steering Group 2017)

# High Carbon Stock Approach

to sample Parasolier 'forest' formations in the south-eastern part of the concession that were not originally covered in sampling grid, and 3) delays resulting from the time taken to cut paths through dense scrub in western parts of the concession.

As a result of the above, the team decided in the field to modify the original methodology in order to be able to gain adequate coverage of the main vegetation classes in the concession within the available time. The final sampling approach is explained in full detail Annex 3 of the HCV report.

Table 5. Sampling plots per land cover class (based on final classification)

Land cover class (HCSA classification)	Land cover class (Gabonese forest classification system)	Number of forest inventory plots
MDF	Old secondary forest	39
LDF	Young secondary forest	34
YRF	Parasolier formation (regrowth 5-15 years)	21
Scrub	Fallow/ 'Jachere' (<5 years)	3
Open land	Open land	2

12.61 m radius circular plots were used for the forest inventory as required by the HCSA (Figure 10). Identification was done using the 'Guide d'identification des arbres de la Guinée Equatoriale' (Wilks and Issembe 2000). Diameter at breast height (DBH) was measured using dendrometer tapes at 1,30m above ground; or 50 cm above deformity, buttress or stilt roots.

# High Carbon Stock Approach

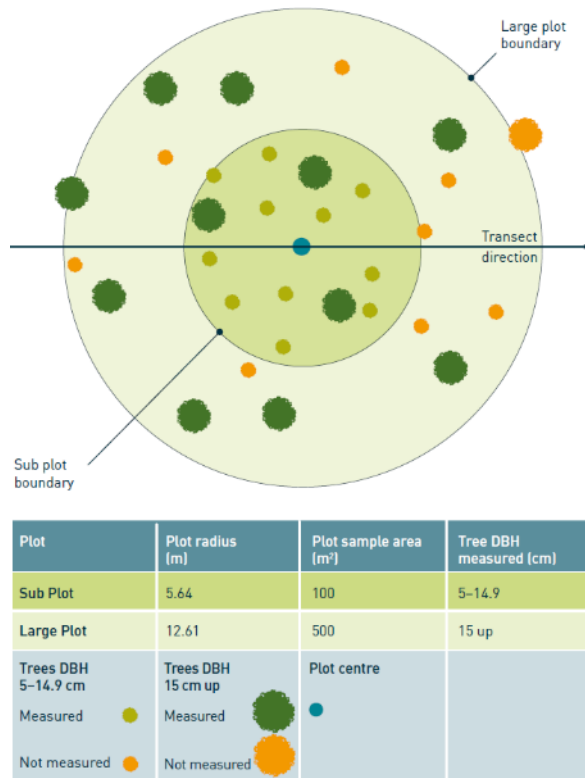


Figure 10. HCSA forest inventory plot design.



## 7.2 Map indicating plots

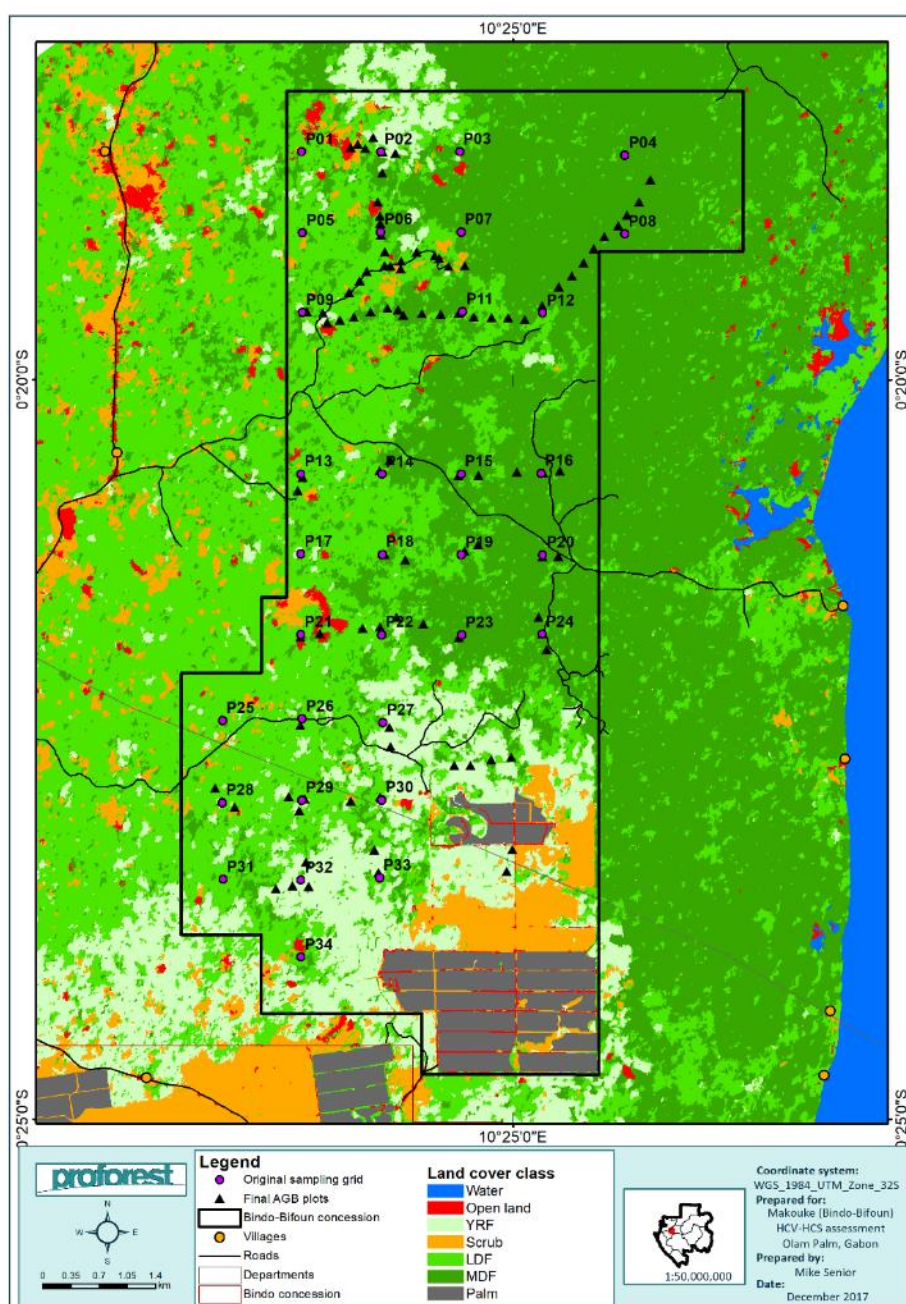


Figure 11. Corrected, final land cover classification for the BB concession, overlaid with the location of originally proposed sampling grid points (purple circles), and final locations of forest inventory plots (black triangles).

## 7.3 Forest inventory team members and roles

Name	Organisation	Role
Dr. Mike Senior	Proforest	HCS lead and supervisor
Prof. Alfred Ngomanda	IRET/CENAREST	Lead and quality control (desk-based)

# High Carbon Stock Approach

<b>Prof. Judicaël Lebamba</b>	IRET	Field coordinator
<b>Yves Issembe</b>	Herbier National du Gabon	Botanist, para taxonomist

In addition to the named team members above, the team was assisted by 2 data recorders from IRET responsible for populating datasheets, and 3 field assistants from local villages responsible for transect cutting and plot preparation.

## 7.4 Methodology used for forest sampling

In addition to the application of the HCSA forest inventory protocol to record tree identity (to species level) and DBH at breast height the following habitat data were also recorded at each plot:

- Forest type based on Gabonese classification (mature secondary, young secondary, 'jachere'/fallow)
- Canopy opening (%)
- Dominant taxa in the shrub and herbs layers
- Understorey closure (%)
- Five photos orientated in turn to the north, south, east and west, and to the canopy were taken
- All plot locations were georeferenced.

The following floristic analyses were conducted:

- Species or family dominance was measured through Importance Value Index (IVI) that combines several botanic parameters (relative density, relative dominance, relative frequency), and determines importance of a species or family, within a vegetation, compared to all other species and families (Cottam et Curtis, 1956)
- Species richness in the BB concession was estimated with either Shannon's index, either Simpson's index or Fisher's index  $\alpha$  (Fisher et al 1943) depending on sampling effort.
- Vegetation structure parameters: Tree density (trees/ha) and basal area (m<sup>2</sup>/ha) of every tree species.

The presence and approximate distribution of Rare, Threatened and Endangered (RTE) and endemic species was assessed, based on forest class associations of different species. Endemism was assessed by comparing to established floral references<sup>7</sup>. Phytogeographic classes used to characterise species distribution are:

- Endemic species in Gabon (GAB)
- Sub-endemic species in Gabon which are species having at least 80% of their distribution in Gabon (SGA)
- Endemic species in Domaine Bas Guinéen (DBG)
- Species from Guinéo-Congolaise region (RGC)
- Widely distributed species in Africa (LD).

---

<sup>7</sup> Check-list des plantes vasculaires du Gabon (Sossef et al. 2006) and vegetation inventories reports done by MBG in the Bas-Ogooué region



# High Carbon Stock Approach

RTE species were identified based on the IUCN Red List<sup>8</sup> and decree N°0137/PR/MEFEPA of 4<sup>th</sup> February 2009 of Gabonese Republic related to conservation of tree species in Gabon.

## 7.5 Methodology used for carbon calculations

Species-specific wood density was derived from World AgroForestry database and Zanne et al 2009<sup>9</sup>. Total aboveground forest biomass in each plot was calculated with the most recent pantropical allometric equation (Chave et al., 2014), as recommended by Prof Ngomanda as the most accurate for this forest type and location in Gabon.

## 7.6 Indicative photos of each vegetation class

5 images (N,S,E,W, and canopy views) per class.

*Medium density forest*

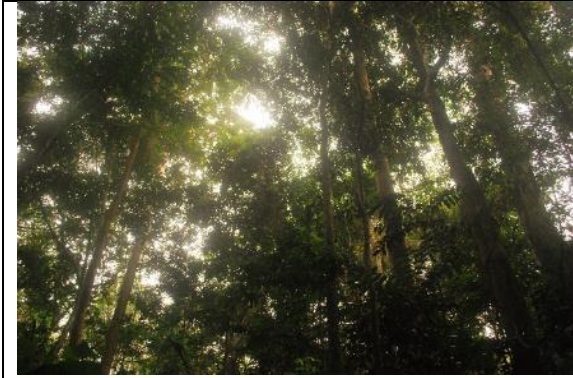


<sup>8</sup> <http://www.iucnredlist.org>

<sup>9</sup> Zanne, et al 2009. Global wood density database. Dryad. Identifier: <http://hdl.handle.net/10255/dryad.235>.



## High Carbon Stock Approach



*Low density forest*





## High Carbon Stock Approach



*Young regenerating forest*





## High Carbon Stock Approach



*Scrub*



## High Carbon Stock Approach



*Open land*





# High Carbon Stock Approach

## 7.7 Statistical analysis (allometric used, confidence tests, justification)

Statistical analyses were conducted using the R statistical software (v3.5.0). ANOVA tests were used to test for **statistical differences between the carbon stock of the land cover classes**. The test revealed significant differences between land cover classes. Results are presented here:

	Sum Sq	Mean Sq	Df	F value	Pr(>F)
<b>Land cover class</b>	444368	111092	4	9.0622	<0.0001
<b>Residuals</b>	1152335	12259	94		

## 7.8 Summary of statistical analysis of carbon stock results per vegetation class

Please fill out the table below.

**Table: Summary of statistical analysis of carbon stock results per vegetation class**

Land cover class	Number of Plots	Stems per hectare	Basal Area (m <sup>2</sup> /ha)	Average Carbon Stocks	Standard error of the mean	Confidence limits (90%)	
						Lower	Upper
Open Land	2	-	-	-	-	-	-
Scrub	3	453	3.8	8	15	-21.6	37.7
Young Regenerating Forest	21	885	21.3	47	15	17.6	76.6
Low Density Forest	34	651	21.5	73	26	21.7	124.4
Medium Density Forest	39	515	31.3	192	49	95.5	287.6

Additional forest structure variables:

LC class	Canopy cover (%)*	% stems Parasolier ( <i>Musanga sp</i> )	Mean DBH (cm)
<b>Open land</b>	0	-	-
<b>Scrub</b>	10	8	6
<b>YRF</b>	22	72	20
<b>LDF</b>	17	50	22
<b>MDF</b>	26	12	28

# High Carbon Stock Approach

\*Note that canopy cover values appear to have been biased by the data recorder. Although the forest was relatively open in the area – the values appear abnormally low so should only be taken as relative indicators not absolute values.

## 7.9 Forest inventory results

Please fill out the table below.

**Table: Forest inventory class**

Land cover class	Average carbon value	Physical description of the land cover, e.g. species mix, forest type (pioneer, regenerating, primary etc.), diameter distribution, structural indices, maturity indices, etc.
Open Land	0	<ul style="list-style-type: none"> <li>Bare soil or grasses, piper, parasoliers</li> <li>Recently cleared (&lt;1 yr)</li> <li>May include some village plantations</li> </ul>
Scrub	8	<p><b>Dominant tree species:</b></p> <ul style="list-style-type: none"> <li>Very few trees &gt;5cm DBH</li> <li>Any trees present are pioneers (Parasolier, Macaranga)</li> </ul> <p><b>Understorey species:</b></p> <ul style="list-style-type: none"> <li>Grasses, piper, parasoliers, (Mucuna in places)</li> </ul> <p><b>Comments:</b></p> <ul style="list-style-type: none"> <li>Very young fallow regrowth (&lt;5 yrs)</li> <li>May include some village plantations</li> </ul>
Young Regenerating Forest	47	<p><b>Dominant tree species:</b></p> <ul style="list-style-type: none"> <li>Almost 100% Parasoliers (&amp; Macaranga)</li> <li>Near monospecific, very low tree diversity</li> </ul> <p><b>Understorey species:</b></p> <ul style="list-style-type: none"> <li>Afromomum, young parasoliers, Haumania</li> </ul> <p><b>Comments:</b></p> <ul style="list-style-type: none"> <li>Youngish fallow regrowth (5-15 yrs)</li> <li>No large trees, but more smaller stems and typically more closed canopy than LDF</li> </ul>
Low Density Forest	73	<p><b>Dominant tree species:</b></p> <ul style="list-style-type: none"> <li>Still high frequency of pioneers/parasoliers but fewer, larger stems</li> <li>More slower growing and slightly more shade-tolerant pioneer species (e.g. Okoume) taking over from Musanga</li> </ul> <p><b>Understorey species:</b></p> <ul style="list-style-type: none"> <li>Afromomum, young parasoliers, some Marantaceae</li> </ul> <p><b>Comments:</b></p> <ul style="list-style-type: none"> <li>Higher canopy than YRF but more open</li> <li>Mix of old fallow regrowth &amp; some logged areas</li> <li>Includes some fallow regrowth where large trees left standing</li> </ul>
Medium Density Forest	192	<p><b>Dominant tree species:</b></p> <ul style="list-style-type: none"> <li>Okoume, Dichostemma, Diospyros, Xylopia, Irvingia</li> <li>Very few pioneers/parasoliers</li> <li>Not true climax sp (Caesalpinaceae etc)</li> </ul> <p><b>Understorey species:</b></p> <ul style="list-style-type: none"> <li>Marantaceae</li> </ul> <p><b>Comments:</b></p>

# High Carbon Stock Approach

- Mostly logged >20 yrs ago
- Ranged from old 2o to near primary pockets

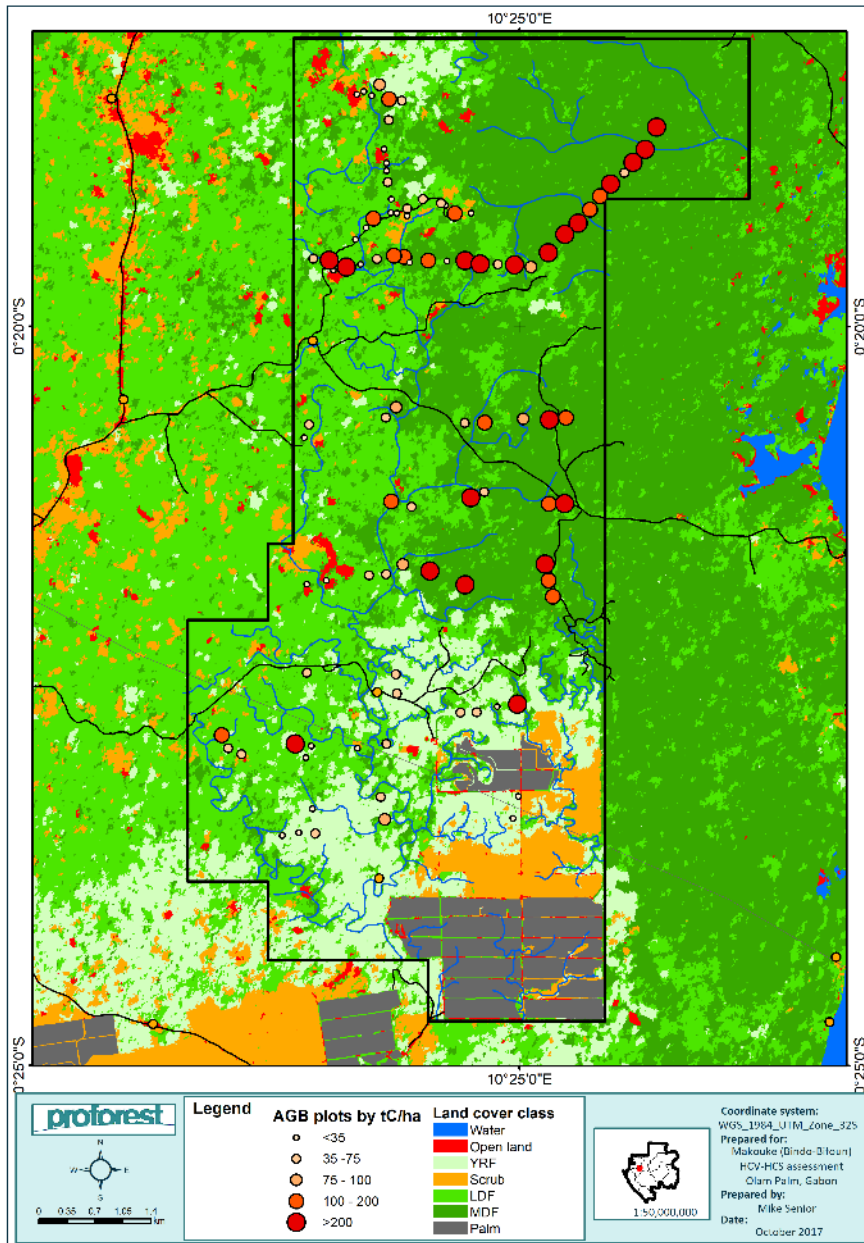


Figure 12. Forest inventory plots coded by carbon stock (tC/ha). Larger, redder plots have higher C stock

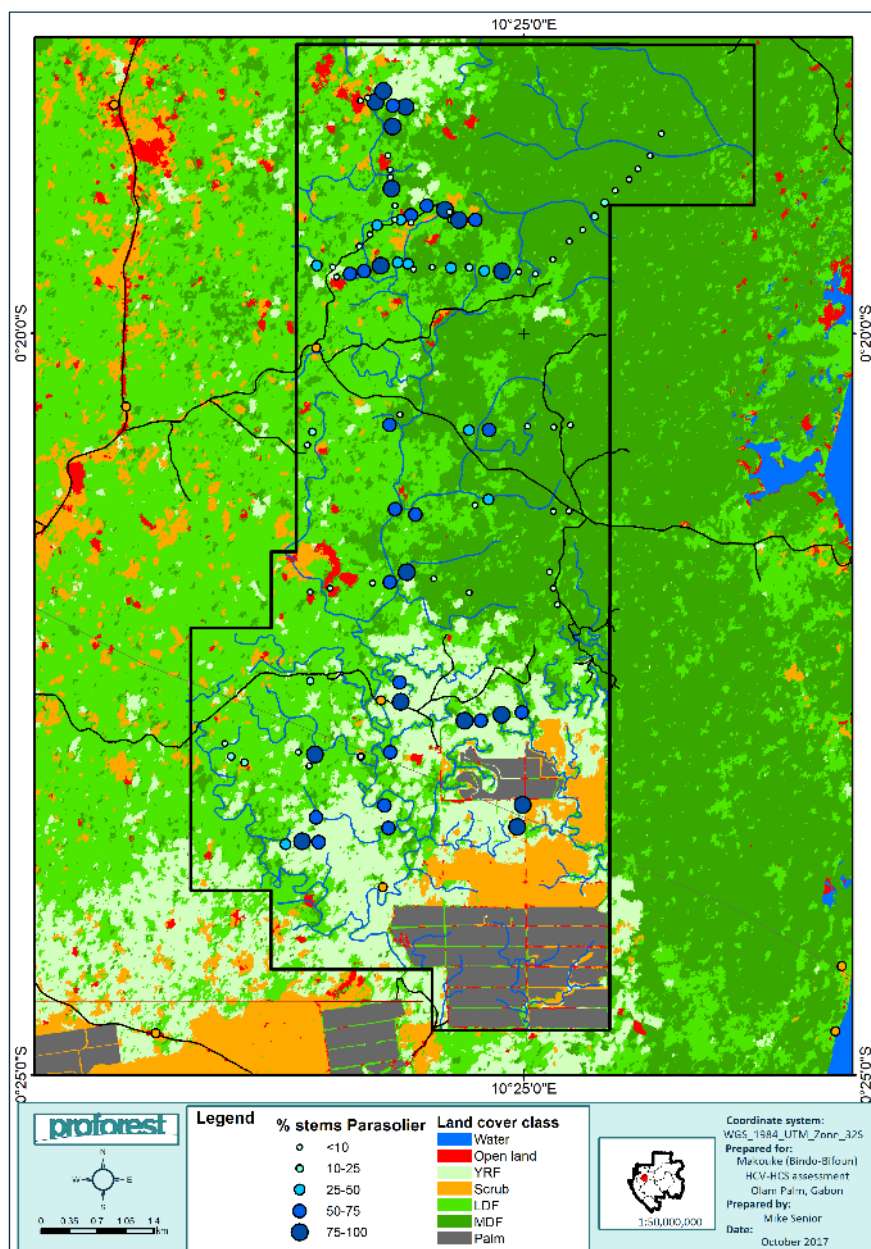


Figure 13. Forest inventory plots coded by % of Parasolier stems. Larger, bluer plots have more Parasolier stems

## 7.A Supplemental information provided to Peer Reviewers

Note that this information will not be included in the public summary report.

### 7.10 Complete forest plot data

Please provide separately.

## 8. Land Cover Classification

### 8.1 Refined land cover map with title, date, legend and any HCS forest patches identified

The main change made in the reclassification was to update the classification as an object-based classification and to better reflect the distribution of fairly large areas of near monospecific stands of



*Musanga* sp in the concession – these represent Young Regenerating Forest. Most of these stands are areas in the southeastern part of the concession where land was originally cleared for planted by SIAT approximately 7-11 years ago but was never then planted with oil palm and hence regrew. Other smaller misclassifications were also corrected (such as where scrub had been misclassified as oil palm or vice-versa).

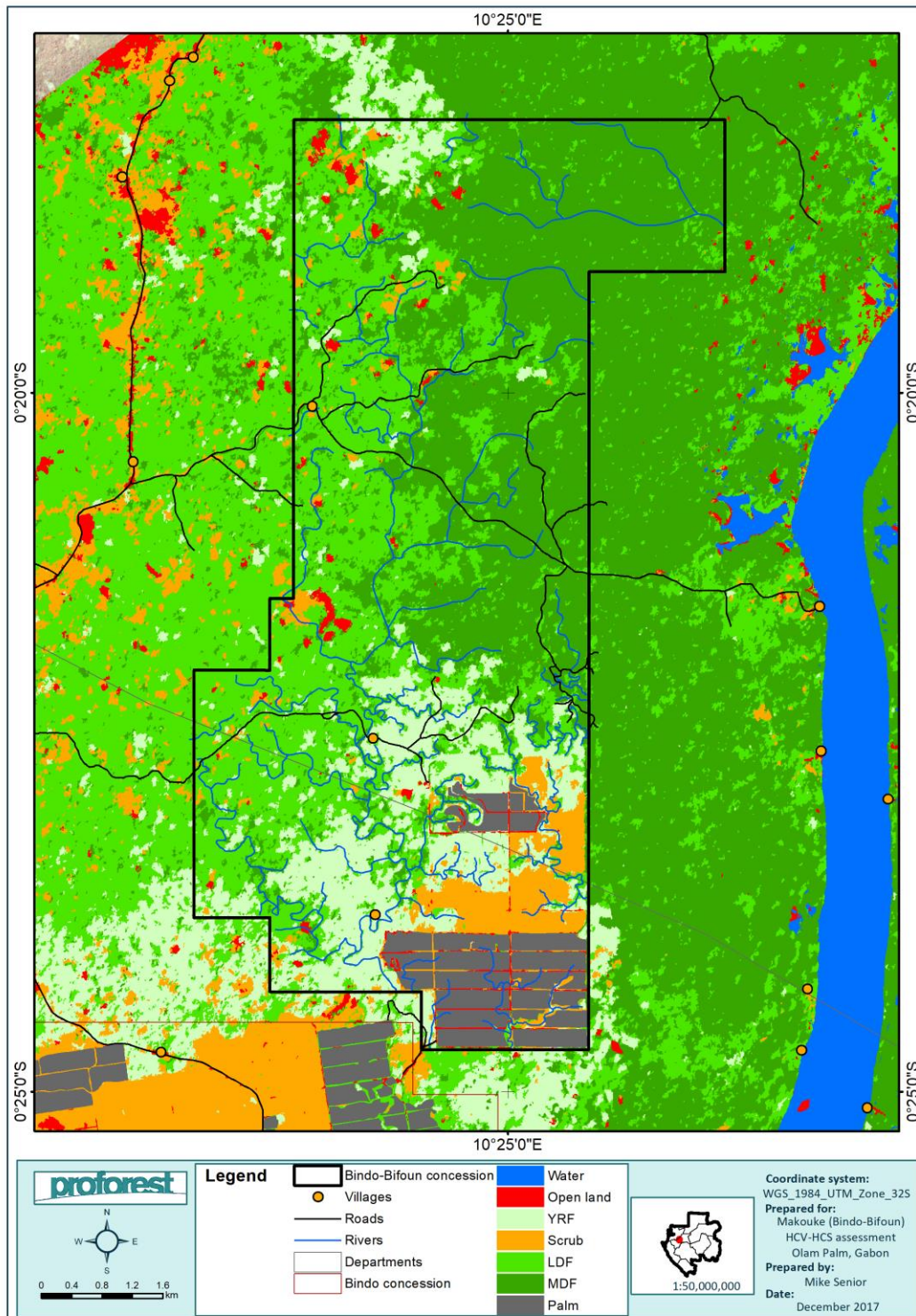


Figure 14. Final, corrected land cover classification

*Note that an additional classification was conducted for the BB concession using the draft Gabonese definition of high carbon stock forest. The methodology and results of this classification are presented in Annex 1.*

## 8.A Supplemental information provided to Peer Reviewers

### 8.2 Shape files of land cover map and forest patches

*Please provide separately. Each patch must be numbered using the GIS coordinates of the center of the patch.*

## 9. Patch Analysis Result

### 9.1 Results of Decision Tree

Note that there were also a number of very small HCS patches <1 ha in size with no core, that are also connected to the main HP patch. These are not listed here for brevity but are included in the shapefile of HCS forest.

Patch number (FID)	Total area (ha)	Of which core (ha)	Priority (Low-LP, Medium-MP, High-HP)	Description of Decision Tree results
1 (419)	4734	3670	HPP	HCS forest to conserve.
2 (207)	1.38	0	Low (no core)	Conserve: connects to HPP
3 (276)	1.07	0	Low (no core)	Conserve: connects to HPP



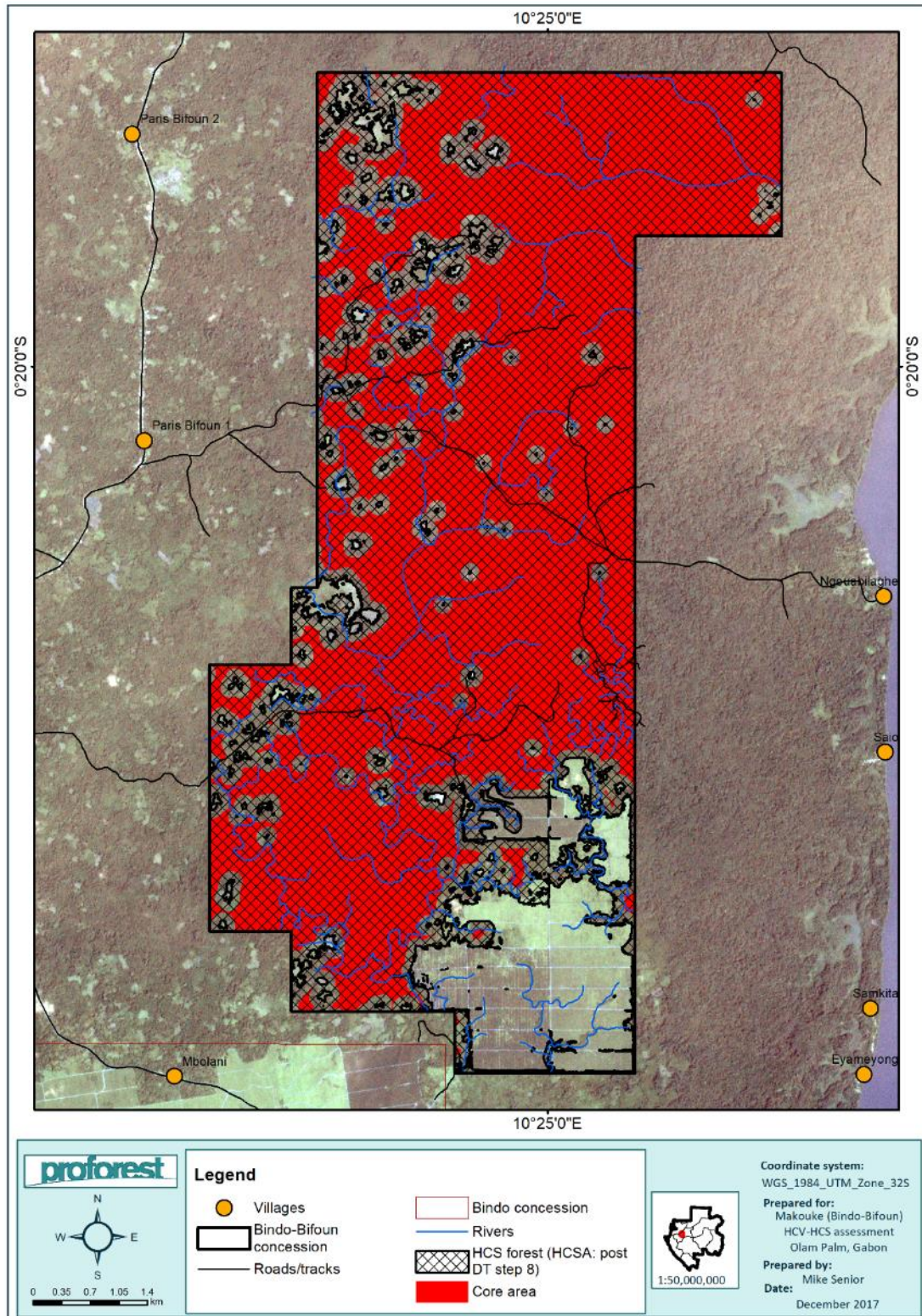


Figure 15. Results of patch analysis for the BB concession and Aol.

## 9.2 Comments on Decision Tree outcome

Including pre-RBA and RBA results. For any RBAs, describe the methodology used and results per patch

All of the HCS forest in the Aol (concession) is contiguous (or connected within 200 m) meaning that



no pre-RBA or RBA is required. The only exception is for some negligibly small patches <0.1 ha that were removed during the patch analysis.

## 10. Indicative Land Use Plan

### 10.1 Summary of results of final ground verification (if any)

This assessment was conducted as an integrated HCV-HCSA assessment and so RBA and ground checks were integrated with the HCV assessment. Final ground verification pre-development will be conducted with HCV teams accompanying the clearance teams (as in line with Olam's SOPs) – but this will only be done on agreement of final HCSA areas (e.g. in line with a potential Gabon approach or legacy case).

### 10.2 Final HCS map

*Through Step 11 of the Decision Tree*

# High Carbon Stock Approach

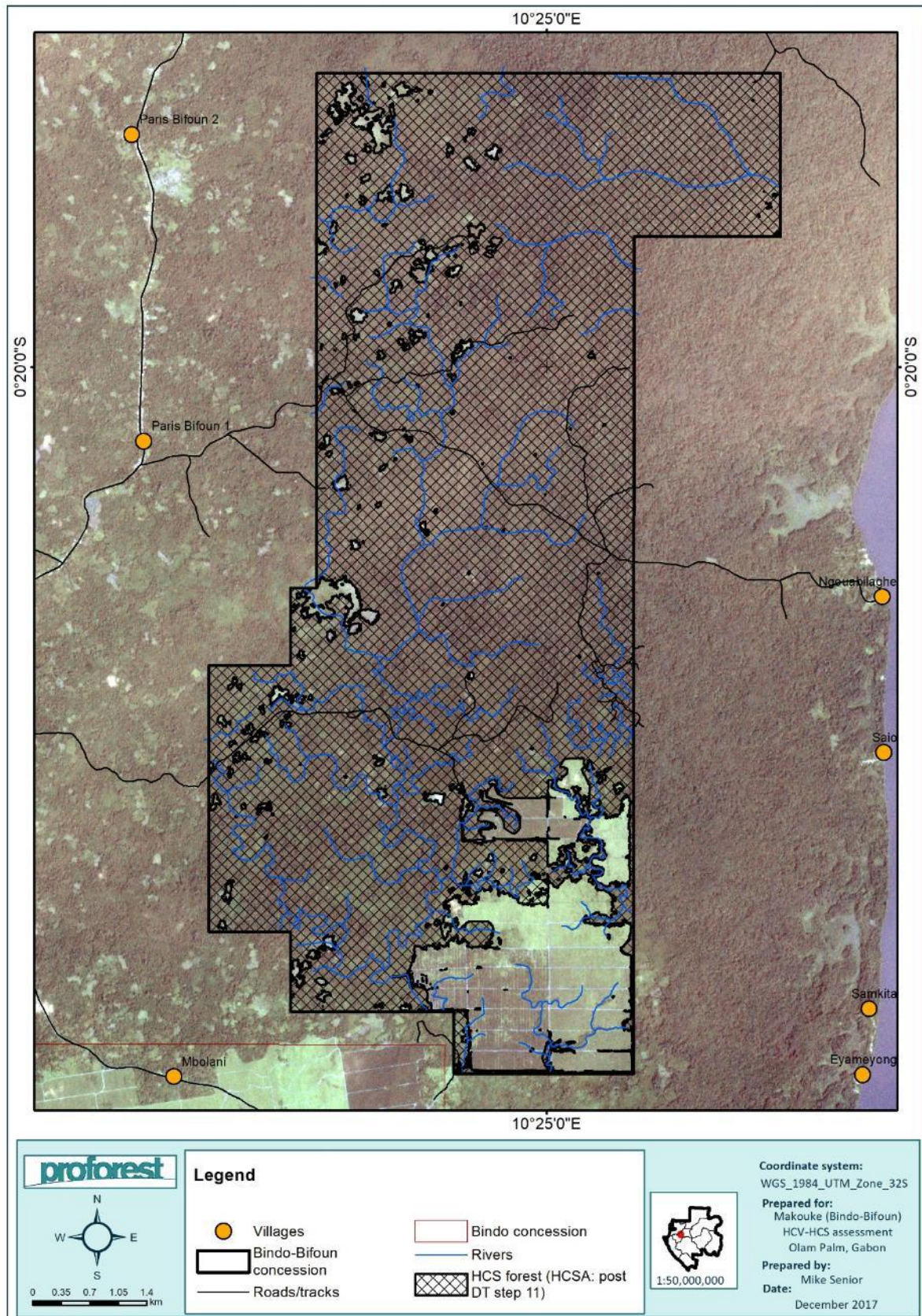


Figure 16. Final HCS forest after DT step 12 but pending potential future revision pending Gabon HCS agreement or legacy case procedure (if applied)



## 10.3 Overview of forest conservation management and monitoring activities to be included in the Conservation and Development (land use) Plan

All HCV Management Areas (MA) and provisional HCSA areas are shown below. Note that the HCV1 MA is considered final, the HCV4 MA are provisional (subject to updated mapping of rivers and streams by Olam), and HCV5 areas are subject to negotiation with Olam. The HCS forest area will not be developed at present, pending agreement on an 'adapted' Gabon-relevant HCS approach endorsed by national stakeholders and the RSPO. For full details of proposed HCV management and monitoring recommendations refer to the HCV assessment report.

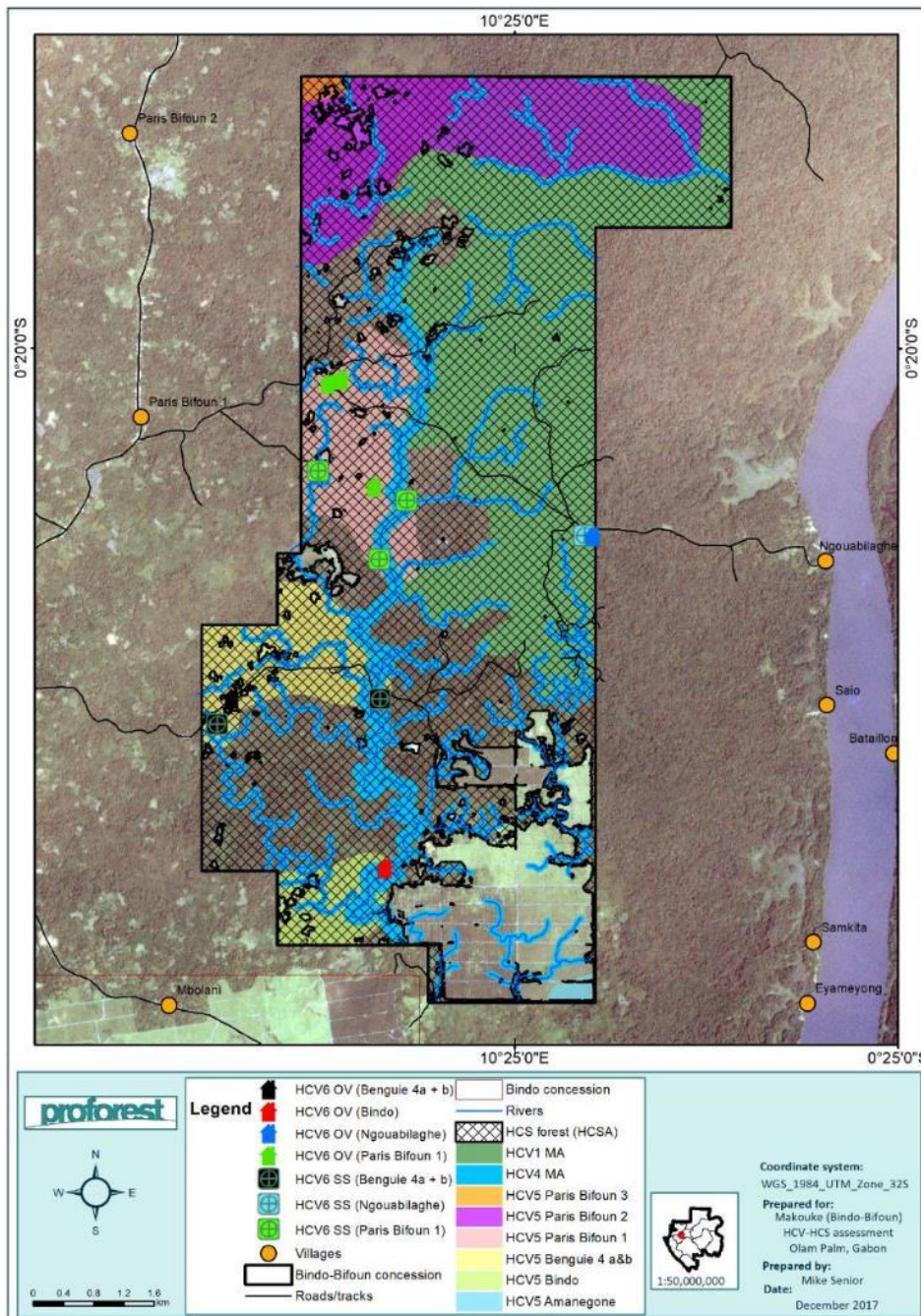


Figure 17. Map of final HCV1, provisional HCV4 MAs, HCV5, HCV6 areas, and HCS forest (provisional pending potential Gabon agreement or legacy case, if applied). OV=Old village, SS=sacred site.

# High Carbon Stock Approach

## 10.4 List of activities still to be carried out before Conservation and Development Plan can be finalised

**At present Olam will only provisionally develop non-HCSA and non-HCV areas – in line with Figure 17. This may be subject to change in the next year if an ‘adapted’ Gabon-relevant HCS approach (see Annex 1) is agreed or if this case is considered as a legacy case by HCSA.**

This interim agreement presented some challenges in terms of consultation and communication with local villages around the BB concession. Given the numerous times that the BB concession has changed hands over the past decades (AgroGabon, PalmHevea, SIAT, Olam), there is high degree of consultation fatigue and frustration amongst the villages regarding changing social agreements and development plans. For this reason, and the fact that the ‘final’ developable area may change based on an agreement of an ‘adapted’ Gabon-relevant HCS approach (see Annex 1), it was decided that:

1. The HCV assessment team (Proforest and Terea) would only present the results of the HCV assessment to villages for the final consultation meetings, and
2. Olam’s social team will communicate to each of the villages, as part of ongoing FPIC discussions and during the pre-development negotiation of social contracts, that Olam will initially only be developing a subset of non-HCSA and non-HCV areas. This will involve communicating to villages:
  - a. Maps of the initial development area (Figure 17),
  - b. General reasons for this ‘phased’ approach, and
  - c. Indicative timelines for possible further development.
3. Once there is final agreement on the HCS areas (after an agreement of an ‘adapted’ Gabon-relevant HCS approach), Olam will need to finalise an Integrated Conservation and Land Use Plan (ICLUP) in line with HCSA requirements.

The current list of HCV and HCS areas as shown in Figure 17 are provided below:

**Table 6. List, status and size of current HCV and HCS areas.**

Type of HCV or HCS	Status	Size (ha)
HCV1	Final MA	2,031.9
HCV4	Final MA	1,032.6
HCV5 Benguie4	Provisional (Pre-negotiation)	316.0
HCV5 Paris Bifoun 1	Provisional (Pre-negotiation)	381.2
HCV5 Paris Bifoun 2	Provisional (Pre-negotiation)	733.3
HCV5 Paris Bifoun 3	Provisional (Pre-negotiation)	17.9
HCV5 Bindo	Provisional (Pre-negotiation)	149.0
HCV5 Amanegone	Provisional (Pre-negotiation)	18.1
HCV6 old village buffer (Bindo)	Precautionary buffer zone	0.8
HCV6 old village buffer (Benguie 4ab)	Precautionary buffer zone	0.8
HCV6 old village buffer (Paris Bifoun 1)	Precautionary buffer zone	0.8
HCV6 sacred site buffer (Paris Bifoun 1)	Precautionary buffer zone	0.8
HCV6 sacred site buffer (Paris Bifoun 1)	Precautionary buffer zone	0.8
HCV6 sacred site buffer (Paris Bifoun 1)	Precautionary buffer zone	0.8
HCV6 sacred site buffer (Benguie 4ab)	Precautionary buffer zone	0.8

## High Carbon Stock Approach

HCV6 sacred site buffer (Benguie 4ab)	Precautionary buffer zone	0.8
HCV6 sacred site buffer (Ngouabilaghe)	Precautionary buffer zone	0.8
HCV6 old village buffer (Ngouabilaghe)	Precautionary buffer zone	0.8
HCV6 old village buffer (Paris Bifoun 1)	Precautionary buffer zone	0.8
HCV6 old village buffer (Paris Bifoun 1)	Precautionary buffer zone	0.8
<b>All HCVs (no overlap)</b>		<b>3,736.4</b>
<b>Final HCV 1 &amp; 4 only (no overlap)</b>		<b>2,794.8</b>
<b>HCS Forest area total (including HCV overlap)</b>		<b>4,743.1</b>
<b>HCS Forest, excluding HCV 1-6</b>		<b>1,190.3</b>
<b>Total concession size</b>		<b>5,488</b>

## 11. Annex 1: Methods and results of Gabon high carbon stock definition

Developed by Andréana-Paola De Wachter (Head – Remote Sensing), Olam Palm Gabon

The Gabonese government and national stakeholders (led by the Conseil National Climat) are developing a National Palm Policy, which includes a national definition of high carbon stock areas that will need to be exempt from development for commercial agriculture. This nationally led process seeks to interpret global concepts in the highly forested Gabonese concept, and has proposed a current definition of high carbon stock forest as those with carbon stock >118 tC/ha. This threshold is the result of the National Resource Inventory conducted in 2012 and 2013 throughout the country and where 104 x 1 ha plots were established to measure forest biomass and carbon (C). The carbon value of 118 tC/ha corresponds to the average value of secondary forests, the average value of a logged forest being 171 tC/ha, the one of national park being 206 tC/ha and the one of mature undisturbed forests exceeding 200 tC/ha and up to 300 tC/ha (Burton *et al*, 2016; Austin *et al*, 2017; INR-Gabon). An extrapolation of the 104 plots results was done using LiDAR and satellite images to obtain a national carbon map.

A comparison was conducted of the HCSA-defined High Carbon Stock forest and high carbon stock areas as defined by the Gabonese national approach. The carbon map of the 118tC national threshold was refined from the existing national carbon map and refined using other data collected previously by Olam. Specifically using the national carbon inventory data collected during the National Resource Inventory and in other Olam plantations (OPG lot 2) by ANPN, based on the above ground biomass inventory data of 30 plots and according to the National Resource Inventory methodology.

Olam used Lidar data from 2012, by creating a 2m resolution raster of numerical height model (HNM). The density of the Lidar points was 2 points/m<sup>2</sup>. We chose the spatial resolution of 1 ha of pixel for the HNM to match the size of the 1 ha sampling plot of the national biomass inventory. Then an interpolation was done using the biomass equation developed by Burton and al. (2014). This biomass regression equation is strongly correlated with the tree height model derived from Lidar.

The carbon map of BB concession, based on the national methodology (ANPN) of biomass estimation shows the result below (Figure 18). The dark green color represents the area to avoid with a carbon stock of more than 118 tC/ha. The light green is the area which could be developed which carbon stock is equal to or less than 118 tC/ha.



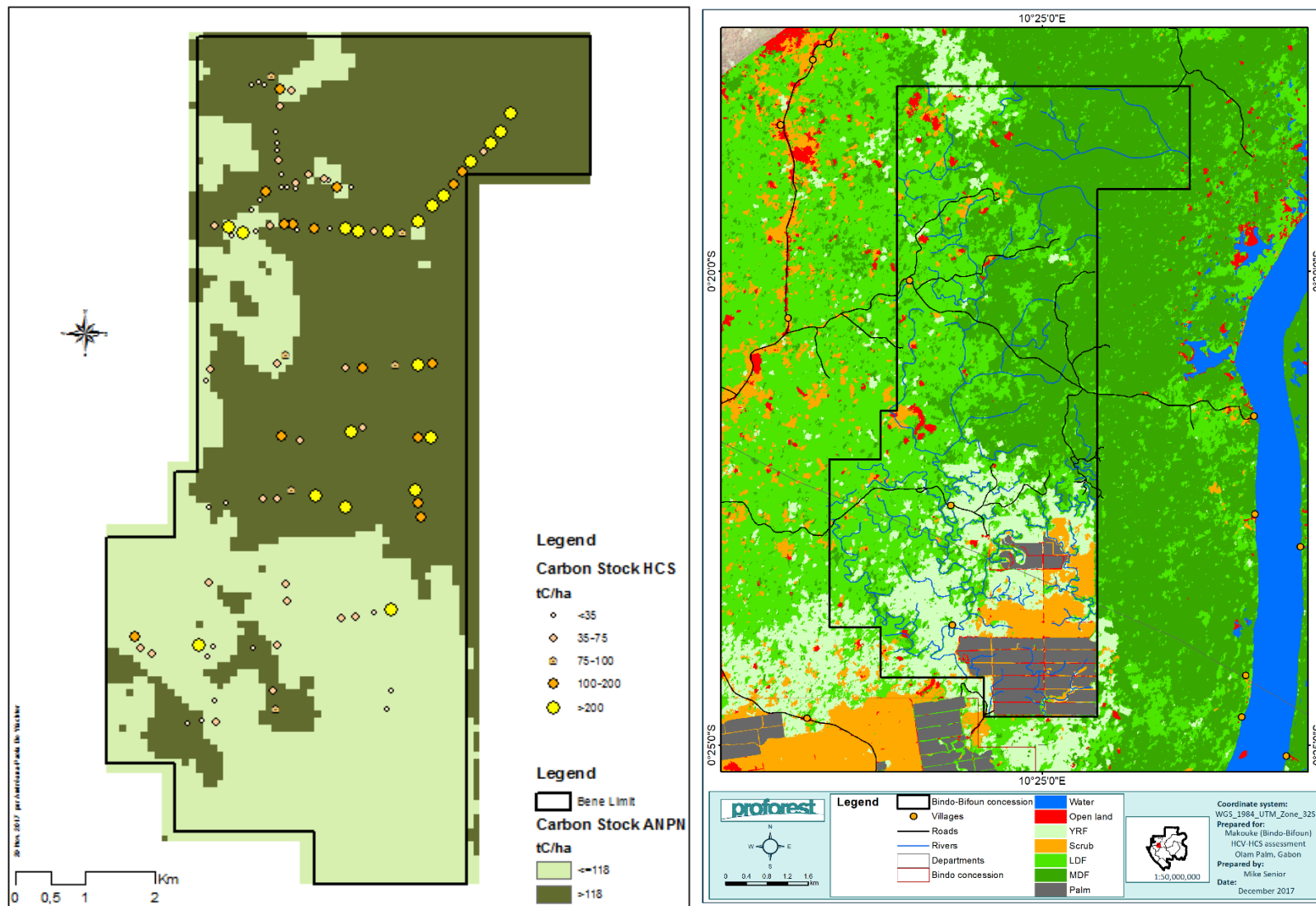


Figure 18. On the left, a carbon stock map (tC/ha) for the BB concession showing areas with greater than and less than 118 tC/ha, overlaid with AGB forest plot locations and carbon stock from this HCV-HCS assessment. On the right, the HCSA land cover class



## High Carbon Stock Approach

The total area considered as high carbon stock under the Gabonese approach compared to the HCSA is shown below. Under the Gabonese approach, the high carbon stock area represents 55% of the concession, compared to 86% under the HCSA. Broadly speaking the 118 tC cut-off protects all of the Medium Density Forest class as defined by the HCSA methodology (which had an average carbon stock of 192 tC/ha), and some of the less degraded areas of Low Density Forest (which had an average carbon stock of 73 tC/ha).

Definition/system used	High carbon stock area (ha)	Non-HCS area (potentially developable, pending HCV and community land) (ha)
Gabonese definition	3,029 (55%)	2,459 (45%)
HCSA definition	4,743.1 (86%)	744.9 (14%)