

proforest

High Conservation Value and High Carbon Stock Approach Assessment



De United Foods Industries
(DUFIL) Limited Proposed Oil
Palm Development, Edo State,
Nigeria

About Proforest

Proforest is an independent mission-driven organisation working in the field of natural resource management and specialising in practical approaches to sustainability. Our expertise covers all aspects of the natural resources sector, from biodiversity conservation, sustainable forestry and agricultural commodities production to responsible sourcing, supply chain management and investment.

Proforest works to transform commodity production as well as supply chains and sectors through developing **awareness** about sustainability, helping to generate **commitment** to better practice, supporting **implementation** of these commitments in practice and working with the wider community to increase the positive **impact**.

Proforest Ltd provides direct support to companies implementing responsible production, sourcing and investment for agricultural and forest commodities.

The Proforest team is international and multilingual and comes from a wide variety of backgrounds, including industry, academia and civil society. This allows us to work comfortably with diverse organisations in a range of cultures. We have in-house knowledge of more than 15 languages, including English, Bahasa Indonesia, Portuguese, Mandarin, French and Spanish.

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Date contract for assessment was signed	28 th March 2019
Assessment start date (month/year)	May 2019
Date of first report submission to ALS	17 th August 2020
Date of first re-submission	4 th December 2020
Date of second re-submission	May 2021
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List of Acronyms and Abbreviations

Aoi	Area of Interest
APOI	Africa Palm Oil Initiative
ARPN	Agro-Allied Resources and Processing Nigeria Limited
CITES	Convention on International Trade in Endangered Species
CoFO	Certificate of Occupancy
DUFIL	De United Foods Industries Limited
ESIA	Environmental and Social Impact Assessment
FAO	Food and Agriculture Organisation of the United Nations
FPIC	Free Prior and Informed Consent
HCS	High Carbon Stock
HCSA	High Carbon Stock Approach
HCVRN	High Conservation Value Resource Network
HCSA	High Carbon Stock Approach
HDF	High Density Forest
IBA	Important Bird Area
ICLUP	Integrated Conservation and Land Use Plan
IFL	Intact Forest Landscape
LGA	Local Government Area
NI	National Interpretation
NTFPs	Non-Timber Forest Products
PDA	Proposed Development Area
P & C	Principles and Criteria
RSPO	Roundtable on Sustainable Palm Oil
TFA	Tropical Forest Alliance
USGS	United States Geological Survey

List of required maps

Required maps	Section where map is located (add page numbers)	Status
Map showing location of the management unit	1.2 Location of the assessment	Yes
Sites/locations visited during scoping study	5.1 Summary of scoping study activities	Yes
Map of Aol with the boundaries of the wider landscape and management unit	6.1 Boundaries of the Aol	Yes
- Map showing the Aol relative to protected areas or conservation priority areas in the wider landscape - Map showing watershed boundaries, important rivers and other water bodies in the Aol	6.2 and/or 6.3 Biological and ecological characteristics	- Yes - Yes
Map showing human settlements overlapping the Aol.	6.4 Social, cultural and economic characteristics	Yes
Map of land cover classification output – final (revised) vegetation classes	6.6 Image analysis and land cover classification	Yes
- A map to show where participatory mapping was conducted - Maps for each type of field study showing e.g. location of studies (as applicable)	7.1.2 Social methods 8.1.2 Environmental methods	- Yes - Yes
Maps resulting from participatory mapping with local stakeholders	7.2.3 Results of social fieldwork OR, as relevant in 7.2.4, 7.2.5, 7.2.6, and 7.2.7	Yes – 7.2.4, 7.2.5, 7.2.6, 7.2.7

A different HCV map for each category including the land cover layer	In sections 7.2 and 8.2 for all the relevant subsections where HCVs have been identified	Yes
Peat map	Non-applicable	Yes (indicative)
Map of proposed HCS forest	9. Patch analysis – in relevant step of the Decision Tree	Yes
HCV management areas for all identified HCVs	10. Management and monitoring recommendations for each value	Yes
Summary map showing all values identified and all management areas with boundaries of MU and wider landscape. Map must include landcover layer.	10.4. Summary map	Yes

List of required supplementary materials

These materials have been submitted along with the assessment report:

1. Input satellite imagery used for classification, lidar or aerial photographs.
2. Shapefiles of HCVs or HCV areas
3. Shapefiles of HCVMA's
4. Shapefiles of community land use and land tenure
5. Shapefiles of final land cover classification
6. Complete forest plot data. Raw and processed data for each plot and summary data at plot level
7. Complete species list with wood density assumptions (if relevant)
8. Shapefiles of HCSA forest inventory plot locations
9. Shapefiles for each step of the HCSA Decision Tree
10. Shapefiles of HCS forest patches. Each patch must be numbered using the GIS coordinates of the center of the patch.

Updated supplementary materials

1. Satellite imagery for scoping
2. Sample for accuracy assessment for initial land cover classification
3. Sample for accuracy assessment for final land cover classification
4. ARPN concession
5. Peatland
6. HCS areas

7. HCVs
8. Non-HCS areas
9. HCS core areas
10. HCS types
11. 100m buffer
12. HCV 1-4
13. Local people's (free) land
14. Connectivity
15. HCS set aside areas

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1 Introduction

1.1 Purpose of assessment

This HCV-HCS assessment was commissioned by De United Foods Limited (ARPN) to among others, meet RSPO certification requirements for new plantings. The company intends to establish a nucleus oil palm plantation and set up a CPO mill.

1.2 Location of assessment

The proposed development area (PDA) is in the de-reserved area of the Ekiadolor Forest Reserve, located in the Ovia Northeast Local Government Area of the Edo State of Nigeria at roughly 30 km from the capital, Benin City. The coordinates of the four corners of the rectangle in which the PDA is embedded are 5°36'18.053"E and 6°34'46.207"N for the lower left, 5°44'56.104"E and 6°34'46.207"N for the lower right, 5°36'18.053"E and 6°46'21.937"N for the upper left, and 5°44'56.104"E and 6°46'21.937"N for the upper right (Figure 1). The PDA covers an area of about 14,906.7 ha, in a largely degraded landscape and itself, significantly degraded (Figure 2).

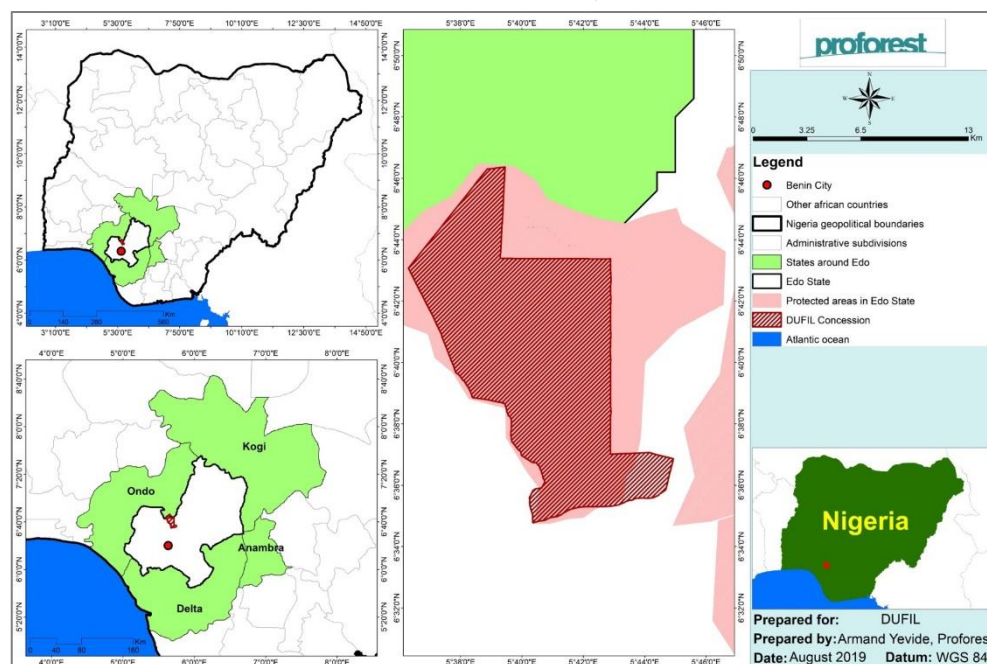


Figure 1: Map showing location of the ARPN proposed oil palm development area

Data source: Administrative and geopolitical boundaries (<https://gadm.org/>); Atlantic Ocean extracted from Sayre et al., 2013 (Sayre R, Comer P, Hak J, Josse C, Bow J, Warner H, Larwanou M, Kelbessa E, Bekele T, Kehl H, et al. 2013. A new map of standardized terrestrial ecosystems of Africa. Washington (DC): Association of American Geographers.) ; Protected areas from WDPA (<https://www.protectedplanet.net/en/thematic-areas/wdpa>); Concession boundaries from company; Coordinate of Benin City from Wikipedia.

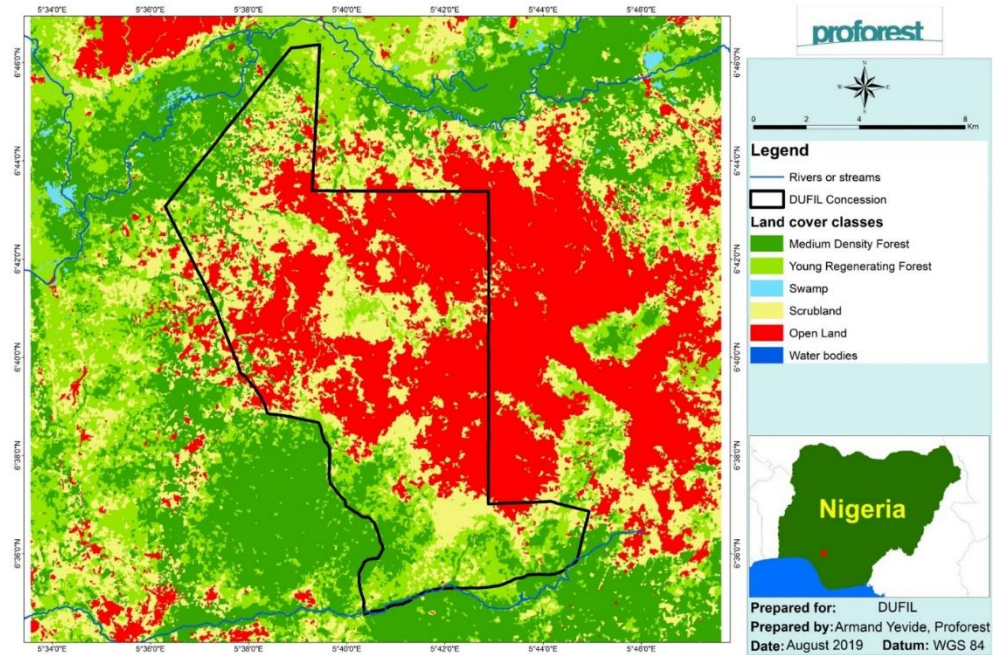


Figure 2: Landcover map of the Aol

Data source: Administrative and geopolitical boundaries (<https://gadm.org/>); Protected areas from WDPA (<https://www.protectedplanet.net/en/thematic-areas/wdpa>); Concession boundaries from company; Rivers digitized from the sentinel imagery used for land cover classification.

NB: The scrubland area within the PDA overlaps with existing farmlands or areas under Taungya farming.

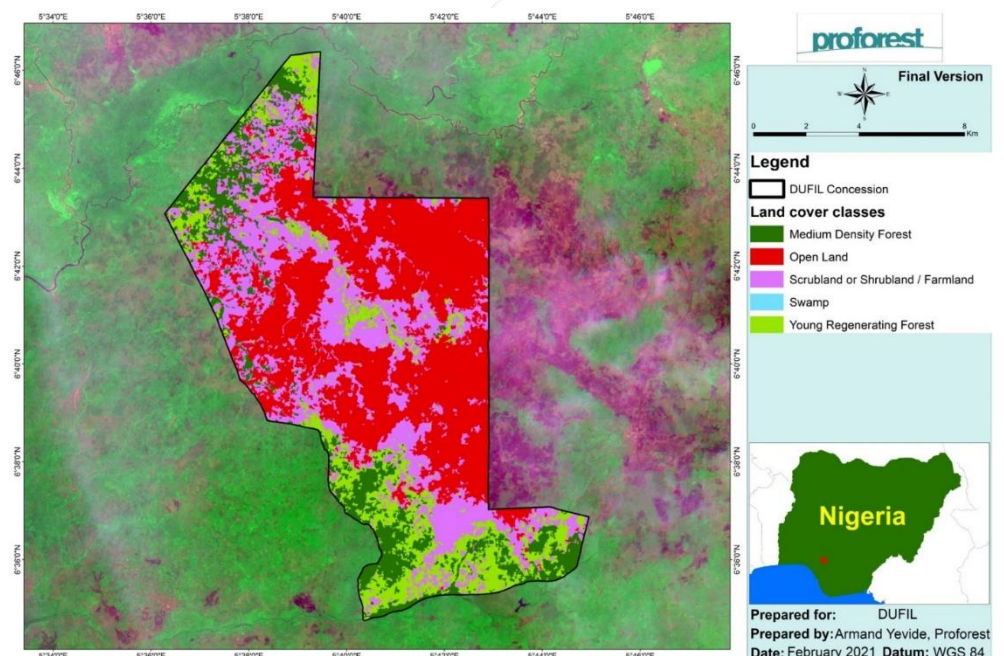


Figure 3: Map showing distribution of land use/cover within the PDA

1.3 Overview of the organisation commissioning the assessment

DUFIL (now Agro-Allied Resources and Products Nigeria Limited, ARPN)¹ was established in Nigeria in 1995 and commenced its operations in 1996. The company is a joint venture between Tolaram Group of Singapore and Salim Group of Indonesia. As part of its expansion drive, ARPN initiated a 'backward integration' programme in 2010 aimed at producing the major raw materials used in the manufacturing of the company's noodle brand, including palm oil through the development of oil palm plantations. This is the first of its planned plantations in Nigeria. ARPN has a 1,500-ton per day palm oil refinery in Lagos, which it feeds with crude palm oil (CPO) bought from suppliers, and hopes to serve with material from its own RSPO-certified plantations in the future. While not yet a member, ARPN seeks to become an RSPO member.

1.4 Brief national and regional context

The forests of the southern Nigeria form part of the Lower Guinea Forest Ecosystem (LGFE) which extends from western Nigeria to south-western Cameroon. The LGFE are a center of primate diversity, supporting 9 endemic primate species and IUCN Red Listed species such as African forest elephant, chimpanzee and the Nigerian white-throated guenon. According to the National Biodiversity Strategy Report (2010), there are about 5,000 species of plants, 22,090 species of animals including insects, 889 species of birds, over 135 reptilian species, 109 amphibian species, and 648 fish species with the forests of the Cross River State being considered as a hotspot for amphibian biodiversity.

Threats to biodiversity and tropical forests in Nigeria result primarily from habitat loss and unsustainable logging, leading to rapid decline of biodiversity in the face of its burgeoning human population (70% of which reside in the rural areas). Much of Nigeria's important wildlife and forest resources are located in Protected Areas, but all of these lack real protection, according to various reports (Kalu and Izekor, 2006). The five types of Protected Area in Nigeria are forest reserves, national parks, biosphere and strict nature reserves, game reserves and special ecosystems and habitats (Kalu and Izekor, 2006).

Edo State is one of the 36 states of Nigeria with a total land area of approximately 1.9 million ha of which about 30% were set aside as forest reserves for protection of biodiversity. However, the rate of deforestation in the State has been so high over the last few decades that the once bastion of forestry in Nigeria has lost almost all of its pristine forest. The high pressure on forest resources have resulted from population growth and over-exploitation of natural resources coupled with weak management systems, and led to substantial loss of forest cover within and outside legally designated forest reserves. Within forest reserves, excessive cutting of trees and other unauthorized activities are so prevalent that some of the forest reserves in the State including Obaretin, Okomu, Ologbo and Owan have either been fully or partially de-gazetted and allocated for agricultural activities because they no longer contain trees (Kalu and Izekor, 2006).

In 2018, the country launched a policy to double its oil palm production area from 3 to 6 million hectares, with a view to meeting domestic palm oil demand by the year 2027. In line with this, the Edo State government is implementing land and agricultural reforms

¹ See Annex 14 for land transfer and sale agreement

aimed among others, to transform oil palm production for greater socio-economic impact within the constraints of sound social and environmental practices. Recently, the State signed up to the Africa Palm Oil Initiative (APOI), a signature initiative of the Tropical Forest Alliance (TFA) 2020, thereby committing to responsible oil palm production that meets international best practice requirements. In 2018, the State government commissioned a land use and land cover mapping and analysis as an important step towards the goal of sustainable agricultural development in Edo State.

The distribution of the protected areas in the country is shown in Figure 4 below.

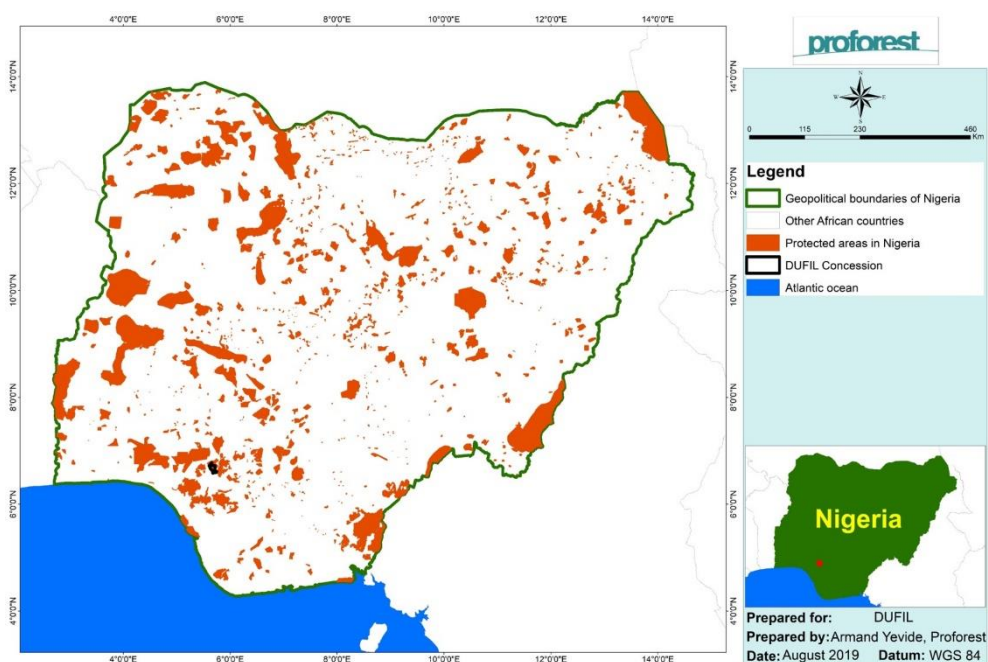


Figure 4: Distribution of Protected areas in Nigeria

Data source: Administrative and geopolitical boundaries (<https://gadm.org/>); Atlantic Ocean extracted from Sayre et al., 2013 (Sayre R, Comer P, Hak J, Josse C, Bow J, Warner H, Larwanou M, Kelbessa E, Bekele T, Kehl H, et al. 2013. A new map of standardized terrestrial ecosystems of Africa. Washington (DC): Association of American Geographers.); Protected areas from WDPa (<https://www.protectedplanet.net/en/thematic-areas/wdpa>); Concession boundaries from company; Topographic layer based on DEM extracted from <http://viewfinderpanoramas.org/dem3.html>.

2 Assessment team

Tables 1 and 2 below provide details of the assessment team.

Table 1: Lead assessor and GIS/remote sensing expert

Name	Role	Organisation	Relevant expertise	Relevant country or regional experience (including language proficiency)
Nana Darko Cobbina	Lead Assessor (ALS15034NC) Registered HCSA Practitioner	Proforest	Stakeholder engagement, social methods, participatory mapping, social forestry	Sierra Leone, Liberia, Cote d'Ivoire, Ghana, Nigeria, Cameroon, Uganda, Gabon, DRC
Dr. Armand Yevide	GIS and mapping lead	Proforest	Forest ecology, GIS, conservation biologist.	Sierra Leone, Liberia, Ghana, Nigeria, Cameroon, Uganda, DRC

Table 2: Environmental and social experts in the assessment team

Name	Role	Organisation	Relevant expertise	Relevant country or regional experience
Abraham Baffoe	Licensed (ALS15006AB)	Proforest	Social forestry, stakeholder engagement, conservation planning.	Sierra Leone, Liberia, Cote d'Ivoire, Ghana, Nigeria, Cameroon, Uganda, Gabon
Dr. Emmanuel Danquah	Faunal team lead	Independent	Faunal survey lead	Sierra Leone, Ghana, Nigeria, Uganda
Dr. Adeyemi Adesoji	Flora/forest inventory team leader	Independent	Plant taxonomy, ecology	Nigeria
Afolabi A.	Flora team member	Independent	Plant taxonomy, ecology	Nigeria
Dr. Augustus Asamoah	Faunal team member	Proforest	Avifauna, wildlife ecology	Sierra Leone, Ghana, Nigeria, DRC, Uganda
Helena Tetteh	Social team member	Proforest	Participatory mapping, community consultations	Sierra Leone, Nigeria, Uganda, Ghana
John Amonoo	Social team member	Proforest	Participatory mapping, community consultations	Nigeria, Ghana
James Odey	Social survey lead	Independent	Anthropology, participatory mapping, community consultations	Nigeria

Omere Abraham Esosa	Social team member	Independent	Participatory mapping, community consultations	Nigeria
Kenechukwu Nwandu	Social team member	Independent	Participatory mapping, community consultations	Nigeria
Osaretin Idele	Social team member	Odighi community	Participatory mapping	Edo State / Ekiadolor Forest Reserve
Vincent Omoegbee Idehen	Social team member	Odighi community	Participatory mapping	Edo State / Ekiadolor Forest Reserve
Osayamen Orihionkpaio	Social team member	Odighi community	Participatory mapping	Edo State / Ekiadolor Forest Reserve

3 Assessment timeline

The assessment process commenced in late 2016 when ARPN commissioned a scoping for the PDA. The scoping was conducted in January 2017. However, with the change of government in Edo State, the new governor put a hold on agricultural development in de-gazetted forest reserves until the completion of further due diligence. Upon completion of the process, the State government affirmed ARPN's PDA, following which the company requested Proforest to continue the assessment process by carrying out the full HCV-HCSA assessment. The fieldwork lasted from 3rd to 24th June 2019 and overlapped with the period of the social impact study. Table 3 provides details of the assessment timeline.

Table 3: Assessment timeline

Process Steps	Main activities		Jan-Feb 17	May 19	Jun 19	Jul 19	Aug 19	Sep 19	May 2020	Jul 2020
Pre-assessment	Due diligence and data and information collection from ARPN and review of same									
	Analysis of information including feedback to client									
Scoping study and initial stakeholder consultations	Scoping (field) study									
	Preparation of full HCV-HCS assessment proposal and development of assessment methods									
Participatory field assessment ²	Botanical and fauna survey including ecosystem assessment									

² Field work was concurrent with social impact study, with both being coordinated in an integrated manner, logistically and organizationally. The EIA was carried out by a different consultant and the fieldwork for this only overlapped with the assessment fieldwork briefly.

	Participatory mapping and identification of social HCVs								
	Community consultations								
	Consultations with government agencies, experts and NGOs								
Data analysis drafting of report	Validation and analysis of field data (including patch analysis)								
	Preparation of draft report								
Final stakeholder and community consultations	Presentation of preliminary findings to stakeholders								
Preparation of final report	Finalisation of report								
HCV Quality Panel review ³	Report review								

4 Pre-assessment

As noted earlier, following initial contact by the client in 2016, the pre-assessment begun with collection of initial basic information and a series of meetings with the client to understand the scope and rationale for the assessment and the definition of assessment activities as well as preliminary compilation of basic information pertaining to the planned assessment.

4.1 Due diligence

During the initial desk-based study and early engagement with the company, the lead assessor established evidence to meet the required pre-conditions. Some of the due diligence requirements were established over the duration of the entire assessment process as described in Box 1 below.

Box 1: Due diligence

1. **Commitment to environmental and social safeguards** –company management affirmed their commitment to implementing best practice requirements including ensuring that operations do not begin before all relevant impact assessments including HCV-HCSA, ESIA, etc. have been done. This was only verbally established during the pre-assessment phase but have been reinforced with the submission of written commitment on environmental and social safeguards including affirmation that operations will not begin until all impact assessments have been approved, and the NPP completed and ICLUP developed. This is attached to the report as Annex 10. Also see reference to name change in Section 1.3. See also Annexes 13 and 14. The company is committed to RSPO membership and eventual certification.

³ Feedback from the Quality Panel was received in December 2020 and the report revised and re-submitted in January 2021.

2. **Moratorium on land clearing or land preparation** – as noted above, this was only verbally stated during the pre-assessment phase but the company has now provided a written statement that includes the commitment that land preparation will only begin upon completion and approval of all required impact assessments and after the proposed ICLUP has been completed (Annexes 10). This was initially cross-checked using time series satellite imagery and later confirmed during ground-truthing of the initial land cover classification and consultations with stakeholders including government officials and local communities during the scoping study and further established during the assessment field work. Refer to the name change in section 1.3.
3. **Demonstrated legal right over or permission to explore area of interest**– the company provided proof of a valid CofO covering the scope and extent of the PDA. This was not accessible during the due diligence or pre-assessment phase but was confirmed during the scoping visit. The CofO is numbered EDSR 18122 and valid for a period of 45 years commencing on 11th May 2016 for the purpose of oil palm plantation development (Annex 11). In addition to this, there is also evidence that the due process has been followed in the de-reservation process as contained in the “documentation covering the legislative process to de-reserve BC11/1 of the Ekiadolor Forest Reserve for the development of agro-industrial oil palm plantations”. It is important to note that the entire PDA is the de-reserved Ekiadolor Forest Reserve. Prior to the de-reservation, the Ministry made an effort to rehabilitate the denuded forest reserve by implementing a Taungya scheme, which comprised essentially of permitting farmers to grow annual crops together with trees with the hope that eventually when the canopy is established, the farmers will vacate the forest reserve. However, after over a decade of unsuccessful implementation, a decision was made to de-reserve. Refer to the name change and related evidence in section 1.3 and Annex 14. Clause 4 of the CofO states that the land must be developed within two years from the issue date. ARPN has provided evidence to clarify why this clause has not been triggered. See Annex 15 (CofO confirmation letter by the Ministry of Agriculture).
4. **FPIC**– the company indicated that initial contact had been made with some of the affected communities through the Ministry of Agriculture, and that the FPIC process was underway. Evidence of this was not accessible during the pre-assessment phase but during the scoping visit, it was confirmed that the FPIC process had been initiated and was jointly led by company representatives and officials of the Ministry of Agriculture. It must be noted that the farmers using the area are not customary rights holders but had been granted user rights (renewable annual permits) for the use of the then degraded forest reserve as part of a Taungya scheme by the Ministry of Agriculture with the aim of eventually vacating the forest reserve assuming the Taungya were successful. Therefore, there has been communication / engagement process by the government over some time making clear their use of the area is temporary. However, as further discussed in the report, the Ministry is making available parts of the buffer of the former forest reserve to the affected farmers in place of the lost farmlands. Some of the consultation records were reviewed by the assessment team at the Ministry of Agriculture

during the scoping study. However, copies of these were not retained. A signed statement on FPIC documents reviewed is attached as Annex 12. The FPIC process was still ongoing at the time of the field work in June 2019 but the company has made available, copies of signed consent letters from affected communities, acknowledging payment of compensation and giving their nod for the project to commence (Annex 9). See also minutes of meetings, attendance list, dates and venues in Annex 16.

4.2 FPIC gate

The pre-assessment was completed in December 2016. Following the desk-based due diligence which partially fulfilled the requirements as established in the Manual (to be published later), and the indication that the FPIC process was underway, the client was informed about the need for a scoping study to confirm the status of FPIC in affected communities and conduct a reconnaissance survey of the PDA, with a view to determining the feasibility of a full assessment.

FPIC Note: Status of FPIC at the end of the assessment

The only community that refused the right to be consulted and participate in this assessment is Okokhuo. At the time of the assessment, the community had taken the Ministry to court in respect of grievances related to the crop compensation. At the time of finalising this report, the company provided evidence that FPIC had been secured from Okokhuo and the court case was being settled out of court.

All other communities agreed to, and participated in the assessment. At the start of the fieldwork, the team learned that while all affected communities had been engaged by the Ministry of Agriculture and/or ARPN about the project, there was some concern about the depth of engagement and adequacy of information provided. However, the company staff used the opportunity of the HCV-HCS assessment fieldwork to provide additional and adequate information about the project at the consultation meetings as well as the planned assessments. The assessment team also complemented this by providing a background to the project and detailed information about the purpose, scope, methods and outputs of the assessment. The consultation meetings and participatory mapping only then went ahead, following their agreement to participate in the assessment.

5 Scoping study

5.1 Summary of scoping study activities

Following a period of information gathering and the desk-based due diligence in December 2016, a scoping study was planned and completed in January 2017. A supplementary scoping study was done in May 2019, prior to the start of the full assessment to ground-truth the initial land cover classification. The objectives of the field scoping study were among others to:

- Gather first-hand information about the nature of the land cover, physical features and land use types in the PDA and the immediate landscape.
- Assess and ensure that FPIC has been initiated and that consent was obtained to conduct the assessment.
- Obtain an understanding of the land-ownership regime of the proposed PDA and the adjoining landscape.
- Get a better understanding of the landuse activities within the PDA, settlements within and fringing the PDA and using this to inform the communities engagement requirements for the HCV-HCSA and SIA assessments.
- Verify prior desk-based due diligence and conduct ground-truthing as appropriate.

Scoping study activities included:

- Seeking consent from local people and authorities prior to the full assessment.
- Visiting samples of different vegetation types to ground-truth the land-cover map
- Meeting with stakeholders to understand initial concerns over the project.
- And generally, verifying due diligence including what activities were already happening on the ground, the progress of the initiated FPIC process including the right of the company to develop the area as planned⁴.

The timeline of scoping study activities is provided in Table 4 below.

Table 4: Timeline of scoping study activities

Activity	Description	Timing / date
Information gathering	• Desk-based study through gathering of data including GIS related data	• Week of the 16th January 2017
Visiting sample of communities	• Meetings with Ekonobore and Odighi communities, and Caravan Camp • Site visit and drive through the proposed PDA	• 25th January 2017
Stakeholder identification and initial consultations	• Meeting with ARPN management and Consultant Surveyor • Meetings with officials of Edo State Ministry of Agriculture	• 23rd January 2017 • 24th January 2017
Field visits	• Walk and drive through the PDA to examine features of	• 25th January 2017

⁴ The due diligence information was verified during the scoping study and later prior to start of the main assessment. Both results were used to reach a conclusion to proceed with the full assessment.

Activity	Description	Timing / date
	interest of randomly selected spots	
Ground truthing initial land cover map	Delineation of the AoI and unsupervised classification of the vegetation based on a 10 m sentinel remote sensing product acquired on the 12th February 2019 followed by vegetation ground truthing.	May 2019

NB: See Annex 16 for minutes of meetings by company and/or Ministry of Agriculture including those held in advance of the assessment.

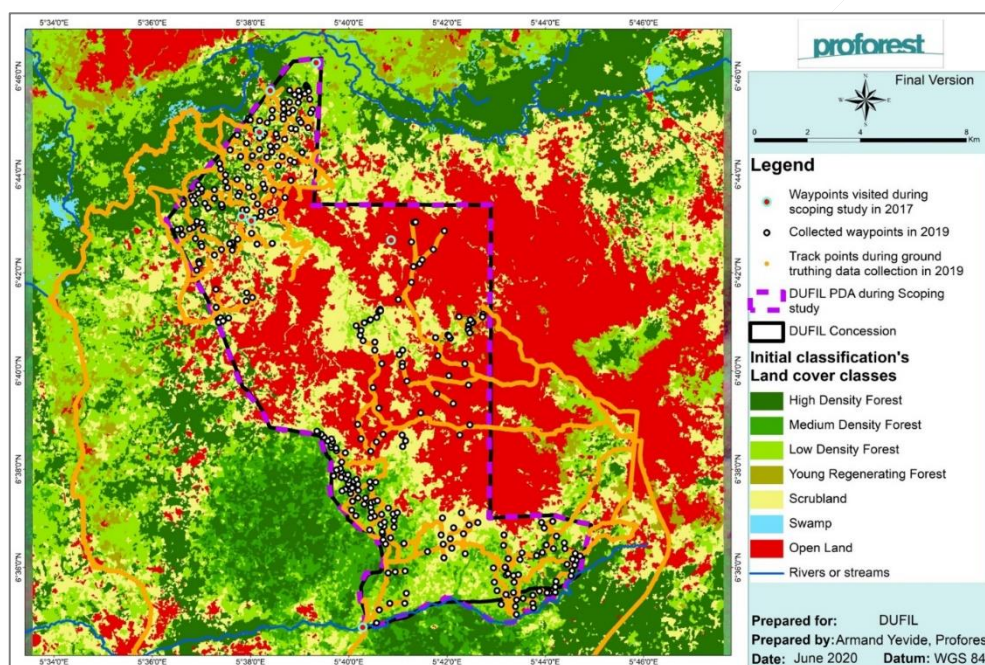


Figure 5: Map showing areas sampled during scoping study

Data source: Concession boundaries from company; Rivers digitized from the sentinel imagery used for land cover classification; Other layers from field assessment.

NB: As indicated above, minutes, attendance list, dates and venues of meetings held with affected communities by the company and/or Ministry of Agriculture in advance of the assessment have been provided in Annex 16.

5.2 List of consultations

The range of consultations carried out during the scoping study is provided in Table 5.

Table 5: Experts and stakeholders consulted during scoping study

#	Name/Group	Title	Org/Comm	Key concerns & recommendations
1	Pastor Omorie	Agric Director	Edo State Ministry of Agriculture	Displacement of farmers because of the lease but a buffer zone has been demarcated to relocate farmers who can continue their activities.
	Edoba P. Ebenedion	Dep Agric Dir		Crop compensation issues given that farmers have crops within the lease area. For that, the Ministry of Agriculture is leading the enumeration exercise in partnership with communities for their compensation.
	David Ogunbor	Principal Agric Officer		
	K. Egiebork	Agric Officer		Oil palm plantations activities might negatively impact the rivers and streams within and around the lease area. For that, appropriate buffer should be left around those water bodies.
2	Elders and members of Ekonobore* Community	n.a	Ekonobore	Farmers concerned by transparency of crop enumeration and compensation procedures. For that, Community engaged the services of Elaho Associates (private valuation firm), to provide technical support with regards to the enumeration and valuation process. Elaho Associates have been involved in the process from the start. Expectation of compensation for cocoa farm. For that, community is informed by Ministry that cocoa cultivation was not permitted in the PDA; thus cocoa farms would not be enumerated and compensated for.
3	Elders and members of Odighi* Community		Odighi	Want the compensation process to end well and sufficient land to be made available for farming as indicated during meeting with Ministry
4	Inhabitants of Caravan Camp		Caravan Camp (part of Odighi)	Transparency of crop enumeration and compensation exercise. For this, inhabitant of the camp are involved in the process.

*See location on community map below.

5.3 FPIC Gate

A key outcome from the scoping exercise was the conclusion that the HCV assessment could proceed. Interviewed management representatives affirmed the commitment of the company to environmental and social safeguards; clarified the moratorium on land clearing or land preparation until all impact assessment were approved and landuse planning completed to designate conversion and conservation areas (i.e. ICLUP); the company's legal right over the PDA was confirmed as evidenced by the CoFO and; FPIC process initiation was also confirmed through review of relevant documents at the Ministry of Agriculture and during consultations with a sample of communities.

The company had initiated or was about to initiate FPIC in all of the communities in the Aol. Based on this, the assessment team consulted all communities in the Aol. Only one community (Okokhuo) refused to participate in the assessment.

Following the assessment and initial report drafting, the company has availed evidence (Annex 9) confirming that FPIC had been secured in 14 communities. Consequently, the report has been revised to clarify these as the affected communities, as defined by the company, which have expressly and formally granted FPIC for the project (Table 6).

Table 6: Communities in the Aol and affected communities

#	Communities in the Aol	Consulted	FPIC	Affected Communities
1	Abumwenre	Yes	Yes	Abumwenre
2	Agekpanu	Yes	No	
3	Agemokpae	Yes	No	
4	Aihuobabekun	Yes	Yes	Aihuobabekun
5	Ariyan	Yes	Yes	Ariyan
6	Eko-Ekpetin	Yes	Yes	Eko-Ekpetin
7	Ekonobore	Yes	Yes	Ekonobore
8	Emah	Yes	No	
9	Idunmwenhigie	Yes	Yes	
10	Igbekhue	Yes	Yes	Igbekhue
11	Igolo	Yes	Yes	Igolo
12	Odighi	Yes	Yes	Odighi

13	Okoghohon	Yes	No	
14	Okokodo	Yes	Yes	Okokodo
15	Osasinwonmba	Yes	Yes	Osasinwonmba
16	Oshodin 1&2	Yes	Yes	Oshodin 1&2
17	Ugboke	Yes	Yes	Ugboke
18	Ugbokuli	Yes	No	
19	Okokhuo	Yes	Yes	
20	Iguhoru	Yes	No	

5.4 Boundaries of the Aol

The PDA occurs in the de-reserved part of the Ekiadolor Forest Reserve, within a wider landscape dominated by the Osse and Ovia Rivers to the north and south respectively (Figure 6). The limits of the Aol extend at least 5 km from the PDA boundaries and beyond the two rivers⁵ to include affected communities.

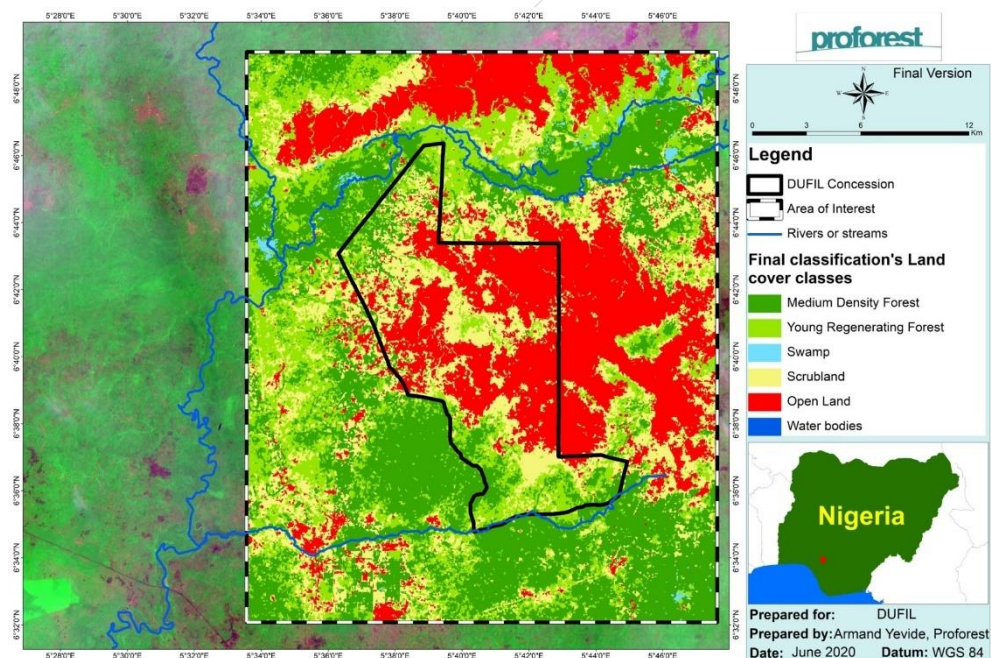


Figure 6: Map showing the boundaries of the area of interest (Aol)

⁵ The MU occurs in Ovia Northeast LGA, which represents the administrative boundaries of the Aol.

Data source: Concession boundaries from company; Rivers digitized from the sentinel imagery used for land cover classification; Aol from 5km buffer converted into envelope feature making a minimum of 5km buffer.

5.5 Physical and environmental characteristics

Physical features in the landscape

The general topography of the landscape slopes gently, with rarely noticeable hills or moderate slopes except in south-central part of the PDA (Figure 7). Swamps and streams are scattered in the landscape, with the two major rivers straddling the PDA to the north and south (Figure 5). Located in the moist forest zone of Nigeria, rainfall in the landscape is heavy for about nine months of the year, from March to November, with mean annual rainfall of about 2,100 mm with peak in June, July and September. The driest months are the months of December and January. Mean monthly temperature value ranges between a minimum of 25.3°C and maximum of 28.2°C, while relative humidity is high throughout the year, with cloud cover. The major soil type is sandy loam; the texture of the soil is responsible for its high permeability and high base-leaching. These conditions, together with the high annual rainfall, induce high soil acidity with soil pH values ranging from 4.30 - 5.00.

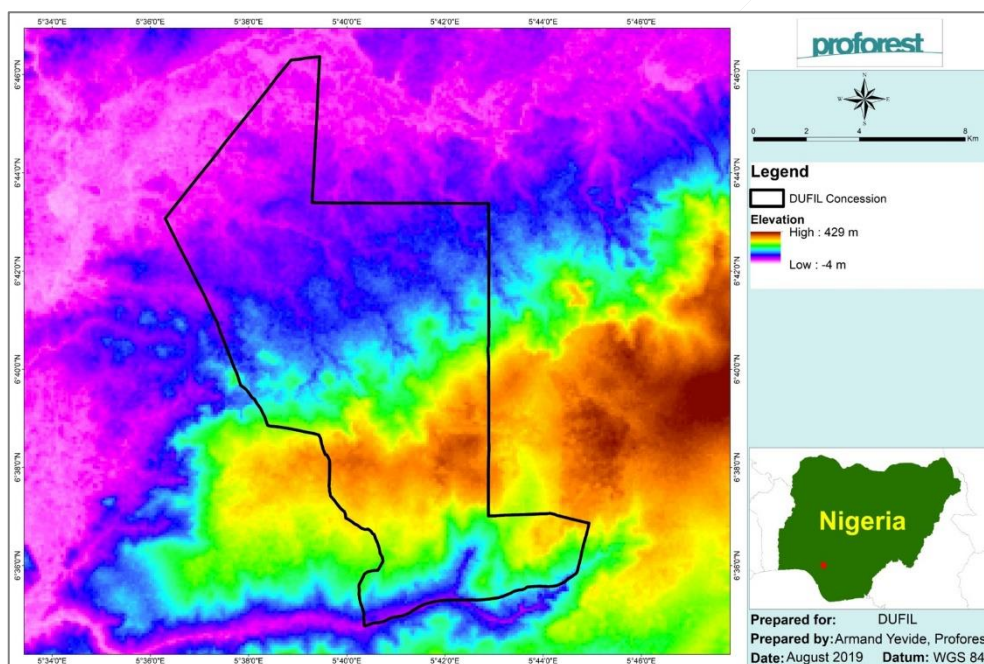


Figure 7: Topography of the assessment landscape

Data source: Concession boundaries from company; Elevation layer based on DEM extracted from <http://viewfinderpanoramas.org/dem3.html>.

5.6 Biological and ecological characteristics

Presence and condition of protected areas / forest reserves

Edo State has a total land area of 1.9 million ha of which about 30% were designated as Protected Areas which are in 48 Forest Reserves. However, excessive logging and anthropogenic activities notably farming have led to degradation of most of these forest reserves. The forest reserves in the wider landscape of the assessment area consist of a

mixture of gazetted and de-reserved forest areas including Ohosu, Oraluleha Ozalla, Owan South, Ehor West, Ehor North, Ehor South, Iguobazuwa BC_N, BC_E, BC_S and Okomu National Park (Figure 8). Most of these reserves are so badly degraded that most parts have been de-reserved and are now farmlands (Isikhuemen, 2012).

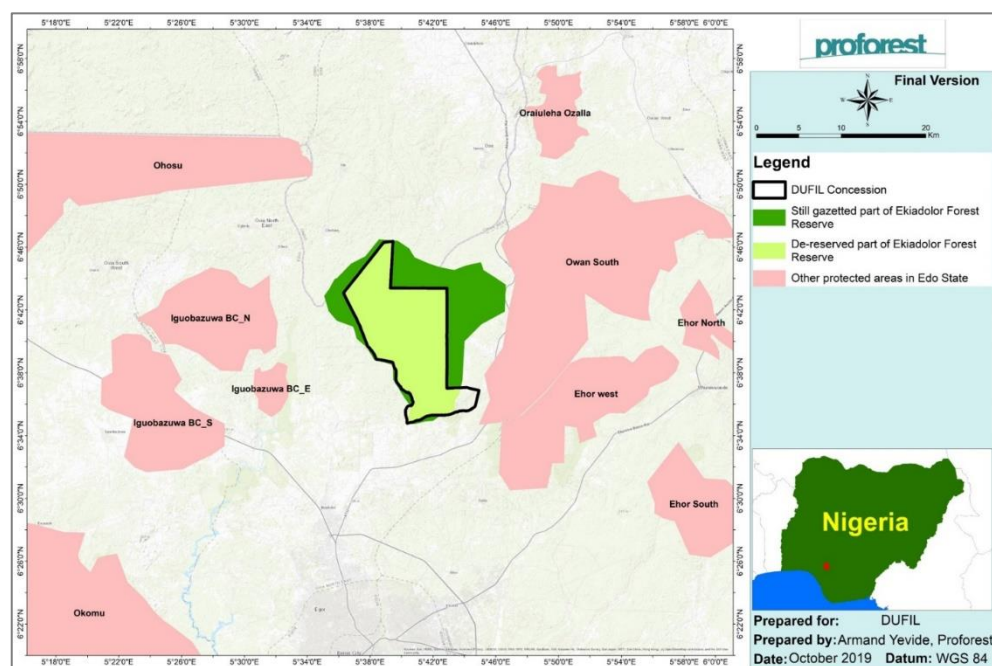


Figure 8: Map showing the Aol relative to protected areas in the wider landscape

Sources of the base map: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Data source: Protected areas from WDPA (<https://www.protectedplanet.net/en/thematic-areas/wdpa>); Concession boundaries from company.

Occurrence of species of global concern and migration corridors

There is a paucity of published material on the occurrence, abundance and distribution of species in the Aol and immediate landscape. Most of the limited studies have focused on the Protected Areas, particularly ONP, but these too are not recent. The ONP maintains one of the highest concentrations of the large mammalian fauna of south-western Nigeria (Akinsorotan et. al. 2011).

However, as earlier noted, the landscape is highly modified and fragmented following years of sustained degradation with only patches of forest in good condition. There are no IBAs or migratory corridors in the landscape. The prevailing ecosystem types are forest (mostly severely degraded), wetlands including seasonal swamps and secondary fallow lands. Generally, the wider landscape could be characterized as a medium forest cover landscape.

Ecosystem services and threats

Provisioning services include timber and food from both terrestrial and aquatic systems, with rich aquatic life and soils that support agriculture. Anecdotal evidence suggests that the streams and rivers have a high abundance and diversity of fish that forms the bulk of the protein needs of inhabitants. Common species include catfish, tilapia, shell-fish, croakers, barracuda, and fin fish.

Wetlands in the landscape regulate the movement of essential water and sediments and contributes to controlling possible flood in a region with relatively high rainfall. The main threats to wetlands are oil and gas exploration, dredging, reclamation and introduction of invasive species. A significant relationship between gas flaring and food resources has been observed: there is premature abortion of fruit and colour changes in leaves contributing to poor crop yields; while fish catches on which inhabitants depend are low due to mortality or migration.

5.7 Social, cultural and economic characteristics

Names and location of settlements

As noted earlier, there are 20 communities within the Aol. However, only the 13 communities which formally confirmed FPIC and agreed to the conduct of the HCV/HCS assessment have been considered in the methods and results of this assessment. These are shown in Figure 9 below, indicated in Table 6 and subsequently referred to throughout the relevant parts of the report.

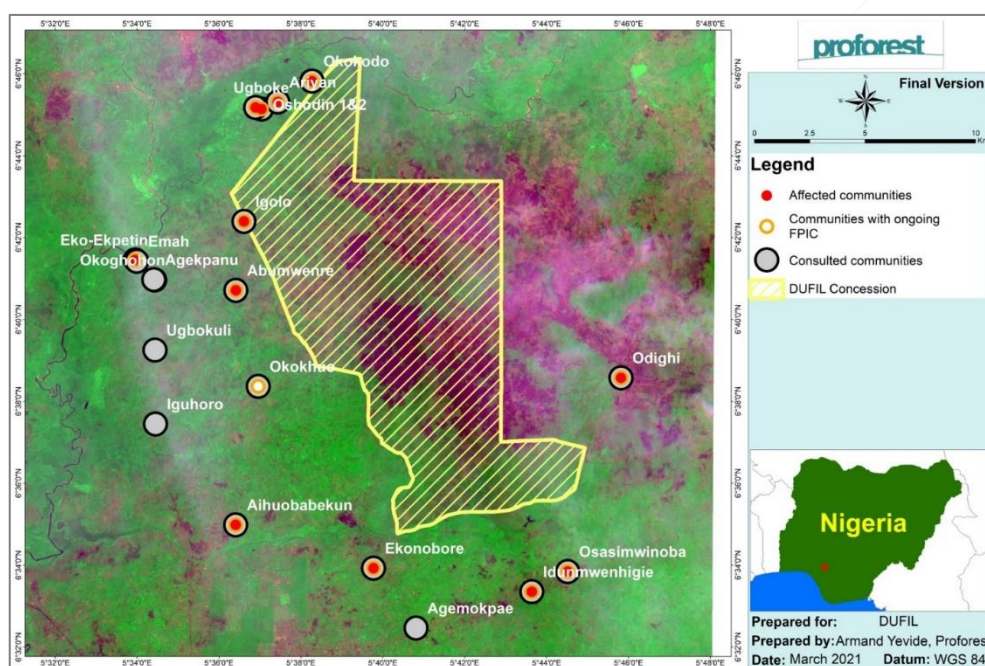


Figure 9: Map showing communities in the Aol

Data source: Concession boundaries from company; Other layers from field assessment including participatory mapping.

NB: No coordinates were available for Igbekhue and therefore not shown on the map.

Population and housing

According to the SIA study, the resident population aggregated for selected households in the communities was 2,442 persons (Table 6). However, including the non-resident population gives a total population of about 5,379 persons. It should be noted that the household size per village indicated in the table below excludes the non-resident population.

Table 7: Aggregate population by village

Demographic characteristics	Abumwenre	Aihuobabekun	Arinyan	Eko-Ekpetin	Idunmwengie	Igolo	Okoko-do	-Odighi	Oshodi 1&2	Ugboke
Total resident population	181	389	77	342	93	95	36	279	95	366
Number of persons currently living outside	278	371	115	274	219	162	121	347	230	352
Total aggregate population	459	760	192	616	312	257	383	626	325	718
Total number of households	57	100	24	101	51	31	23	110	47	91
Average household size	8.1	7.6	8	6.1	6.1	8.3	6.8	5.7	6.9	7.9
Proportion of male population	47.7%	48.8%	51%	50.2%	50%	48.2%	44.6%	50.6%	49.8%	53.6%
Proportion of female population	52.3%	51%	49%	50.5%	49.4%	51.8%	55.4%	49%	50.2%	46.4%
Female headed households	16	54	9	39	17	12	12	11	11	9
Proportion of female headed households	28.1%	54%	38%	38.6%	33.3%	38.7%	52.2%	10%	23.4%	9.95%
% of migrant population	51.4%	10.7%	7.8%	19%	1%	16.7%	38.2%	21.7%	35.7%	43.6%

Source: Draft SIA report.

NB: No data for Ekonobore, Igbekhue and Osasinwonmba

Most houses are made of mud but about a quarter are made of brick. The overwhelming majority of houses were roofed with corrugated zinc roofing sheets, with only a handful roofed with thatch (Figure 10).

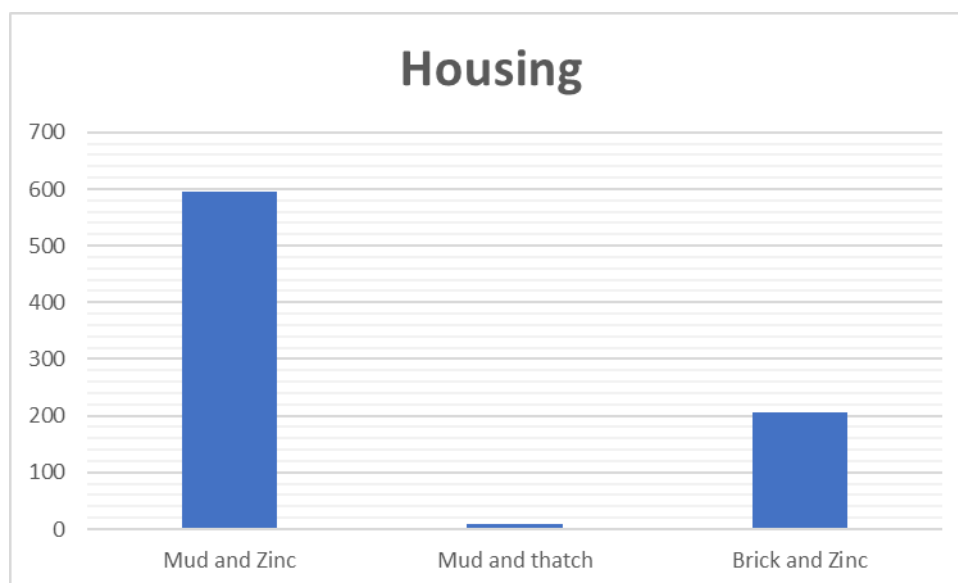


Figure 10: Housing conditions

Ethnicity and religion

The dominant ethnic group in the Aol is Bini. Others are Esan, Afemai and Yoruba migrants. The dominant religions are Christianity and traditional religion, with a widespread distribution of shrines and sacred sites in the surrounding landscape. There is a good degree of cultural similarities among the prevailing ethnic groups especially in the areas of religious worships, folklore, dances, festivals, traditional modes of dressing, arts and craft.

Socio-economic activities

Although Edo is an oil-producing state, agriculture still dominates socio-economic activities in all rural communities. The form of farming practiced is shifting cultivation which includes food and cash crops. Other livelihoods activities include fishing, small- scale logging and petty trading.

According to the SIA study, the predominant livelihoods activity in the landscape is farming, followed, albeit to a very limited extent by fishing, and wood harvesting for charcoal. Most farmers combine food and cash crop farming, with cocoa and plantain being the dominant cash crop (mainly farmed by migrants). Plantain and cassava are the two most important

food crops cultivated by the people (Figures 11 and 12), but these are also cultivated for cash and form the bulk of agricultural traded goods in nearby and distant markets.

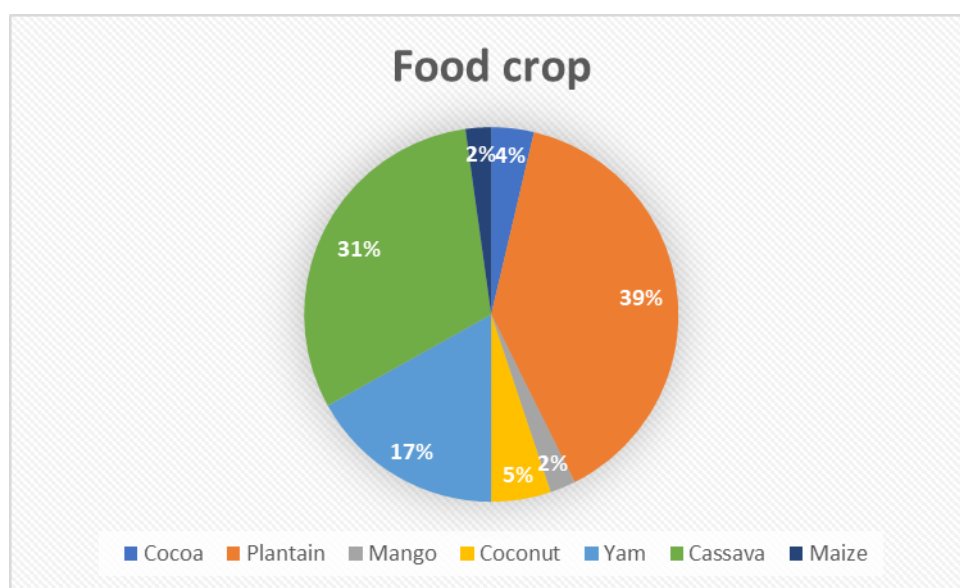


Figure 11 Most important food crop

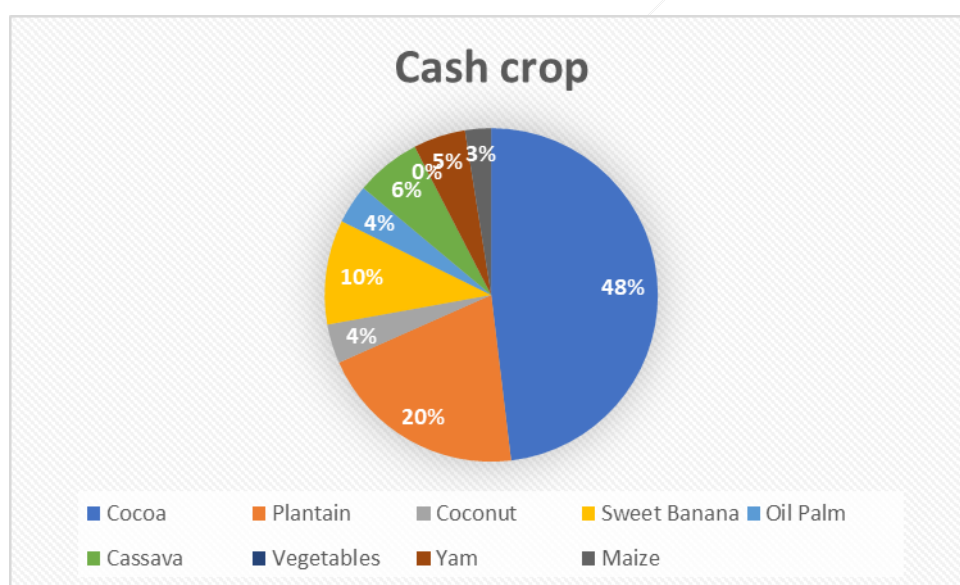


Figure 12 Most important cash crop

As an agrarian economy, diversity in cash crops produced is important for safeguarding local peoples' income. It is also important to note that apart from *Irvingia spp.* locally referred to as "Ogbolor" which is sometimes cultivated and used in cooking, all other tree crops grow in the wild.

Table 7 below summarizes the dependency profile of communities. Sale of agriculture produce excluding oil palm was the most important means of livelihoods across the study communities (SIA Report, October 2019).

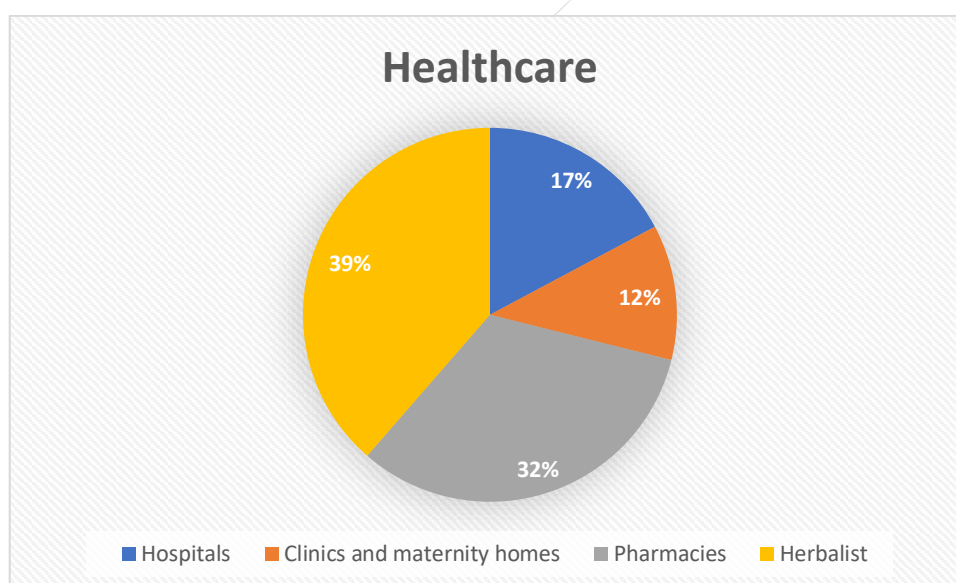
Table 8: Household dependency levels

Means of livelihoods	Percentage of dependency
Salary	14.6%
Labour wages	2.4%
Sale of agriculture produce exclude oil palm	63.4%
Oil palm	12.2%
Petty trading	3.7%
NTFP harvesting and sales	2.4%
Remittance	0%
Real estate	1.2%
Pension	0%
Artisan	0%
Other, specify	0%
Total	Approx. 100%

Health, education and infrastructure

Healthcare

Aside Odighi community which has a functional health center, the rest of the communities engaged either had maternity homes or resort to traditional herbalist for healing or child delivery. According to the SIA study, only a few of the respondents (17.2%) preferred accessing healthcare from hospitals. The other sources were clinics including maternity (11.7%) and drug stores (32.5%). Others who appeared to be the majority (38.6%) resort to traditional healers.



Most households have pit latrines while the rest resort to open defecation. The principal means of waste disposal is burning or burying in the ground. Most organic waste is fed to poultry and livestock. Poor sanitation and a general low access to potable water result in diseases. Water-related diseases are one of the most critical health problems in the communities and the health issue most closely linked with environmental degradation. Malaria, dysentery, typhoid and cholera top the list.

Education

Cumulatively across the communities, 57.8% of male and 42.2% females are in school while 51.6% male and 48.4% females are out of school (Figure 13).

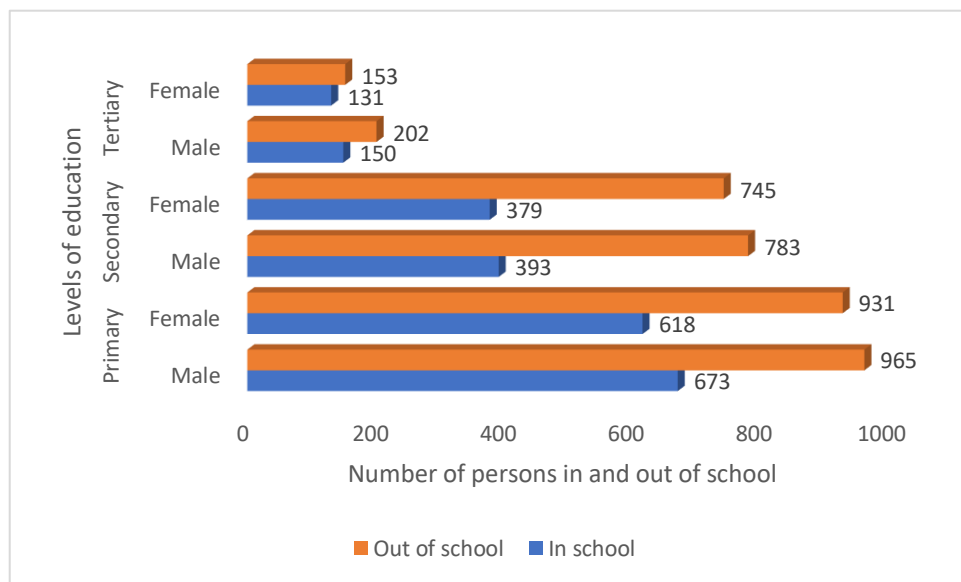


Figure 13: Literacy levels of consulted communities

Infrastructure

Table 8 below provides an overview of the state of social amenities and infrastructure in the some of the communities consulted and as captured in the SIA report. The only community with a market is Odighi.

Table 9: Overview of infrastructure in communities

Community	Drinking Water source	Community cemetery	Public Toilet facility	Community centre	Electricity , Market	Police post	Priority needs
Odighi	Borehole	-	-	1	-, 1	-	Secondary School
Ekonobore	Stream	-	-	-	-	-	Electricity
Abumwenre	Stream	-	-	-	-	-	Hospital
Ugboke	Stream	-	-	-	-	-	Clinic
Oshodin 1&2	Bush water (stream), Ovia river	-	-	-	-	-	Hospital
Ariyan	Bush water (stream), Ovia river	-	-	-	-	-	Hospital

Community	Drinking Water source	Community cemetery	Public Toilet facility	Community centre	Electricity , Market	Police post	Priority needs
Okokodo	Bush water (stream), Ovia river	-	-	-	-	-	Hospital
Igolo	Aiwor River	-	-	-	-	-	School
Eko-Ekpetin	Borehole Okhuo river	-	-	-	-	-	
Idunmwenhigie	Okhuo river	-	-	-	-	-	Electricity
Osasinmwinoba	Borehole	-	-	-	-,1	-	
Aihuobabekun	Stream	-	-	-	-	1	Police station

Source: Draft SIA report.

NB: Table does not include data from Igbekue (not captured in the SIA report). Tables 6 and 8 comprise a list of communities where household data was collected for the SIA.

Community organisations and customary rights to land and resources

Prior to the colonial era, lands were solely owned by families and communities with family heads as custodians who then allocate based on the needs of their members. The enactment of the Nigerian Land Use Decree of 1978 placed all land in the belonging of the government to be held in trust for the public. However, land tenure continues to be governed by customary laws in all rural parts of the State. And because transactions in the land market are largely informal, tenure security is low. The current locations of communities are the result of allocations by the Oba to the earliest settlers.

The traditional authority hierarchy comprises the Oba, who is the overlord of all the Benin Kingdom; the Enogie, nominated by the Oba as the Paramount chief and; the Odionwere, the village head who is appointed by the Oba and oversees the affairs of a village in consultation with his council of elders made up of representatives of priests, elderly, women, youth, and such other interest groups as the Odionwere may prescribe to be included. The Enogies of Iguoghor and Odighi are the Paramount Chiefs of the area, under who the Odionweres in their respective jurisdictions operate.

Over time, family inheritance and land rentals (sometimes in the form of share-cropping) have been the main means of access to land⁶ by successive generations. There is no outright purchase of land. The tenure relations governing the use of the Ekiadolor Forest Reserve, from which the PDA has been carved out, is land leases by the Ministry of Agriculture to individual the farmers under the Taungya farming scheme and general usufruct by surrounding communities. According to officials, the forest reserve land and surrounding buffer is the property of the Edo State Government. The existing rights of

⁶ Not forest reserve land

farmers farming in the reserve is subject to the temporary lease agreement administered by the Ministry. Communities have usufruct rights to the reserve to collect NTFPs. It is important to clarify however that, the focus and objectives of community consultations have not only been limited to the legally-leased areas, but extended to include areas under customary tenure of local communities i.e. areas subject to the their expression of usufruct rights to collect NTFPs. With the exception of lands allocated to individual farmers for Taungya farming, there are no defined areas or designated areas for individual communities within the PDA or surrounding buffer.

5.8 Land use and development trends

The development plans of local governments are set within the Niger Delta Regional Development Master Plan and the Edo State 30-year development plan. Both set out a framework to realise the development, environmental and socio-economic aspirations of the people, and among others, address agriculture, biodiversity, rural and urban planning, health, water supply, energy, women and youth employment.

There is growing interest and demand from companies for land for industrial oil palm development in the wider landscape. The State Government is committed to ensuring a prosperous and sustainable oil palm industry that creates jobs and wealth for the local population, but which is environmentally and socially sustainable and protects remnant tropical forests in the State. The State Government also intends to ensure that all palm oil companies operating in the State adopt best practice requirements and are either RSPO certified or seeking to achieve RSPO certification. In 2018, the Edo State Government signed up to the Africa Palm Oil Initiative – the first signature programme of the Tropical Forest Alliance 2020. Recently, the State Government has requested technical support from Proforest to facilitate a state-wide land cover mapping and analysis as a first step in a three- phase process in developing a landuse plan and forest strategy aimed at re-vitalizing Edo State forest sector. The objectives include:

- Acquisition of satellite imagery for land cover analysis of the entire Edo State identifying the different land cover classes and their size in ha
- Analysis of forest cover types using original forest reserve maps to identify different types of forests (intact forest, degraded forest, scrub, tree plantations etc) and the size (in ha) of these different land cover types within all forest reserves in the State
- Identification of areas within original forest reserves (and their size in ha) that have been de-reserved/degazetted or legally granted for agricultural development
- Identification of areas within original forest reserves (and their size in ha) that have been degraded or lost to other activities but have not been legally de-reserved/degazetted or legally given out for agricultural development

5.9 Image analysis and land cover classification

Delineation of the area of interest

Though the PDA is located between two rivers, the Aol used for the land cover analysis and for the HCS study was obtained by creating a 5 km buffer zone around the 14,906.7 ha of the PDA and converting the obtained buffer into an envelope feature with ArcGIS

version 10.3. The 5 km distance was used to comply with HCSA requirement on AoI delineation. Though the PDA covers about 14,906.7 ha and the buffered area is 54,641.8 ha, the final size of the used AoI is 81,259.1 ha. Figure 14 below presents the PDA, its 5 km buffer and the AoI.

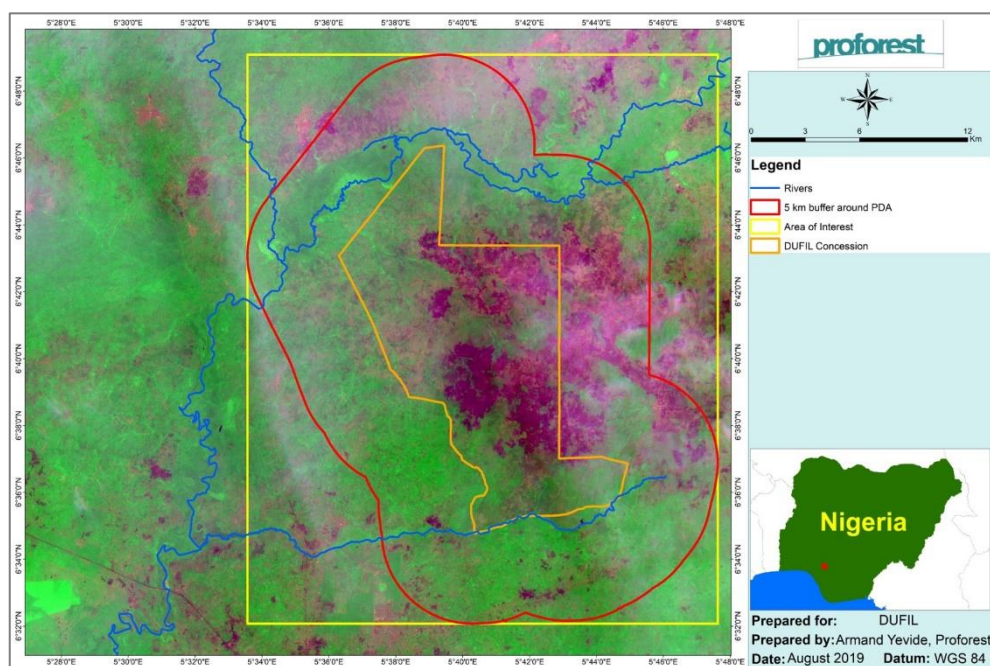


Figure 14: Map showing ARPN PDA with the AoI

Data source: Concession boundaries from company; Rivers digitized from sentinel imagery used for the land cover classification.

NB: The Sentinel-2B image is a 10 metre resolution satellite image acquired from the EarthExplorer webpage of the United States Geological Survey (USGS) (<http://earthexplorer.usgs.gov/>) for the year 2019 (Scene Identifier: LLC_T3INGH_A010115_20190212T095947 acquired on the 12th February 2019).

Remote sensing image acquisition and characteristics

The methodology in the workflow of the Option 3 was used to carry out the HCS assessment. This option was chosen given the challenges of getting LiDAR data for the PDA. In carrying out the initial land use and land cover classification, a Sentinel-2B remote sensing product which was less than six months old was downloaded from the United States Geological Survey (USGS), which provides through its Earth Explorer website (<http://earthexplorer.usgs.gov/>), several remote sensing images that exist in various types and for various dates. Though various products are available on that platform, Sentinel 2 was chosen because it provides a multispectral data with 13 bands in the visible, near infrared, and short-wave infrared part of the spectrum with spatial resolution of 10 m, 20 m and 60 m. Various band combinations based on the 10 m spatial resolution bands 2, 3, 4, and 8 were used and the false colour image based on the combination of the bands 4,8,2 was finally used to perform the vegetation classification given the low cloud cover it provides (Figure 15).

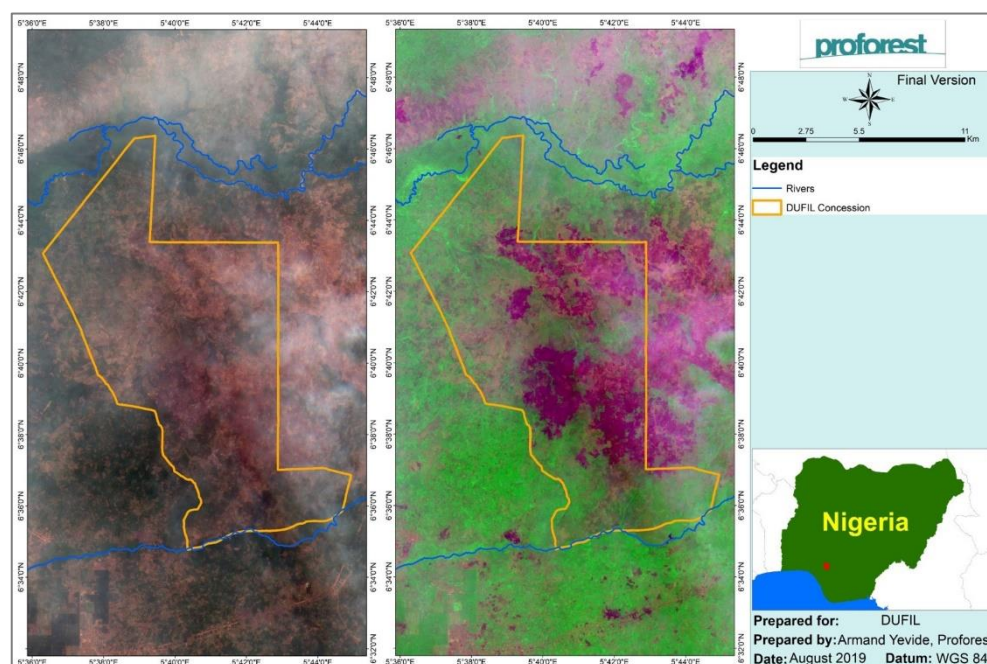


Figure 15: Map showing the ARPN PDA overlaid with the Sentinel-2B image from the combination of the bands 432 (Left) and 482 (Right)

Data source: Concession boundaries from company; Rivers digitized from sentinel imagery used for the land cover classification.

NB: The Sentinel-2B image is a 10 metres resolution satellite image acquired from the EarthExplorer webpage of the United States Geological Survey (USGS) (<http://earthexplorer.usgs.gov/>) for the year 2019 (Scene Identifier: L1C_T31NGH_A010115_20190212T095947 acquired on the 12th February 2019).

Table 10: Detailed characteristics of the remote sensing products used

ID	L1C_T31NGH_A010115_20190212T095947
Acquisition date	12-FEB-2019
Tile Number	T31NGH
Cloud Cover	8.1449%
Platform	SENTINEL-2B
Processing Level	LEVEL-1C
Datum/Projection	WGS84/UTM 31N

Land cover classification methodology

To perform the land cover classification of the Aol, a segmentation of the satellite image was done using the segment mean shift function in AcrGIS version 10.3 with 19.5, 15, and 2 as spectral detail, spatial detail, and minimum segment size in pixel respectively. The default value of the spatial detail was maintained while the spectral detail and minimum segment size in pixel were set to ensure a more precise segmentation of the land cover features on the Sentinel-2B image. The output raster of the segmentation was submitted

to an unsupervised classification followed by a reclassification into 32 classes of the unsupervised classification output. Each of the 32 classes were assigned one of the HCS and non-HCS land cover classes in the table below that presents the description of the land cover classes used and their correspondence to the HCS and non-HCS classes.

Table 11: Description of the land cover classes used

Land cover classes used	Description	HCS and non-HCS classes
High Density Forest (HDF)	Remnant forest or advanced secondary forest.	High Density Forest
Medium Density Forest (MDF)	Remnant forest that is more disturbed than the HDF.	Medium Density Forest
Low Density Forest (LDF)	Remnant forest-like highly disturb and recovering.	Low Density Forest
Young Regenerating Forest (YRF)	Mostly young re-growth forest, but with occasional patches of older forest within the stratum.	Young Regenerating Forest
Scrubland (SCR)	Vegetated land with some woody regrowth and shrub. This might include some relatively old fallow.	Scrub
Oil Palm Plantation (OPP)	Cultivated oil palm relatively old.	Scrub
Open Land (OL)	Cleared or grassland as well as buildup or urban area. This also includes newly planted oil palm.	Cleared / Open Land
Swamp	Area covered by water and natural woody or non-woody vegetation with aquatic or water tolerant species.	NA
Water bodies	Rivers, streams and pond	Cleared / Open Land

Land cover outputs

The land cover classification of the Aol revealed a medium forest landscape. The land cover is dominated by open land which represents about 26.4% of the Aol. The PDA has about 27.2% of forest cover and 0.5% of Young Regenerating Forest. The dominant land cover classes are open land (42.7%) and scrubland (29.6%). The scrubland in the area could qualify as fallow as they are mainly areas abandoned after harvesting or after years of farming to restore soil fertility. The initial and final land cover classifications are shown in Figures 16 and 17 below.

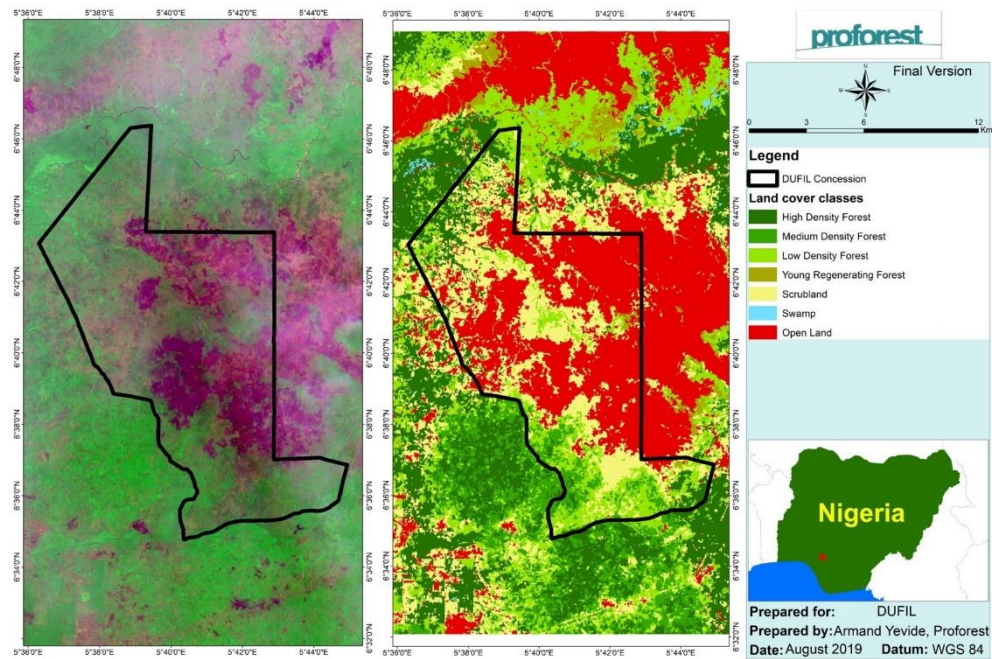


Figure 16: Map showing the results of the initial land cover classification

Data source: Concession boundaries from company.

NB: The Sentinel-2B image is a 10 metres resolution satellite image acquired from the EarthExplorer webpage of the United States Geological Survey (USGS) (<http://earthexplorer.usgs.gov/>) for the year 2019 (Scene Identifier: L1C_T31NGH_A010115_20190212T095947 acquired on the 12th February 2019).

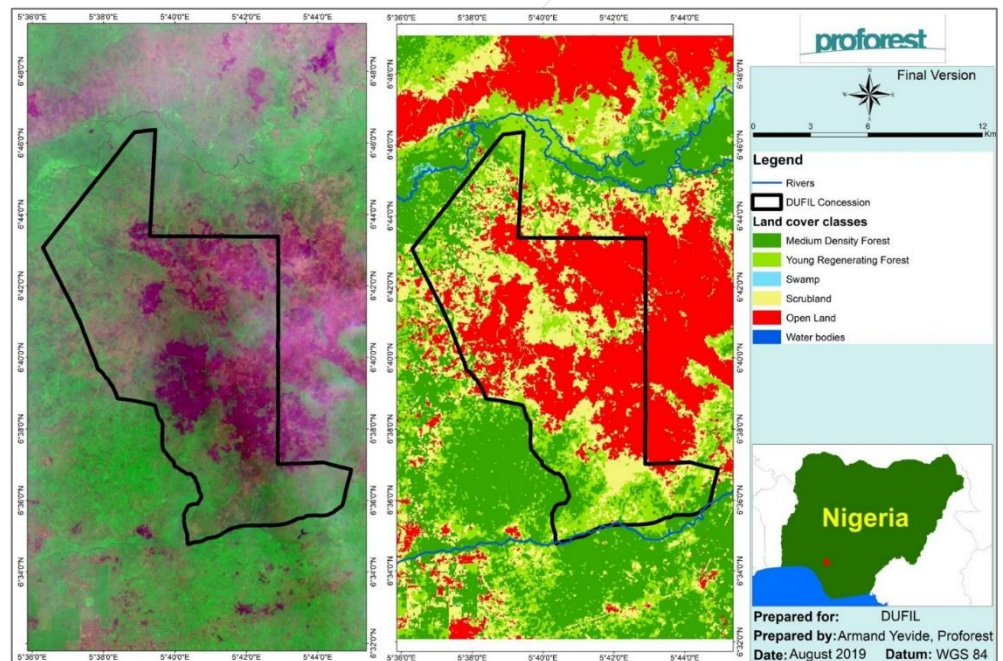


Figure 17: Map of land cover classification output - final (revised) vegetation classes

Data source: Concession boundaries from company.

Table 12: Size and proportion of HCS and non-HCS classes within the PDA

Land cover classes	Number of Hectares			% of total PDA
	Mineral	Peat	Total	
HCS classes:				
High Density Forest	1,127.7	0	1,127.7	7.6
Medium Density Forest	746.0	0	746.0	5.0
Low Density Forest	2,179.2	0	2,179.2	14.6
Young Regenerating Forest	74.8	0	74.8	0.5
Sub-total	4,127.7	0	4,127.7	27.7
Non-HCS classes:				
Scrubland	4,415.3	0	4,415.3	29.6
Swamp	0.48	0	0.48	0.0
Open Land	6,363.2	0	6,363.2	42.7
Sub-total	10,779.0	0	10,779.0	72.3
TOTAL	14,906.7	0	14,906.7	100.0

Land cover classification accuracy assessment

An independent sample of 350 pixels were randomly selected including a minimum of 50 for each land use and land cover classes to assess the classification accuracy. Google Earth imagery supported by sentinel downloaded imageries as well as pictures taken by assessment team was used to create the independent sample for the accuracy assessment. Error matrices as cross-tabulations of the mapped class vs. the reference class were used to assess the accuracy. Overall accuracy, user's and producer's accuracies, and the Kappa coefficient were then derived from the error matrices. The Kappa coefficient incorporates the off-diagonal elements of the error matrices (i.e., classification errors) and represents agreement obtained after removing the proportion of agreement that could be expected to occur by chance. The overall accuracy was 78.9% for the initial classification and 89.3% for the improved or final version of the initial classification based on the ground truthing data. The detailed accuracy tables are provided in the annex.

6 Social section: methods and results

6.1 Social methods

ARNP commissioned Proforest to undertake both the HCV-HCS and social impact assessments. Therefore, for improved efficiency, coordination and to avoid stakeholder consultation fatigue, fieldwork for both assessments was combined.

In addition to extensive review of the relevant literature, socio-economic survey results (including household data) from the ESIA assessment was combined with the social fieldwork to form the main sources of information for use in the assessment report. The methods for the fieldwork included household surveys, focus group discussions, key

informant interviews, public community meetings and participatory mapping – all of which were used to collect relevant socio-economic and cultural information.

The criteria for selection of communities for consultation included the following:

- Located within the PDA and/or approximately 5 km buffer of the PDA and using land or resources in the PDA. As explained in 5.4 above, the limits of the Aol are defined to incorporate all communities that were using land and/or resources from the PDA, and therefore extended beyond 5km from the boundary in some situations. It is also important to clarify however that, the focus and objectives of community consultations have not only been limited to the legally-leased areas, but extended to include areas under customary tenure of local communities. Therefore, the scope of participatory mapping of resources including HCVs 5 and 6 have included areas outside the limits of the PDA and its surrounding buffer, to cover all such customary use areas, as shown in the Aol.
- All communities with inhabitants farming in the PDA under the Ministry of Agriculture's Taungya farming scheme
- In each community, a deliberate effort was made to include all interest or sub-groups including women, youth, elders, settlers/migrants to ensure a balanced representation during data collection.

NB: As indicated above, only the 13 communities from whom the company provided evidence that FPIC had been secured and who permitted the conduct of the HCV/HCS assessment are now reflected in the report, and indicated in the methods and results sections.

6.1.1 Literature review and use of secondary data

The main approaches used in desk-based information gathering included:

- Internet search on relevant topics including demographic and health survey reports, regulatory background and procedural framework for social and environmental impact assessment in Nigeria, Land Use Act of 1978 (Chapter 202), national and state policies and action plans on environment, agriculture and forestry
- Review of unpublished reports provided by the Edo State Government Secretariat and the Ministry of Agriculture (which was leading the crop compensation exercise and had compiled some preliminary background information on the affected communities/farmers, existing tenures, farm locations and sizes, etc.
- Review of past social studies carried out in respect of other oil palm companies in Edo State.

In addition, the lead assessor and most of the assessment have considerable experience carrying out similar assessments in Edo State, all of which relevant knowledge and access to privileged information was brought to bear in carrying out the desk review and indeed, more widely in the conduct of the entire assessment.

6.1.2 Social fieldwork

This section summarizes the approach used to collect primary data by the assessment team. As noted earlier, it involved a combination of public meetings, focus group discussions and participatory mapping. The social impact study, which happened at the same time as the HCV-HCS assessment also included household survey and key informant interviews. The findings from all of these processes have been incorporated into the results of this assessment. Results of consultation and participatory mapping from the 13

affected communities are reflected in this report. Records of consultations are provided in the Annex. Information on areas under customary tenure was elicited using a combination of the following approaches:

Public meetings

Public meetings were held as a primary means of collecting information in a situation where as many interest or sub-groups were represented. This provided for an open and transparent approach to sharing and collecting information and to some extent, confirming the credibility of information provided. Participants in public meetings involved a cross-section of stakeholder groups, including traditional leaders, elders, women, the youth, farmers, hunters and other identifiable groups.

Focus group discussions

Usually after each public meeting, additional meetings were had only with women, who were identified as key resource users but who did were typically hesitant to vocalize their views during the larger community meetings. Even on occasions where some women were very expressive during the public meetings, the team still went ahead with these FGDs.

Participatory mapping

Participatory mapping was used to identify existing community land uses, HCVs 4, 5, 6 and their recommended management areas as well as for aiding the discussion and consensus on areas for current and future land needs. With the exception of Okhokhuo (that did not consent), participatory mapping was carried for all affected communities.

Participatory mapping proceeded in the following stages:

- First, sharing a copy of the PDA map with all consulted communities and seeking agreement on the location of the community during the public meeting
- Second, a discussion of key infrastructure, resources, cultural values and their locations. Sub-groups were also tasked to represent these on a blank sheet of paper to provide a basis to discuss and agree on what is present (school, market, clinic, streams, NTFPs, etc.) and their relative locations.
- Third, a group of 2-3 persons were then nominated to join the social team to the specific sites to collect the GPS coordinate for mapping purpose.
- Finally, the data collected was used to prepare a geo-referenced map showing all identified values (HCVs 4, 5, 6) and a visualization of indicative community use areas for validation during the final consultation meetings with the communities.

NB: *The above methods have been used to elicit information in areas under both legal and customary tenure. Such areas overlap in the PDA and the adjacent Ekiadolor forest reserve and its surrounding buffer. The exclusive customary use areas i.e. without overlapping legal rights, are the remainder areas in the AoI outside the protected areas in other words community use areas. Information on these areas were also elicited using the above methods including consultations with communities and participatory mapping, that resulted directly in the identification and mapping of HCV/HCS areas and proposed areas designated as community use areas or the so-called 'free areas'.*

6.2 Results: Social HCVs and livelihoods

Table 12 provides a summary of the outcomes from stakeholder consultations, details of which are provided in Annex 2.

6.2.1 Summary of interviews and discussions

Table 13: Summary of interviews and discussion

#	Expert/Organisation/Social group	Name/title/role	Type of interaction	Concerns/topics/recommendations
1	Edo State Government Officials: -Ministry of Agric -Min of Environment -Forestry Dept -Ovia NE LGA	1.1. Okonofua Godwin (Permanent Secretary) 1.2. Bashiru S. Kadiri (Outgoing P.S) 1.3. Tony Imafidon (Asst Director Forestry) 1.4.M.I. Anogie (Director of Agric Services)	Group meeting/interview	Discussed the crop compensation process and the circumstances leading to the allocation of the PDA to ARPN as well as their obligations and rights. Want regular updates of the HCV-HCS assessment. Clarified the legal limits of the land (ca. 14,900 ha) as well as the indicative buffer area (3 km).
2	Min of Agric	2.1.David Ogunbor (Principal Agric Officer)	Interview	
3	Survey Department	3.1.Henry Oriakhi (Consultant Surveyor)	Interview	
4	Agric Department	4.1.Bright Umweni (HOD)	Interview	At this stage, there has been limited involvement by the department as the Ministry has been more engaged in the crop compensation issues.
5	Nigeria Conservation Foundation	5.1.Joseph Onoja (Programme Director)		No studies undertaken in the AoI but believes HCVs are likely to occur in the landscape. Particularly interested to know which HCV 1 species are identified from the bio-surveys and concerned about the likelihood of shortage of land for farming as a result of the planned development.
6	Environmental Rights Action / Friends of the Earth-Nigeria	6.1 Mrs. Obaseki (Administrator)	Interview	Concerned about the livelihoods impact and food security needs of

		6.2 Godwin Ojo (Executive Director)		affected communities. Area likely to contain all HCV categories so rigorous methods should be applied to identify them. Address FPIC issues.
7	Paramount Chief Iguogorn	7.1 HRH Omokharo (Paramount Chief/Enogie Iguogor)		Development is generally lacking in the area with bad roads, few schools and clinics and no pipe-borne water but electricity in most communities.
8	8.1 Odighi	Public meetings were held to include all affected communities. The public meeting at Oshodin 1 and 2 had participants from Ariyan and Okokodo. Detailed outcomes from the community meetings are provided in the Annex 2, and a summary of issues provided below. - Communities raised concern about the crop compensation exercise and noted that it had not been transparent and that some farmers are yet to receive compensation. - Questions were asked why the Ministry and not ARPN, has led the initial engagement with the communities until only a few weeks prior to the commencement of the HCV/HCS and SIA assessments. They expressed the hope that ARPN will continue (as it appears to be doing now) to take the lead in engaging communities and responding to grievances. - Food security concerns were also raised, with the reduction of areas now available for farming. Recommendations were made for the Ministry to open up more areas in the denuded forest reserve and buffer areas for farming. - There are no community cemeteries. Most people travel to bury their dead in their home towns and for the few indigenes, burial of the dead is done in their homes. - NTFPs are used by communities to supplement their food, fodder, medicinal, and building materials needs. However, invariably, communities noted that all of these were not to be found in any particular locations but spread/scattered across the landscape and surrounding areas.		
	8.2 Abumwenre			
	8.3 Ekonobore			
	8.4 Ugboke			
	8.5 Oshodin 1&2			
	8.6 Ariyan			
	8.7 Okokodo			
	8.8 Igolo			
	8.9 Eko-Ekpetin			
	8.10 Aihuobabekun			
	8.11 Idunmwenhigie			
	8.12 Igbekhue			
	8.13 Osasinmwinoba			

6.2.2 Status of FPIC

All 13 affected communities indicated in the report agreed for the conduct of the social fieldwork including consultations and participatory. Each of these communities also confirmed that crop enumeration was complete and compensation was in progress, and conditioned their full and complete approval of the project once every affected farmer had received full compensation.

Prior to starting the fieldwork, the team confirmed the initiation of FPIC by a joint team of officials from the Ministry of Agriculture and a company representative by reviewing the report of the survey, enumeration and valuation report carried out as part of the crop compensation process. The report documents initial engagements with affected farmers/communities about the planned development project and the lease allocation to ARPN. Upon completion of the fieldwork and initial drafting of the report, the company has made available signed copies of consent from all affected communities.

6.2.3 Results of social fieldwork

Participatory mapping

The results of participatory mapping has informed HCV 4, 5 and 6 identification as well as recommendations regarding delineation of the 'free areas'.

Prior to the assessment, a land tenure reconnaissance survey was carried out by the Ministry of Agriculture as part of the process to collect baseline information to inform the crop compensation in respect of farms in the Ekiadolor forest reserve that would be affected by the planned development. According to the Ministry, their focus was identifying and demarcating all the farms within the boundary of the PDA, followed by enumeration and compensation. The records of farm ownership, including particulars of the farmer (e.g. name, farm size, number and types of annual crops, etc.) are maintained at the Ministry and State Secretariat, and available for review.

During the assessment, participatory mapping focused on identification and mapping of HCV 4, 5 and 6 areas⁷, location of communities and discussion and identification of areas important for current and future livelihoods and food security.

Prior to any participatory mapping in every community, consent (FPIC) was secured from community members during the public meetings. Without exception, there was general acceptance and a willingness for identifying and mapping these attributes. In most cases, unconditional access was granted to shrine sites, while in a few cases, the team was requested to make payments to facilitate customary rituals for the participatory mapping to go ahead. In these instances, the participatory mapping of the shrines did not proceed as the financial demands could not immediately be met. The company is required to complete these outstanding mappings (see M&M section).

Following the field work, and prior to finalising the report, the outcomes from the participatory mapping was shared in the form of final locations of the agreed HCV and HCS areas, and validated during the final stakeholder consultations. Copies of the maps were left with communities. The M&M section of the report addresses the need for participatory M&M planning upon the basis of M&M recommendations.

⁷ This was particularly in relation to streams, swamps and shrines. There were no peculiar locations for the collection of NTFPs or hunting grounds and gathering areas. A multitude of fallow and farmlands are also scattered randomly in the landscape. Therefore, there is no situation of overlap of the PDA with any such areas in that sense.

6.2.4 HCV 4 Ecosystem services in critical situations

Definition and interpretation

HCV 4 refers to areas that provide basic ecosystem services in critical situations. These include protection of water catchments, and control of erosion of vulnerable soils and slopes. The services provided include flood regulation, water purification, climate regulation, nutrient cycling.

HCV	Key question	Finding
	Ecosystem services. Basic ecosystem services in critical situations, including protection of water catchments and control of erosion of vulnerable soils and slopes.	PRESENT

Identification

HCV 4 covers ecosystem services for which their disruption could result in the “threat of catastrophic or cumulative negative impacts on the welfare, health or survival of local communities, on the functioning of important infrastructure (roads, dams, reservoirs, hydroelectric schemes, irrigation systems, buildings, etc.), or on other HCVs.” The concept of critical situations covers cases where either:

- There are no viable, readily available or affordable alternatives, or
- The loss/damage to an ecosystem service could cause serious prejudice/suffering to recipients either immediately or periodically.⁸

This typically covers, but is not limited to, areas that:

- Protect watersheds, regulate streamflow and prevent potentially catastrophic floods,
- Prevent the spread of fires, protection against winds, regulation of humidity, rainfall and other climatic elements,
- Pollination services, for example exclusive pollination of native or commercial crops by pollinators dependent on the presence of suitable forest habitat.
- Control erosion of vulnerable soils and slopes.

Furthermore, the HCV Common Guidance on HCV Identification lists the following as potential indicators of HCV 4:

- Provision of clean water, where local communities depend on natural rivers and springs for drinking water, or where natural ecosystems play an important buffering or stabilising role.
- Remote and/or poor rural areas where people rely directly on natural resources to supply most of their needs, including water,
- Upstream of extensive or important wetlands, fish nurseries and spawning grounds, or sensitive coastal ecosystems (e.g. mangrove forests, coral reefs etc.),

⁸ Brown, E., N. Dudley, A. Lindhe, D.R. Muhtaman, C. Stewart, and T. Synnott (eds.). 2013 (October). Common guidance for the identification of High Conservation Values. HCV Resource Network.

- Upstream of important municipal water sources,
- Steep or mountainous areas, or areas of high rainfall, where the risk of catastrophic erosion is high,
- Where there is naturally low soil fertility, especially on sandy, peaty or fragile soils, where land clearance, drainage, use of heavy machinery or other intensive land use might affect soil structure and fertility,
- Arid or dryland areas particularly susceptible to erosion and desertification.

Discussion and justification

Control of erosion and slopes (protection of vulnerable soils, aquifers and fisheries)

Most of the PDA is gently undulating except portions of the south-central parts with some moderate slopes. The highest slope is around 15 degrees which is below the threshold of 25 degrees as indicated in the Nigeria RSPO NI document, which recommends application of measures including terracing, platforms and cover crops for terrain with gradients between 9-25 degrees. Given that there is no steep slope within the PDA or surrounding areas, we conclude that slopes as HCV 4 are absent in the AoI (Figure 18).

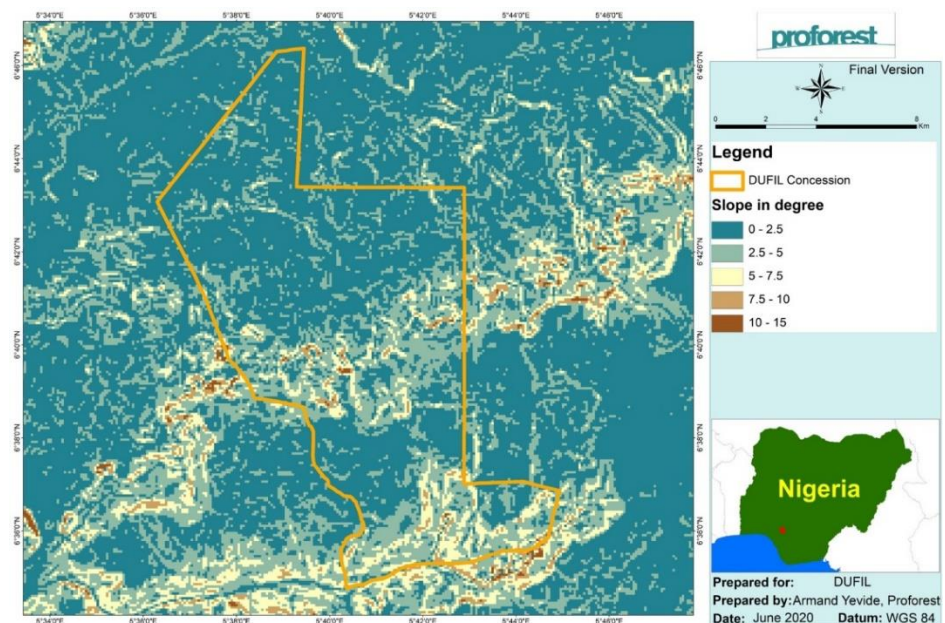


Figure 18: Slope map of the AoI

Data source: Concession boundaries from company; Topographic layer based on DEM extracted from <http://viewfinderpanoramas.org/dem3.html>.

Prevention of spread of fires

Wildfires or bush burning in Edo State and Nigeria in general is an old practice but not regulated. Fire constitutes an important management practice by most farmers in the communities. Wildfires are used to control grazing fields in some cattle keeping communities. Fires are a major cause of disturbance in Nigerian ecosystems. Most are anthropogenic, instrumental for many agricultural practices including land clearing, pasture management, hunting and biomass removal. Research assessing the most recent

fire occurrences in the country is limited (Collins, 2012). Spatially, recent fire events have occurred mainly in the interior regions of the country, with fewer detections in northern Nigeria and the Niger Delta region (Figure 19). Expert consultations and review of the literature suggest that there is no history of extensive and destructive wildfires in this vegetation zone (moist rainforest), which has a relatively short dry season and extensive heavy rains. The risk of destructive wildfires is therefore thought to be virtually non-existent in the area.

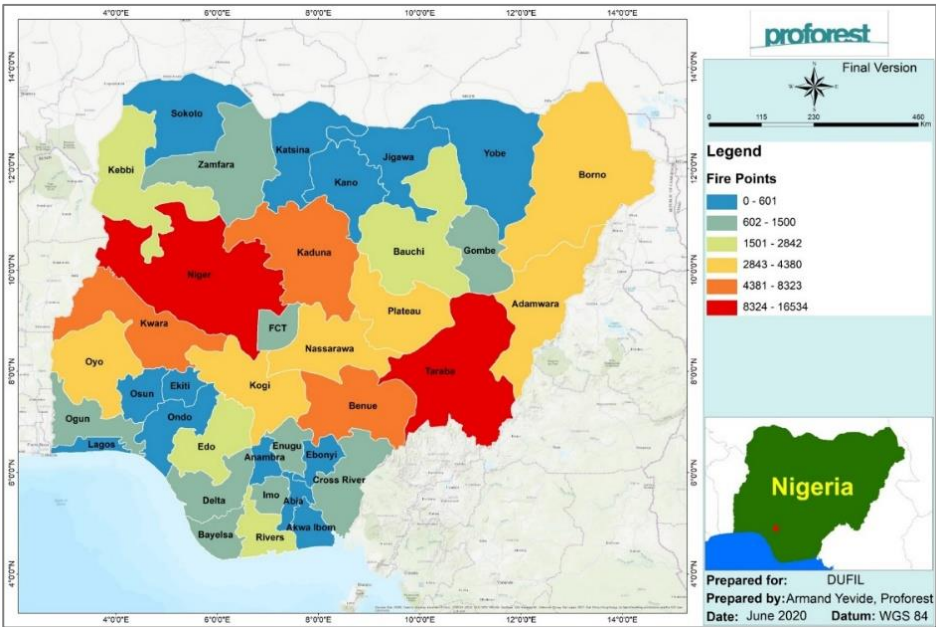


Figure 19: Fire risk map of Nigeria
Data source: Administrative and geopolitical boundaries (<https://gadm.org/>)

Pollination services

Pollination is an ecosystem process that is fundamental to the reproduction and persistence of flowering plants. A large percentage of the world’s flowering plants are pollinated by insects and other animals and most of the remainder use abiotic pollen vectors, mainly wind. This degree of dependence is thought to be even higher in tropical zones, where it is estimated that nearly all plants depend on animals for pollination. However, most of these observations have been made in Latin American and Asian tropical lowland rainforests, and similar degrees of dependence in African tropical forests do not appear to be well documented. Interviews with experts and review of literature indicate that no pollinator faunistic surveys have been done in the AoI and therefore specific data is unavailable.

Areas critical to water catchments and riparian buffers (managing extreme flow events, maintaining downstream flow regimes, maintaining water quality characteristics, etc.).

There are two prominent rivers in the AoI. The Osse and Ovia to the north and south respectively. The Ovia River overlaps with parts of the PDA in the south. These portions have riparian vegetation. This riparian vegetation protects water quality by trapping



sediments and pollutants associated with run-off, helping recharge underground aquifers, dissipating stream energy during floods, and providing detritus for aquatic organisms (Chappel et. Al. 2007). A reduction in the vegetation cover of riparian areas can thus lead to increased sedimentation and nutrient loading of the rivers and its tributaries, resulting in a marked decrease in the quality of these critically important water bodies (there is widespread community dependence on rivers and streams as noted below). By supporting aquifer recharge and maintaining stream flow, the riparian vegetation also ensures water quantity (and quality) is maintained.

It is thus concluded that the riparian buffers along waterbodies in the assessment area constitute HCV 4. A buffer is recommended to be established on each side of waterbodies. The prescribed buffer width is should be relative to the width of the waterbody. Thus, 5m buffer for waterbodies of 5m width or less, 10m for those between 5m and 10m, 20m for those between 10m and 20m width, 40m for those between 20m and 40m, 50m for those between 40m and 50m and 100m for those above 50m (as recommended by RSPO Nigeria National Interpretation guidelines on riparian management). Figure 20 shows the location of riparian buffers overlapping the PDA. It must be noted that only the areas for which streams/river shapefiles were available have been mapped and that there are likely to be other streams running through the PDA that have not been mapped in this assessment. The company should therefore ensure that all streams encountered during land preparation are mapped or that it obtains an accurate recent shapefile of waterbodies in the PDA and use these to update and finalise the (draft) HCV map, applying the same buffer width recommendations as indicated above.

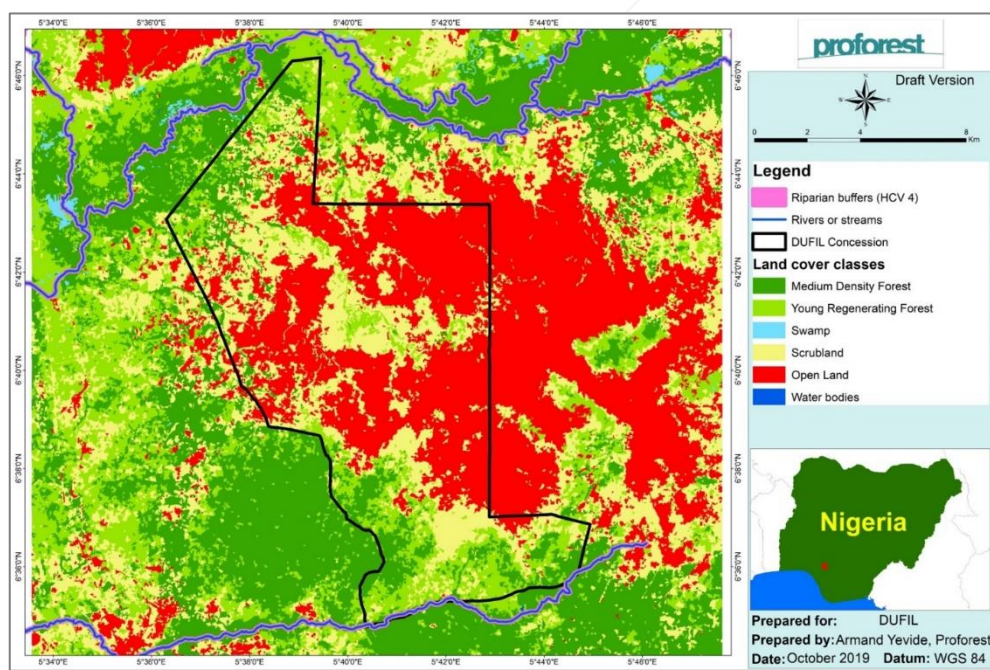


Figure 20: Map showing HCV 4 areas

Data source: Concession boundaries from company; Rivers digitized from sentinel imagery used for the land cover classification.

Protection against winds (regulation of humidity, rainfall and other climatic elements)

There are no reported incidents of wind disasters in Edo State and such events are historically rare in south-wester Nigeria. The predominant average wind direction reported for Edo State varies throughout the year. The wind is most often from the west. The forest patches in the north, south-western and southern parts of the AoI may help in the regulation of humidity and influence the local climatic conditions. These areas overlap with areas identified as HCS forest.

Grasslands providing buffering against flooding or desertification

Most parts of the Edo State lie within the rainforest belt of Nigeria. In spite of its location in the rainforest, many isolated grasslands are reported to be dispersed within the State (Obodoni et. al., 2009). However, none of these areas occur in the AoI or the PDA which lie entirely within the rainforest and previously gazetted forest reserve respectively, as evidenced from the vegetation maps shown throughout this report including Figure 19 above.

Therefore, no areas within the AoI have been established as grasslands providing buffering against flooding or desertification.

Groundwater recharge zones

Landuse / land cover is an important factor in groundwater recharge. This is because the landuse pattern of any terrain is a reflection of the complex physical processes acting upon the surface. The landuse and land cover of an area provides important indications of the extent of groundwater requirement and utilization. A detailed study of groundwater recharge potential would entail integration of the results of lithology, lineament density, slope, soil cover, drainage density and land use land cover. This has not been done during this study but no evidence (review of secondary data and stakeholder interviews) was found on the occurrence of critical ground water recharge zones in the AoI.

Summary of HCV 4 areas in hectares

Value	Area in PDA	Area in landscape
Riparian buffers (Osse and Ovia Rivers and their tributaries)	13.6	551.1

6.2.5 HCV 5: Local people's basic needs

Definition

HCV 5 areas are those that are fundamental to meeting basic needs of local communities (e.g. subsistence, health etc).

HCV	Key question	Finding
5	Does the PDA contain areas that are fundamental to meeting the basic livelihood needs of the local communities, e.g. (subsistence, health etc)?	Present

Identification

An area is considered as HCV 5 when it is the source of resources fundamental to satisfy basic needs in a situation where most of the local people or the poorest population have no realistic alternative. This includes areas that are of essential importance for local communities as substantial and irreplaceable sources of food, medicines, fuel, household water and other basic needs. Where these goods and services are localised in an area within the natural environment and where they serve as a crucial source of livelihood for the communities in situations where no realistic alternatives exist, these goods and services would be identified as HCVs and the areas needed for their maintenance set aside and managed appropriately.

The following would qualify as HCV 5:

- Hunting and trapping grounds
- NTFPs
- Fuel for household cooking, lighting and heating
- Fish (as essential source of proteins) and other freshwater species relied on by local communities
- Building materials (poles, thatching, timber)
- Fodder for livestock and seasonal grazing
- Water sources necessary for drinking water and sanitation
- Items which are bartered in exchange for other essential goods or sold for cash which is then used to buy essentials including medicine or clothes, or to pay for school fees.

Discussion and justification

Water resources and fisheries

The Osse and Ovia rivers, occupy a very major position not only in the ecology but also the local economy of the landscape. Most communities rely on both rivers and nearby streams as their only sources of water for drinking and domestic chores. All such streams have been identified as HCV 5 (Table 13). Some of these were identified during the participatory mapping and subsequently mapped. With the exception of parts of the Ovia River which overlap the PDA in the southern boundary, most of these lie outside the PDA (Figure 21).

Nonetheless, all of these areas have been identified as HCV 5 areas in the landscape . Recommendations have been made to the company to complete the identification and mapping of all streams in the PDA in Section 12 on next steps.

Table 14: HCV 5 attributes in the Aol

	Community	HCV 5
1	Odighi	Sources of water are borehole and Obue river
2	Abumwenre	Osa and Era streams serves as sources of water for domestic purposes.
3	Ekonobore	Okhuo stream serves as a source of drinking water and other domestic activities.
4	Ugboke	Fishing in the Ovia river and Ezenuyormo and Era river is main source of drinking/domestic water.
5	Oshodin 1&2	Ovia river as main source of water for washing, bathing; Bush water for drinking.
6	Ariyan	
7	Okokodo	
8	Igolo	Source of water for drinking (Aiwor river) is about 3 miles close to Agema village.
9	Eko-Ekpetin	Okhuo river as source of drinking water
10	Aihuobabekun	The sources of drinking water are two streams called the Okhuo and the Omozaye .
11	Idunmwenhigie	The source of drinking water is the Okhuo river .
12	Igbekhue	Source of water is Okhuo River .
13	Osasinwonmba	Borehole is source of water for domestic use.

Hunting and trapping grounds

All communities indicated that, a wide variety of animals⁹ are hunted in the Aol but noted that there are no particular locations where hunting is done. Therefore, no particular sites could be located as areas where hunting of these animals is done. In other words, hunting is done extensively in the wider landscape and even when this overlaps into the PDA, there are not specific sites for hunting. Hunting occurs in farms, fallow areas, shrubs and forest patches. Furthermore, it was revealed that hunting is only one of the sources of protein, with other protein sources including fishing from nearby streams and rivers and purchases from nearby markets. Current wildlife regulation prohibits hunting of young immature wild animals or birds, female wild animal accompanied by its young and birds which are apparently breeding in addition to all nationally endangered species.

⁹ Antelopes, bush pigs, grasscutters, buffalos, porcupine, deer, alligators, rabbit, guinea fowl, monkeys, bongo, squirrels, duikers, deer, civets, snakes, chimpanzees, pangolins

Gathering of food, medicines, construction materials, fuelwood and fodder

For the majority of communities, it was revealed during public meetings and FGDs that certain leaves and herbs are collected from nearby bushes, but these are diffused in the landscape and not concentrated at specific locations within or outside the PDA. Furthermore, the communities do not rely solely on medicinal herbs, barks, etc. to meet their healthcare needs since they have access to various health facilities. Herbs are collected mainly from the forested areas and nearby surrounding bushes. It was revealed during consultations that during the dry season, when browse availability is limited, cattle are herded from up north to the south including the assessment landscape. Most timber and poles for building and construction material and fuelwood is sourced from vegetation patches in and around communities. Therefore while the PDA is a source of fuelwood, fodder, poles and timber for nearby communities, these materials are also collected extensively from outside the PDA and are spread widely in the landscape close to settlements (homesteads, roadside,), on farms, in nearby bush land and further afield.

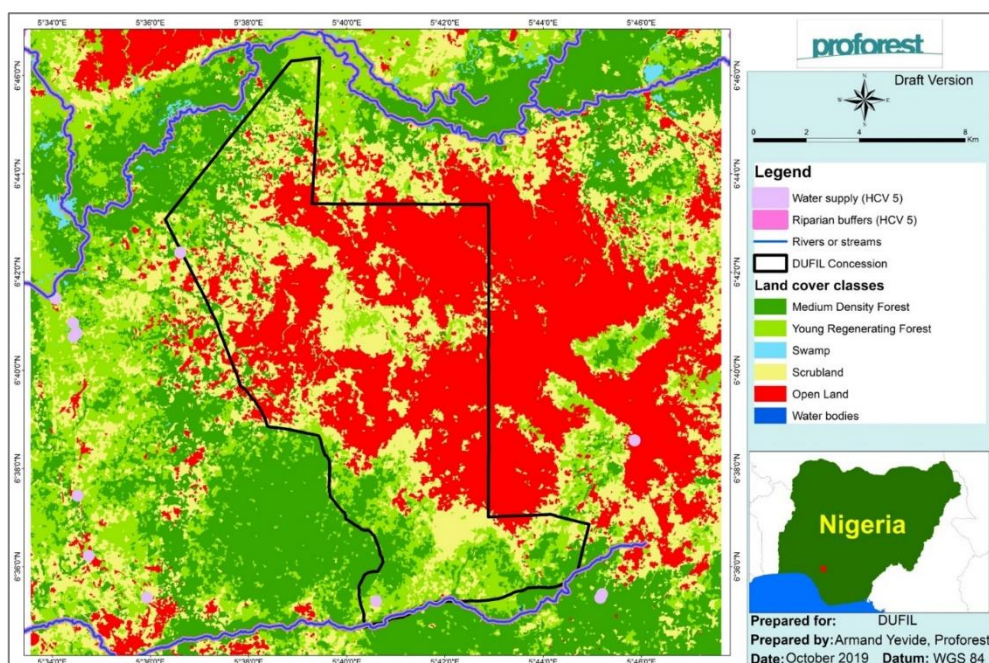


Figure 21: Map showing HCV 5 areas

Data source: Concession boundaries from company; Rivers digitized from sentinel imagery used for the land cover classification; Other layers from field assessment including participatory mapping.

NB: Identified HCV 5 values are critical streams. These are shown as points of the stream on the map and not line attributes because no shapefiles were available and it was going to be too time-consuming to traverse the entire lengths of the streams during the assessment. Consequently, recommendations have been made for the company to identify and properly map these streams during the course of plantation development. As indicated above, these streams were mentioned during consultations with user communities and identified during the participatory mapping.

Summary of HCV 5 areas in hectares

Value	Area in PDA (ha)	Area in landscape (ha)
Water supply points ¹⁰	6.5	58.1
Riparian buffers of Osse and Ovia rivers	13.6	551.1

6.2.6 HCV 6: Cultural values

Definition

An area is HCV 6 if it contains any resource or value that is considered to play critical socio-cultural or religious function. This may include areas that are set aside as sacred forest or sacred trees and serving as the *home to deities or ancestors*.

HCV	Key question	Finding
6	Cultural values. Sites, resources, habitats and landscapes of global or national cultural, archaeological or historical significance, and/or of critical cultural, ecological, economic or religious/sacred importance for the traditional cultures of local communities or indigenous peoples, identified through engagement with these local communities or indigenous peoples.	Present

Identification

Sites of national or global importance

This includes archaeological, UNESCO World Heritage and cultural heritage sites and all other similar sites of national importance. None of such sites are present within the PDA as confirmed from stakeholder interviews and extensive literature search.

Sites of local cultural/traditional or religious importance

These areas include such sites of local cultural importance as sacred groves and cemeteries. In Nigeria, some patches of forest/natural vegetation may be considered as 'evil'¹¹ and are generally set aside from all forms of intrusion and conversion - the belief being that any person who intrudes into such areas would bring a curse to himself and the community. Additional customs that may qualify as HCV 6 in Nigeria include:

¹⁰ These are small streams. The entire length has not be traversed and captured as a line attribute but a point along it taken with the GPS. No shapefiles were available for these streams.

¹¹ No such 'evil' forests were indicated to be present during consultations with communities and therefore no basis for mapping.

- Cemeteries;
- Sacred/totem animal or plant species that are thought to contain spirits or the soul of the community and should not be killed or disturbed;
- Intangible taboos such as *taboo days* on which no entrance into the forest or farms is permitted. These may be one day of the week set aside on which the *gods* and *ancestors* rest; a day within the year for religious festivities or random days that are dictated by the *oracles* for the performance of traditional or religious rites.

Discussion and justification

There are no community cemeteries in the assessment landscape. The reason being that, majority of the people mainly migrants, prefer to bury their loved ones back in their hometowns. However, shrines are very common, with several occurring in most of the communities (Table 14). Most of these shrines were mapped during the participatory mapping exercise. Others were not mapped due to reasons beyond the control of the assessment team (e.g. monies were requested to perform cultural rites of access). The distribution of mapped shrines in the landscape are shown in Figure 22 below. Table 15 shows which shrines have been mapped in each of the communities. As part of the next steps, the company is required to complete the mapping of the remainder six of the identified HCV 6 areas (shrines). For this reason the map is labelled as draft.



The Iyantor tree shrine at Ugbokuli

Table 15: HCV 6 attributes identified in the Aol

#	Community	HCV 6	#	Mapped
1	Odighi	Ugheagbevo, Efa, Odighinebo shrine, Ilaho shrines	4	Yes
2	Abumwenre	Osa and Era shrines	2	Yes
3	Ekonobore	Odudu shrine	1	Yes
4	Ugboke	Ovia , Osun, Ezenuyormo and Era shrines	4	Yes
5	Oshodin 1&2	Iyantor shrine	1	Yes
6	Ariyan	Osa shrine	1	No
7	Okokodo	Oposomi shrine	1	No
8	Igolo	Aiwor shrine	1	No
9	Eko-Ekpetin	Osagbaye shrine	1	No
10	Aihuobabekun	Arue-Omozaye, Omozaye, and Okhuo shrines	3	Yes
11	Idunmwenhigie	Okhuoniyomo, Okhuo and Ulele shrines	3	No
12	Igbekhue	None	0	NA
13	Osasinwonmba	Ekpengbe shrine	1	No



Some shrines in 6 communities could not be mapped because the required rites could not be performed during the field work. The company should therefore work with these communities to map the shrines. It was indicated that all the shrines are within and/or around the communities, with none of them inside the PDA. The communities in question are indicated in the table below. It is challenging to show indicative locations of these shrines on the map as no hint was given about where they are located in the communities

1	Ariyan	Osa shrine	1
2	Okokodo	Oposomi shrine	1
3	Igolo	Aiwor shrine	1
4	Eko-Ekpetin	Osagbaye shrine	1
5	Idunmwenhigie	Okhuoniyomo, Okhuo and Ulele shrines	3
6	Osasinwonmba	Ekpengbe shrine	1

NB: Total of 15 mapped HCV 6 areas, with 3 on the boundary. These are Odighinebo and Ilaho shrines (at Odighi on the south-eastern boundary and quite close to each other) and Aiwor shrine(at Igolo on the north-western boundary).

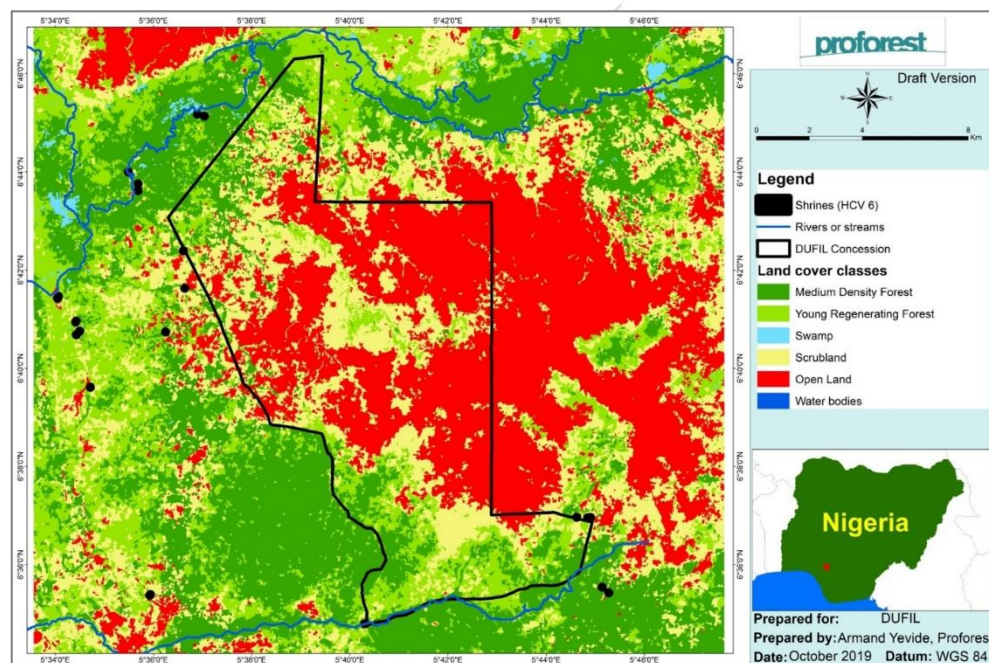


Figure 22: Map showing HCV 6 areas

Data source: Concession boundaries from company; Rivers digitized from sentinel imagery used for the land cover classification; Other layers from field assessment including participatory mapping.

Summary of HCV 6 areas in hectares

Value	Area in PDA	Area in landscape
Shrines in the Aol	0.06	21.91

6.2.7 Local people's lands and future livelihood security

The communities around the PDA are pre-dominantly agrarian and farming is a widespread livelihoods activity. For some of the communities, farming occurs around and within the PDA. Land is an important factor to secure access to – and the availability of food through own production. Food security encompasses food availability, food access and food utilization and no detailed effort has been made here at a comprehensive analysis. Findings from the consultations however, reveal a concern about future food security as a result of displacement from current farmlands overlapping the PDA. Particularly, Abumwenre raised the fear of losing farmlands and not having alternative land for farming outside the reserve, noting that the exact areas acquired and affected farms are not yet known. Ekonobore enquired whether farming will be allowed in other parts of the reserve since a big portion of the area leased to ARPN was under Taungya. The meeting involving representatives from Ariyan, Okokodo and Oshodin revealed concerns about whether land in the proposed free area will be adequate to cater for the needs of all affected communities on the one hand, and whether, adequate land will be allocated to farmers under a renewed allocation scheme. Eko-Ekpetin also expressed concern that the remaining free areas would be woefully inadequate as an alternative land for farming and therefore requested that communities have access to the available buffer to continue farming.

According to the Ministry of Agriculture, more areas will be opened up as 'free areas' to meet the communities' needs. For instance, more areas in the rest of the reserve will be made available for farming in addition to parts of the 3 km buffer (ca 15,098 ha). Communities welcomed and showed support for this proposal (during the final consultations), and were generally of the view that this should adequately meet current and future needs of all the communities in the Aol. The assessment team supports this view and reckon that, with an estimated average population (per community) of about 350 persons, and a population growth rate of 2.7% (according to the National Population Commission's report of 2006), available lands for farming (including existing areas and the proposed 'free areas') should be adequate to meet current and future needs. Considering that the estimated 'free-areas' is ca.15,098 ha, more than sufficient land is estimated to be available per person, now and in the future.

Detailed mapping should be completed of the free areas for an accurate representation of the limits. ARPN should jointly lead in this effort in consultation with affected communities (see section on next steps). For this reason, the map below (Figure 23) is labelled as draft.

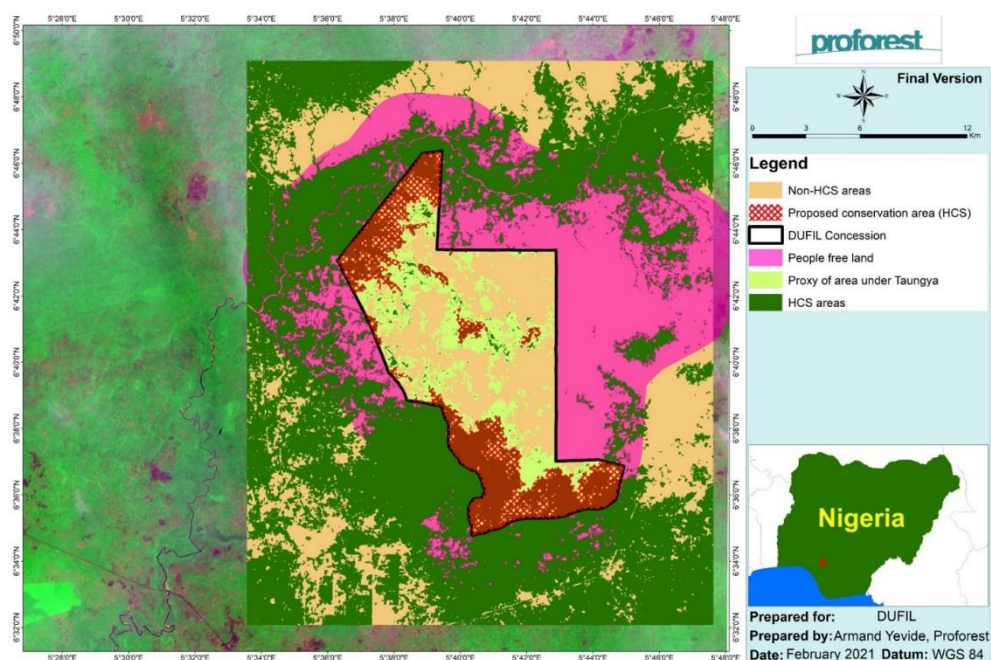


Figure 23: Map showing area designated as 'free area'¹² for farming (3 km buffer)

Data source: Protected areas from WDPA (<https://www.protectedplanet.net/en/thematic-areas/wdpa>); Concession boundaries from company; Other layers from field assessment including participatory mapping.

7 Environmental section: methods and results

7.1 Environmental methods

7.1.1 Literature review and use of secondary data

A literature review was conducted prior to the scoping visit and also during planning of the full assessment. There is a paucity of secondary environmental data on the AoI. However, the below listed secondary data were used and have been referenced throughout the document and/or listed under the reference section:

- Literature and reports including but not limited to academic papers, and grey literature on the ecological, biophysical and social context,
- Information on relevant legislation and international conventions such as national legislation, CITES, IUCN Red Lists,
- Spatial information and relevant local demographic statistics
- HCV and HCSA implementation guidance including the HCV-HCSA Assessment Manual, the Common Guidance for HCV Identification, the HCSA toolkit (version 2), and the HCSA Social Requirements Implementation Guide.

¹² The 'free area' includes the 3 km buffer around the former forest reserve and other areas designated as possible farming areas by the Ministry. Recommendations have been made for more detailed participatory mapping of the allocated free area, with ARPN playing a proactive role in collaboration with the Ministry.

Due to the little secondary data especially on the Aol, this assessment relied on primary data collected in the field by the expert teams.

7.1.2 Environmental fieldwork

Forest inventory sampling and data collection methodology

The inventory was carried out from 3rd to 24th June 2019. The sampling methodology was developed based on the preliminary or initial land cover classification conducted to ensure adequate sampling effort in each of the main vegetation types within the Aol. In the absence of data to use in the sample size estimation formula, an approximately 0.131% sampling rate was used to determine the sample size in hectare and later this was converted into number of plots by dividing the sample size in hectare by the survey plots size. Plots were randomly distributed within the land cover classes with the aim of more intensive sampling of the forest and scrub classes as the other land cover classes are less important in the HCSA. Though plots were distributed randomly, it was kept at a minimum distance of 80 m between plots to ensure independence of sampled plots (Figure 24). There were 65, 105, 45, 60, 100, 5, and 10 plots in the High Density Forest, Low Density Forest, Medium Density Forest, Open Land, Scrubland, Swamps and Young Regenerating Forest respectively.

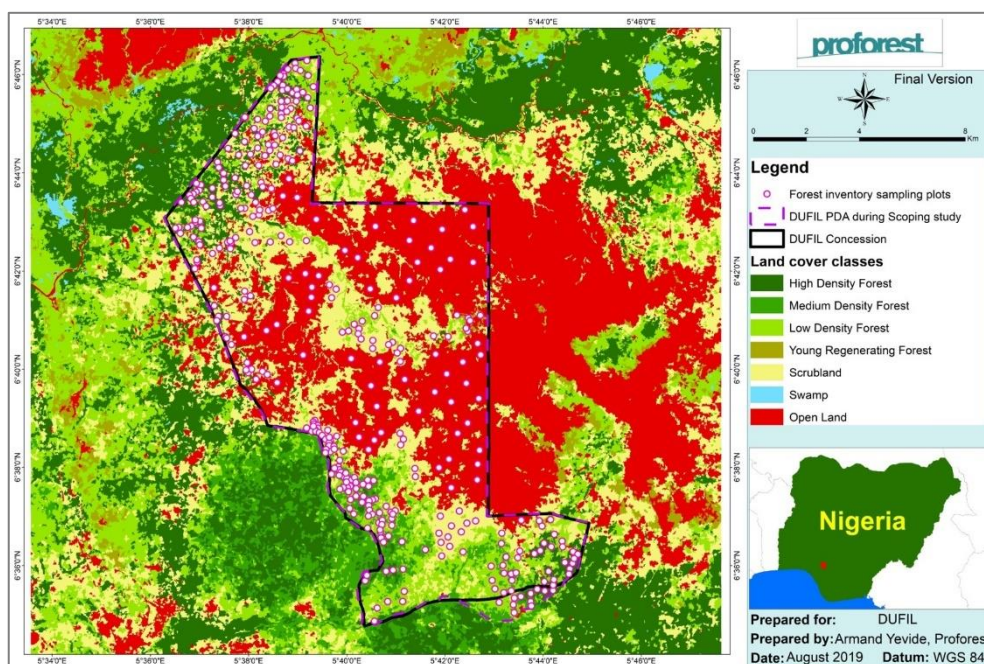


Figure 24: Distribution of the forest inventory plots overlaid with the initial land cover.

Data source: Concession boundaries from company; Survey plots generated.

NB: Plots falling outside the PDA are not actually outside because at the time of the assessment, the ARPN PDA used for the HCV scoping were used to lay the forest inventory plots. It is only after field survey that the new boundaries of the PDA were used.

The geographical coordinates of the plots (centre of the plots) were extracted and loaded into a GPS Garmin used to navigate to each of the plots. Circular plots of 12.61 m radius (main plots) and 5.64 m radius (sub plots) were laid for the survey of trees beyond 10 cm diameter at breast height (dbh) and for trees above 5 cm dbh respectively (Figure 25).

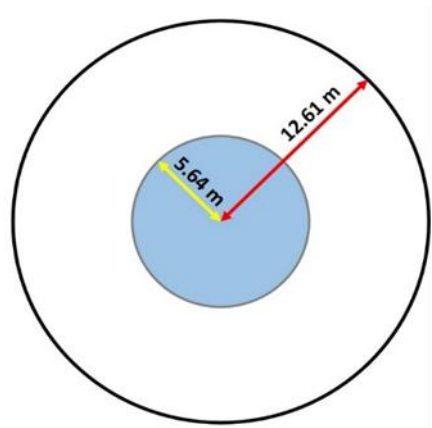


Figure 25: Botanical survey distribution plots and characteristics

Data collected from the plots included the name of the species, diameter at breast height, and the height as well as any useful observation on the individual tree (whether it was diseased, fruiting, etc.). The diameter was measured with a diameter tape and the height of each individual tree was estimated visually. Each main plot was assigned to one of the land cover classes. Additional information on the land cover types were also collected. When applicable, the pictures of the land cover were taken towards the North, East, South, and West as well as the canopy cover.

Due to accessibility challenges some of the plots were not accessed and others were replaced in order to ensure adequate coverage of the land cover classes. Over the expected 390 plots to assess, 306 were actually surveyed including those replaced (Figures 26 and 27).

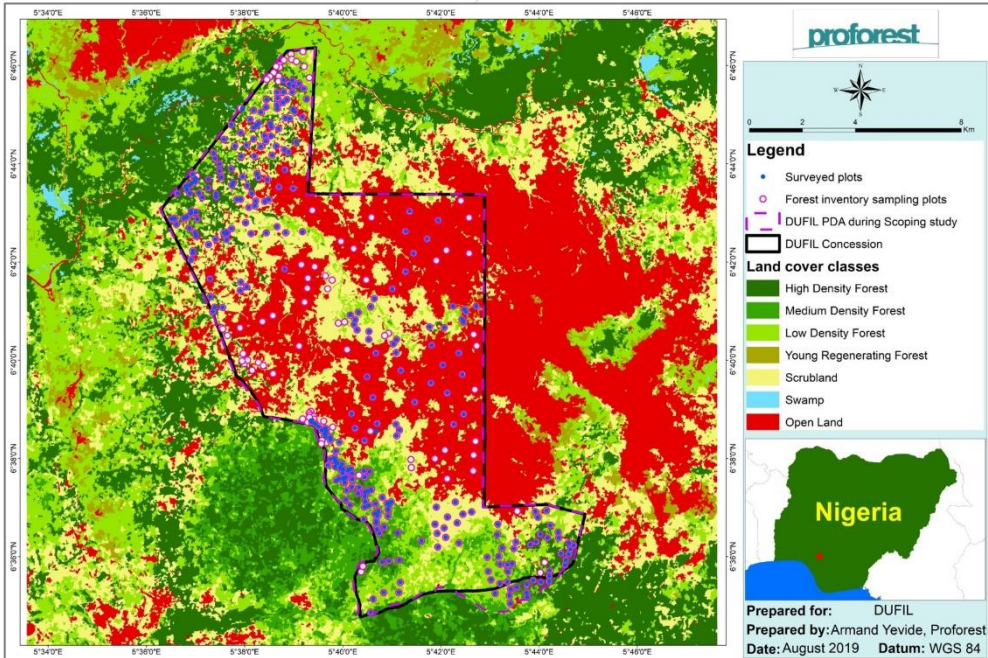


Figure 26: Distribution of the sampling plot and surveyed plots overlaid with the initial land cover
Data source: Concession boundaries from company; Other layers from field assessment and some generated prior to assessment.

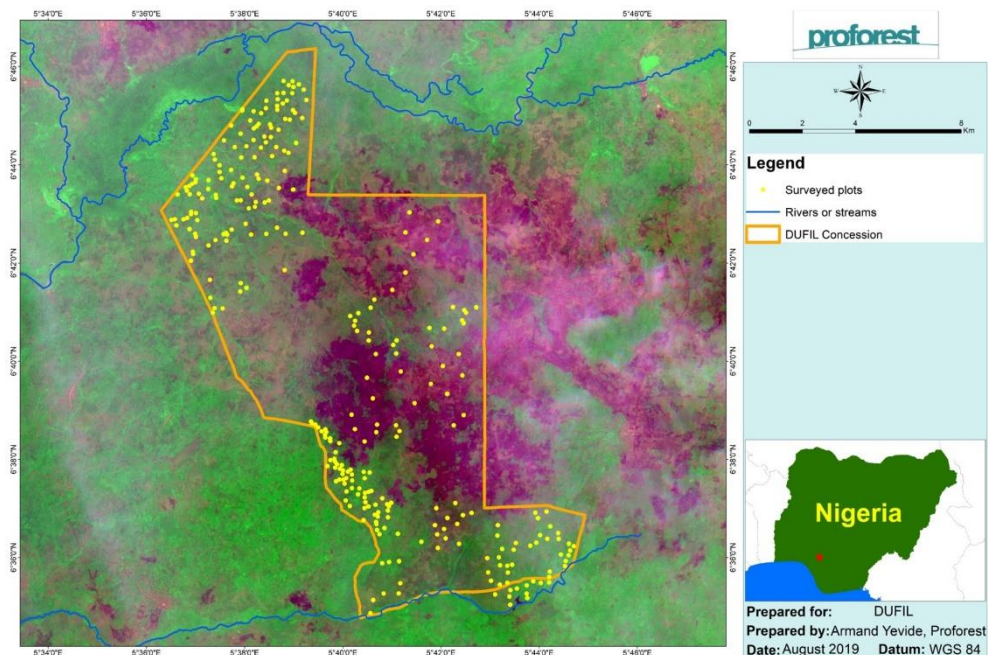


Figure 27: Botanical survey plot distribution plots and characteristics

Data source: Concession boundaries from company; Rivers digitized from sentinel imagery used for the land cover classification; Other layers from field assessment.

Biomass and carbon estimation methodology

There are several approaches developed and used to estimate the total above ground biomass of individual trees or of a given ecosystem. The non-destructive approach (used in this assessment) based on field data collected on living trees and models already built to estimate the biomass they contain is an advancement on the destructive approach which consists in felling trees.

Numerous models have been developed over the course of the years. Some of them are solely diameter-based allometric models while others are diameter and height-based models.

For the current carbon stock estimation, the above ground biomass was estimated using the latest improved allometric model of Chave et al. (2014) which uses tree height, stem diameter and wood density as covariates. To deduce carbon content from the biomass, we used the assumption that carbon concentration is about half (47.5%) of the biomass (Whittaker & Likens, 1973; Brown, 1997; Losi et al., 2003; Nasi et al., 2009). The biomass was estimated for each individual tree (including all stems for multi-stemmed trees) using the equation below:

$$AGB = 0.0673 \times (\rho D^2 H)^{0.976}$$

Where AGB is aboveground dry biomass (in kg); ρ is wood density (in g/cm³) D is diameter at breast height (in cm) and H is the height (in m).

The underground or belowground biomass (BGB) was deduced using the assumption that, for each individual tree, the BGB represents 20.5% of the AGB (Mokany et al., 2006). Therefore, the total biomass was equal to $1.205 \times AGB$.

Wood density was compiled from the Global Wood Density Database (Chave et al., 2009; Zanne et al., 2009), and from the African Wood Density Database (Carsan et al., 2012). Of the 99-species recorded during the inventory; wood density was available for 65 species (65.7%). For the remaining species not reported in these databases, we used the mean wood density of the matching genus (26 species) or matching family (8 species).

Statistical analysis methodology

Statistical analyses were conducted to test for statistical differences in carbon stock between HCS land cover classes. After checking the normality and the homoscedasticity of the data, the ANOVA and Scheffe pairwise tests were conducted using SPSS software version 16.0. A probability threshold of 0.05 or 5% was used to decide whether there is a statistically significant difference between the data compared.

Final land cover class description

After the field work, vegetation ground truthing data collected by the assessment team was used to improve the initial land cover classification conducted prior to the assessment. The figure and table below present the final land cover classes distribution and description. The initial HDF was found to be a MDF and the LDF a YRF while the YRF was more like a Scrubland. Water bodies was added as new land cover class to emphasise the presence of rivers in the north and south of the PDA. The final land cover classification therefore comprised 6 instead of 7 classes.

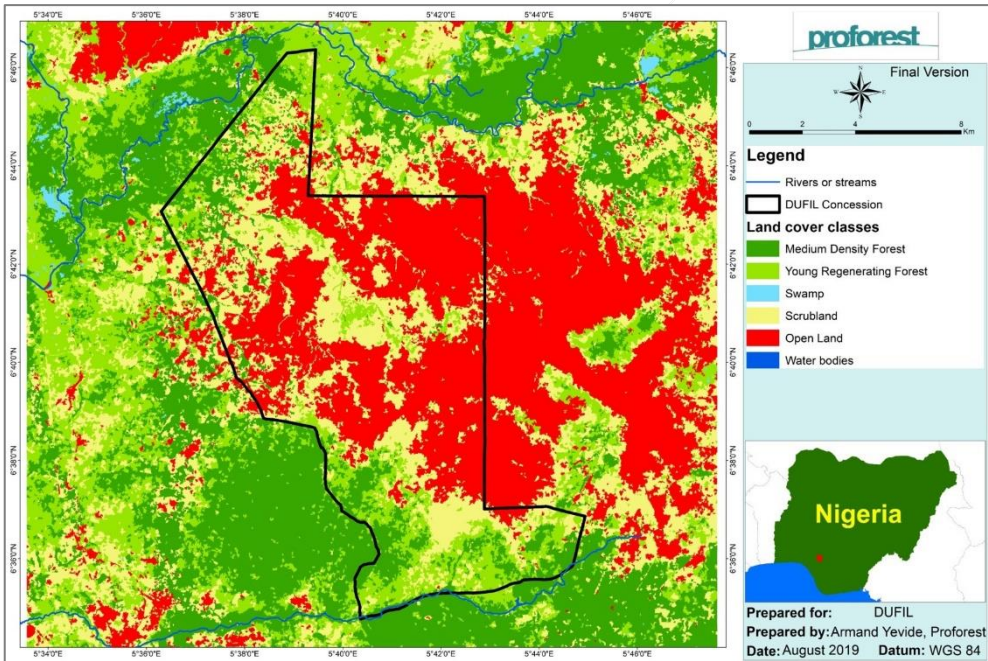


Figure 28: Map showing the result of the final land cover classification
Data source: Concession boundaries from company; Rivers digitized from sentinel imagery used for the land cover classification.

Table 16: Description of the land cover classes used

Land cover classes used	Description	HCS and non-HCS classes
-------------------------	-------------	-------------------------

Medium Density Forest (MDF)	Remnant forest that is more disturbed than the HDF. This vegetation type within the PDA is dominated by <i>Hevea brasiliensis</i> and <i>Tectona grandis</i> . The density of tree species is 483 trees/ha.	Medium Density Forest
Young Regenerating Forest (YRF)	Mostly young re-growth forest, but with occasional patches of older forest within the stratum. This vegetation type within the PDA is dominated by <i>Musanga cecropioides</i> and <i>Dialium guineense</i> . The density of tree species is 194 trees/ha.	Young Regenerating Forest
Scrubland (SCR)	Vegetated land with some woody regrowth and shrub. This might include some relatively old fallow. This vegetation type within the PDA is dominated by <i>Ricinodendron heudelotii</i> and <i>Gmelina arborea</i> . The density of tree species is 107 trees/ha.	Scrub
Open Land (OL)	Cleared or grassland as well as buildup or urban area. This also includes newly planted oil palm.	Cleared / Open Land
Swamp	Area covered by water and natural woody or non-woody vegetation with aquatic or water tolerant species.	NA
Water bodies	Rivers, streams and pond	Cleared / Open Land

The outputs of the final land cover classification have revealed that HDF was actually MDF and that the LDF was YRF. The final land cover classification still confirms the location of the PDA is a MDF (forest representing 52.4% of the Aol). The PDA is dominated by open land (42.7%) followed by scrubland (30.1%). The forest cover 4,052.9 ha which represents 27.2% of the PDA (Table 16).

Table 17: Size and proportion of HCS and non-HCS classes within the PDA

Land cover classes	Total Number of Hectares		% of total PDA	
	Initial	Final	Initial	Final
HCS classes:				
High Density Forest	1,127.7	0	7.6	0.0
Medium Density Forest	746.0	1,873.7	5.0	12.6
Low Density Forest	2,179.2	0	14.6	0.0
Young Regenerating Forest	74.8	2,179.2	0.5	14.6
Sub-total	4,127.7	4,052.9	27.7	27.2
Non-HCS classes:				
Scrubland	4,415.3	4,490.1	29.6	30.1

Swamp	0.48	0.48	0.0	0.0
Open Land	6,363.2	6,363.2	42.7	42.7
Water bodies	0	0.00	0.0	0.0
Sub-total	10,779.0	10,853.8	72.3	72.8
TOTAL	14,906.7	14,906.7	100.0	100.0

Fauna survey methods

The fauna study was conducted in the PDA from the June 3 – 7, 2019 and a follow-up from September 3 – 6, 2019 with the aim of identifying and documenting the abundance and distribution of the fauna community in the PDA and determining their conservation value. Standard taxon-specific field survey techniques were adopted for each of the taxonomic groups. Fauna sampling was carried out using a combination of transect lines and plots (100m x 100m) that were laid out at different parts of the PDA, and traversing different habitat and vegetation covers.

Line transects

Because of relatively large areas to be covered, selected areas of the PDA were systematically sampled based on defined land covers (low to high density forest, regenerating forest, open land, scrubland and swamp), and in each of these strata, a fauna study focusing on birds, mammals and herpetofauna was conducted along five (5) systematically placed line transects.

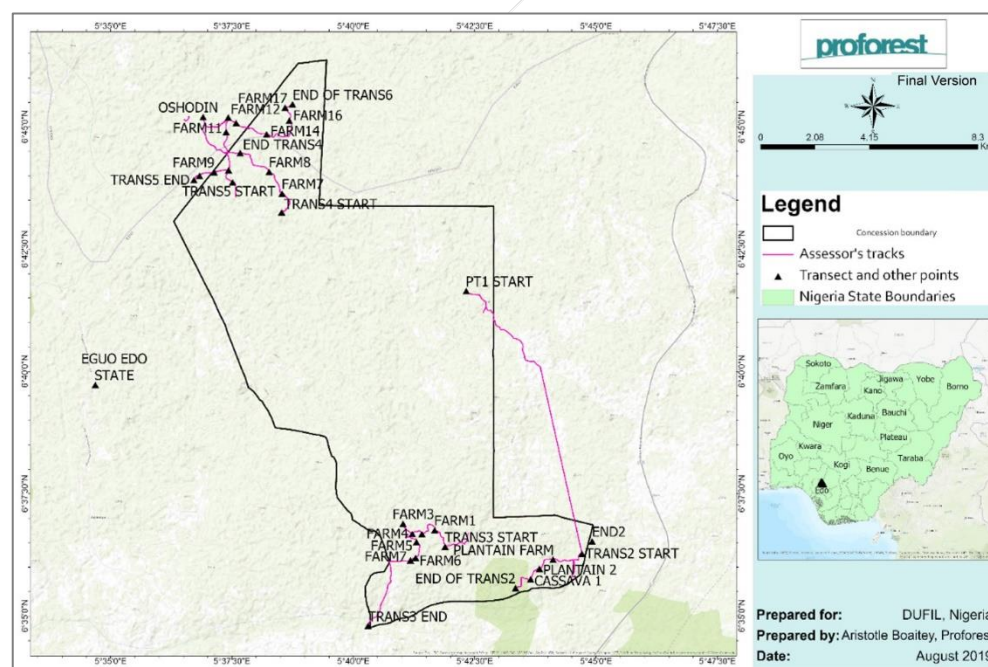


Figure 29: Map of PDA showing location of fauna survey transects

Data source: Concession boundaries from company; Other layers from field assessment.

To determine the presence of the focal fauna species, a record of their direct encounters and also indirect signs such as tracks, droppings, calls and nests were noted along the transects. The team also took cognizance of other activities such as hunting, farming and other human activities with negative impact on fauna wildlife. For most parts of the survey, sampling began in the morning (07:00) and usually lasted for between 6 and 7 hours. The major determinant of the duration of a census in most cases was the extent of habitat and the availability of fauna signs.

Sampling techniques deployed for each taxon is outlined in the following sections.

Herpetofauna

Amphibians and reptiles are a prominent and conspicuous component of the West African forest fauna. They can occur at high densities in the tropics and play important roles as consumers (Leache et. al. 2006). For conservation value assessment, amphibians and reptiles are especially useful for evaluating the health and integrity of the environment (Leache et. al., 2006). Amphibians usually respond quickly to environmental changes and are relatively easy to detect in even the most complex forest habitats. Herpetofauna species are particularly sensitive to habitat disturbance, and their seasonal movements within the landscape are necessary, requiring the availability of a variety of quality seasonal and transitional habitats. The status of herpetofauna populations can thus be used to monitor the health of the surrounding ecosystem (NRCS, 2006). Over one-third of amphibian species are globally threatened, and over 120 amphibian species have likely become extinct since 1980 (Whitfield et al., 2007).

Refuge examination (Rödel and Ernst, 2004) was undertaken along transects and this involved turning over rocks and fallen logs, peeling tree barks, digging through leaf litter, and searching through rotten tree stumps, tree buttresses, termite mounds and burrows for reptiles. Identification of species was based on visual observations of field marks. Amphibians were surveyed in and around ponds and puddles at the study sites (Heyer et al., 1994) and identification was mainly through sight and sound. Amphibian calls were recorded at various water bodies (ponds, pools, puddles, and streams) in the study sites. At each water body, the recorder listened carefully to a chorus to distinguish calls of individual species that were clearly heard. Unfamiliar calls were also recorded and played back later for confirmation using the Amphibiaweb (<https://amphibiaweb.org>). General herpetofauna identification followed Leache et al. (2006), while amphibian species were identified using Rödel (2009).

Large Mammal

Large mammals are of significant ecological, socio-cultural and nutritional purposes. Bushmeat, of which large mammals constitute a major component, is an important source of animal protein intake in many rural communities in West Africa (Ntiemo, 1998). In a highly fragmented landscape with high human population density and high dependence on bush meat, large mammal fauna become increasingly vulnerable. The biological and social values of large mammals make them important components for the determination of conservation value of most tropical ecosystem.

Large mammal survey was carried out by transect survey. This involved attentive walks and ground observations along transects (trails, foot paths and other access routes) in each of the sampling sites, during which direct and indirect observation of a large mammal species were recorded. Direct observation entailed the sighting of large mammal species whereas indirect sightings involved the identification of any sign left by an activity of a

living animal (such as feeding sites, tracks, footprints, faecal pellets, nests, etc.). Local indigenous knowledge of the large mammal fauna of the PDA was also sought during community consultations and informal interaction with individual hunters. Kingdon (1997) was used as the main guide to confirm the identity of species encountered indirectly. Using pictures of large mammal species from Kingdon (1997) as a guide, local knowledge on the occurrence of some large mammals was ascertained.

Birds

Birds constitute an important component of the fauna resources of tropical Africa. Most birds are habitat specific with well-documented general and specific responses to environmental pressures and have also been shown to be reliable indicators of terrestrial biological richness and environmental conditions (Stattersfield, et al. 1998). Through the work of Birdlife International and the Species Survival Committee of the International Union for the Conservation of Nature (IUCN), the global conservation status of bird species are regularly assessed. Birds are therefore one of the fauna entities that are regularly used in assessing the biological quality and conservation value of a habitat. Bird survey at the PDA was carried out using transect counts along existing routes.

Transect count procedure involved slow attentive walk along transect during which any bird encountered by sight or sound, was identified and recorded. This field survey method is quite efficient and effective in open habitat where the chance of hearing and seeing birds are high and where the surveyor's knowledge of the avifauna of the area is quite good. Distance observations were aided by a pair of binoculars (x10 magnification). Borrow and Demey (2014), was used to confirm the identity of unfamiliar species seen. Identity of unfamiliar calls were confirmed with the help of the African Birds Sounds (Chappuis, 2000).

Sampling plots

To complement information from the line transects, sampling plots were used to survey pre-determined swamps (Figure 30) to aid in more detailed searches of cryptic and aquatic species and their signs (footprints and droppings). Plot sampling was conducted each morning till mid-afternoon (07:00 – 14:00).

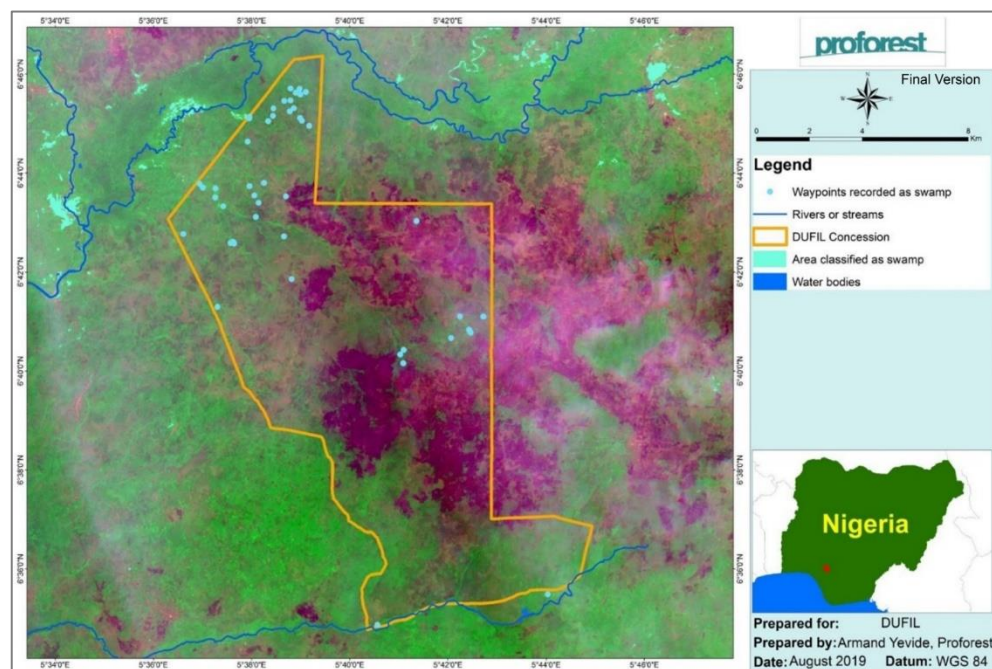


Figure 30: Map of PDA showing location of swamps

Data source: Concession boundaries from company; Rivers digitized from sentinel imagery used for the land cover classification; Other layers from field assessment.

Forty-six (46) swamps were identified in the PDA and stratified along the distribution of nearby local communities as follows: Odighi cluster (9 swamps), Igolo cluster (7 swamps), Edebor camp cluster (11 swamps) and Oshodin cluster (19 swamps).

Two sampling plots, each of size 1 ha (100m x 100m) were located; one in each swamp and the other on the edge of the swamp and surveyed for cryptic and aquatic fauna. Thus, the total area covered by the sampling plots was 92 ha (2 plots x 1 ha x 46 swamps). The first plot located in each swamp was randomly placed whilst the subsequent one was systematically placed at the edge to ensure a uniform spread of plots. Each sampling plot was further sub-divided into smaller manageable plots of 50m x 50m and actively searched for all animal information. Moving clock-wise from one end of the sub-plot to the other end, fauna was identified and recorded by a two-member fauna team spaced at a maximum interval of 30m from each other. In addition, the team walked along the edges of the swamp while scanning both sides for signs of fauna. Swamps varied in size ranging from a little less than 1 ha to over 3 ha.

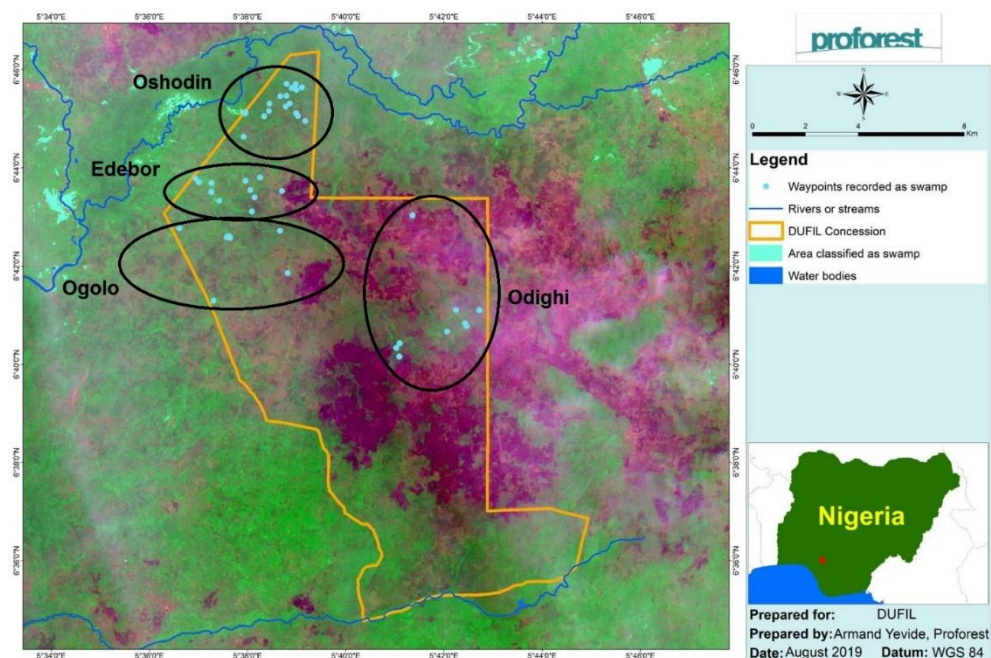


Figure 31: Map of ARPN PDA showing locations of surveyed swamp clusters

Data source: Concession boundaries from company; Rivers digitized from sentinel imagery used for the land cover classification; Other layers from field assessment.

Information on fauna (mammals, birds and herpetofauna) was systematically recorded by direct observation and record of signs (droppings, footprints and vocalizations) within the plots. Sampling also involved casual observations and refuge examinations (searching under rocks, logs, in rotten tree stumps, in leaf litter, old termite mounds and rodent burrows) along animal trails.

Local knowledge

In addition to the field survey methods described for each taxon, local knowledge of fauna species was elicited through formal group consultations and informal discussions with individuals. Account and description of species that were deemed credible were recorded and incorporated in the field data. Printed pictures of species were also shown to them to aid in identification and for confirmation. Local knowledge on the occurrence of fauna species are very important as some fauna taxa tend to be cryptic and often difficult to see in the open during fauna surveys.

Data analysis

Species abundance and distribution

An index count, which produces relative abundance numbers based on encounter rates, was used to estimate species density. Species density = [number of particular species or signs / total number of species]----(1) . Index counts relate animal numbers to an index of animal signs detected along line transects (Buckland et al., 2001; Barnes et al., 1997). Geo-referenced coordinates of recorded species were used to plot species distribution, particularly for species of conservation interest using GIS applications.

Species richness

For each of the three taxonomic groups, field data obtained was analysed to determine species diversity and richness where the method of collection allowed for such analysis to be carried out. Bio-qualitative assessment using species diversity and richness of the fauna community was done using the Shannon-Wiener Diversity Index (H') and Margalef's Index (d) respectively. The computer software PAST Version 3.20 was used to compute values. Species diversity and richness values are rational numbers and their magnitude reflects the extent of diversity or richness.

Conservation status

The conservation status of the fauna in the study area was assessed using the Global [International Union for the Conservation of Nature (IUCN)] and National Ranking in Nigeria Fourth National Biodiversity Report (2010).

IUCN and natural resources

The International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species (2019) provides taxonomic, conservation status and distribution information on taxa that have been evaluated using the IUCN Red List Categories and Criteria (Appendix 1a). The main purpose of the IUCN Red List is to catalogue and highlight those taxa that are facing a higher risk of global extinction (i.e. those listed as Critically Endangered, Endangered and Vulnerable). The IUCN Red List also includes information on taxa that are categorized as Extinct or Extinct in the Wild; and taxa that cannot be evaluated because of insufficient information (Data Deficient).

National criteria

National Rankings in the Nigeria Fourth National Biodiversity Report (2010), which categorizes animal species in Nigeria into three main schedules based on the level of protection required for the particular species were used to rank the level of conservation importance.

7.2 Environmental HCV and HCS forest results

7.2.1 Summary of interviews and discussions

See Table 9 above (Section 7.2.1)

7.2.2 Environmental fieldwork results

Herpetofauna species composition and distribution at the sampling sites

Refuge examination and observations around water bodies recorded a total of 193 observations of herpetofauna species. This comprised 22 species made up of 13 reptiles and nine (9) amphibians. The reptiles consisted of five (5) snakes and three (3) skinks, one (1) turtle and four (4) lizards (crocodile, monitor lizard, agama lizard and gecko). The nine amphibian species were represented by three families (Bufonidae, Phrynobatrachidae and Dicroglossidae) and five genera (Amietophrynus, Leptopelis, Phrynobatrachus, Ptychadena, Hoplobatrachus). The amphibian Family Phrynobatrachidae, recorded the highest number of five species. The frog species in this family are mainly associated with freshwater bodies and the widespread presence of rivers, streams and puddles appear to provide an ideal habitat for these species. Other families with significant presence of

species in the PDA include Scincidae, which recorded three reptilian species from two genera (Table 23).

Table 23: Distribution of herpetofauna species

	Number of observations			Number of species		Species Diversity (H')	
	Species Richness (d)			Species of Conservation concern			
					IUCN	National	
Transects							
1	27	14	2.48	3.94	0	2	
2	30	19	2.86	5.29	1	3	
3	15	8	1.81	2.59	0	1	
4	9	5	1.52	1.82	0	0	
5	17	11	2.26	3.53	0	1	
Clusters							
Odighi	15	10	2.21	3.32	1	3	
Igolo	15	7	1.84	2.22	0	1	
Edebor camp	31	13	2.45	3.49	1	3	
Oshodin	34	12	2.00	3.11	1	3	

Species distribution at the nine sampling areas were varied. Transect 2 recorded the highest number of 19 herpetofauna species, followed by Transect 1, with 14 species and Oshodin areas with 13 and 12 species respectively. Two herpetofauna species, *Varanus stellatus* and *Amietophrynus regularis*, were common to all the nine sampling areas. One species, *Osteolaemus tetraspis* was restricted in distribution and only recorded near water bodies. The rest of the species were fairly widespread across the PDA and were recorded at least at two of the sampling sites. The herpetofauna species recorded in the study are mainly habitat generalist with widespread distribution across the tropical lowland forests and associated habitat across West Africa. Checklist of herpetofauna species recorded in the study is presented in the annex.

Herpetofauna species diversity and richness

Relatively low species diversity index (Shannon-Wiener) of below 2.90 and richness (Margalef) of below 5.30, suggests the PDA is not very rich in herpetofauna species. The low species richness and diversity of herpetofauna on the PDA, may be attributable to the generally high level of degradation resulting from the intense food and cash crop farming, logging and the prevalence of fire. Herpetofauna species are most susceptible to habitat degradation and are particularly sensitive to most forms of habitat disturbance. Thus, their seasonal movements within the landscape to avoid impact of disturbances are necessary, requiring the availability of a variety of quality seasonal and transitional habitats (NRCS, 2006). The composition of the herpetofauna community as recorded in the fauna study suggests that the existing community is composed largely of remnant species that have persisted through the impact of widespread habitat degradation on the

PDA. Amphibians are often the first animals to experience decline in areas undergoing environmental degradation because of their highly permeable skin that rapidly absorbs toxic substances in the air, water, and soil (Hillers and Rödel, 2007).

Mammals

Fauna species composition, distribution and diversity

The relatively high intensity of human activities in the PDA appears to have impacted heavily on the mammal community, especially the large mammal species. A total of 20 large mammal species from 5 Orders, 10 Families and 13 Genera were recorded from the nine sampling sites. Once again, the highest number of 17 species were encountered in Transect 2, followed by Transect 1 with 15 species and then Oshodin, Edebor camp and Transect 5 with 14, 13 and 13 species respectively (Table 24). Nevertheless, the highest number of large mammal observations; were directly and indirectly observed at the Oshodin area followed by Sampling site 2 with 51 and 50 observations respectively. Although largely degraded from past and present human activities, notably farming, the secondary forest patches on the PDA served as important refuges for most large mammal species. No small mammal species was recorded.

Table 24: Large mammal species distribution, diversity and conservation significance at the sampling sites

	Number of observations			Number of species		Species Diversity (H')	
	Species Richness (d)			Species of Conservation concern			
					IUCN	National	
Transects							
1	39	15	2.56	3.82	3	10	
2	50	17	2.73	4.09	3	13	
3	20	10	2.16	3.00	2	6	
4	8	5	1.56	1.92	0	2	
5	29	13	2.50	3.56	2	8	
Clusters							
Odighi	29	12	2.28	3.27	1	7	
Ogolo	49	12	2.24	2.83	0	7	
Edebor camp		42	13	2.29	3.21	1	8
Oshodin	51	14	2.35	3.31	1	10	

The community of large mammal species were dominated by the six species in the Order Actiodactyla and four Primates. *Tragelaphus scriptus*, *Cephalophus maxwelli*, *Potamochoerus porcus* were surprisingly very common on the PDA with direct and indirect encounters at almost all the sampling sites. Feeding activities of *Potamochoerus* was widespread but particularly abundant around the swamps in the forest patches and

fallow farmlands. Very old footprints of forest buffalos (*Syncerus caffer nanus*) probably dating back to the past dry season were recorded. These activities were restricted and confined to a few remnant forests in the north of the PDA. Interactions with some hunters confirmed that buffalos undergo occasional or periodic local migrations into the northern forested parts of the PDA along the Osse River from the adjacent Owan South Forest Reserve. According to the hunters, the buffalos migrate into the PDA probably because it forms part of their original home range and these migrations are seasonal, occur in the dry season and only restricted to the northern forested areas of the PDA that border the Osse River.

The forest patches including riparian vegetation bordering the Osse River in the north of the PDA and Ovia River in the south and the other rivers and streams in the PDA are also particularly important for the primate species as most of the encounters occurred in those areas. *Cercocebus torquatus*, which is listed as Endangered on the IUCN Red List is one of the significant encounters in the study.

Bird species composition, distribution and diversity

Bird survey in the PDA recorded a total of 170 species from 1,924 observations. The presence of different habitats in the PDA appeared to have influenced the species. The highest number of 120 species was recorded at Transect 2 from 355 observation, followed by Transect 5 with 104 species from 288 observation. Transect 2 runs through areas of the PDA with patches of secondary forest vegetation in relatively good condition as well as large areas under intense food crop cultivation.

Table 25: Summary of bird species composition, diversity, richness and conservation status

	Number of observations			Number of species		Species Diversity (H')	
	Species Richness (d)			Species of Conservation concern			
					IUCN	National	
Transects							
1	291	96	4.30	16.75	1	9	
2	355	120	4.63	20.27	2	10	
3	326	98	4.22	16.76	2	12	
4	195	79	4.22	14.79	1	12	
5	288	104	4.49	18.19	2	11	
Clusters							
Odighi	84	32	3.26	7.00	0	8	
Ogolo	98	38	3.40	8.07	0	5	
Edebor Camp		113	51	3.68	10.58	0	9
Oshodin	174	72	4.03	13.76	2	15	

Although mainly a cultivated area dominated by food and cash crops, the relatively large number of bird species recorded may be attributable to the high presence of overhead

canopy trees in the cocoa farms. The northern section of the PDA is dominated by cocoa farms many of which are under the cover of extensive overhead canopy trees.

Avifauna community at the PDA comprised of species that are associated with forest and open areas within forest landscape and this aptly reflected the general habitat condition that prevailed at the PDA. Apart from some few species, birds recorded were mainly habitat generalists, closely associated with open habitats in the forest landscapes. The species composition also showed a relatively high degree of commonness among the sampling areas, with over a hundred species being recorded at more than two of the five sampling sites. There were also a few species whose distribution was rather patchy; and were on only a few sampling sites. These species included semi-aquatic species like *Bostrychia hagedash*, *Butorides striata* and *Anhinga rufa* which were confined to the water bodies, especially in the Edebor camp and Oshodin areas. Details of bird species composition at the sampling sites along with their global and national conservation status is presented in the annex.

Flora

The dominant tree species, genus and families recorded in the PDA are shown in Tables 26, 27 and 28. Nine and 105 individuals of the recorded species are categorized as Endangered and Vulnerable respectively, on the IUCN threat categories. All 9 of those classified as Endangered belong to a single species (*Pterocarpus erinaceus*), while the Vulnerable group are made up of 12 species (Table 27). Fifteen and 3 species are categorized as Endangered and Rare respectively on the National List (Table 28).

Table 18: List and relative abundance of the five dominant species

Species	Number	Percentage
<i>Hevea brasiliensis</i>	174	10.43
<i>Ricinodendron heudelotii</i>	113	6.77
<i>Gmelina arborea</i>	105	6.29
<i>Tectona grandis</i>	87	5.22
<i>Rauvolfia vomitoria</i>	83	4.98

Table 19: List and relative abundance of the five dominant genus

Species	Number	Percentage
Hevea	174	10.43
Ficus	131	7.85
Ricinodendron	113	6.77
Gmelina	105	6.29
Tectona	87	5.22

Table 20: List and relative abundance of the ten dominant families

Species	Number	Percentage
Euphorbiaceae	314	18.82
Apocynaceae	191	11.45
Fabaceae	154	9.23

Moraceae	154	9.23
Lamiaceae	119	7.13
Malvaceae	114	6.83
Urticaceae	98	5.88
Verbenaceae	87	5.22
Cannabaceae	57	3.42
Sapindaceae	57	3.42

7.2.3 HCS forest classification and carbon assessment

The HCS forest classification results are presented here, including descriptions of each land cover class and statistics on forest structural variables. Descriptions are based on the final land cover classification.

a. Description of stratum (technical description and photography)

The final land cover classification revealed the presence in the landscape of six land cover classes: Medium Density Forest (MDF), Young Regenerating Forest (YRF), Scrubland (SCR), Open Land (OL), Swamp, and Water bodies. The pictures below present the appearance of these land cover classes within the PDA. Though the MDF and the YRF have almost 100% canopy closure, the MDF has two layers while the YRF has only one layer. The other land cover classes have less than 50% of canopy closure and for some of them very sparse trees.



Figure 32: Photos of medium density forest land cover



Figure 33: Photos showing the YRF land cover



Figure 34: Photos showing the swamp land cover



Figure 35: Photos showing the scrubland land cover



Figure 36: Photos showing the Open Land cover

b. Area estimates for vegetation stratification

Table 21: Size and proportion of HCS and non-HCS classes within the PDA

Land cover classes	Total Number of Hectares	% of total PDA
	Final	Final
HCS classes:		
High Density Forest	0	0.0
Medium Density Forest	1,873.7	12.6
Low Density Forest	0	0.0
Young Regenerating Forest	2,179.2	14.6
Sub-total	4,052.9	27.2
Non-HCS classes :		
Scrubland	4,490.1	30.1
Swamp	0.48	0.0
Open Land	6,363.2	42.7
Water bodies	0.00	0.0
Sub-total	10,853.8	72.8
TOTAL	14,906.7	100.0

c. Vegetation stratification map

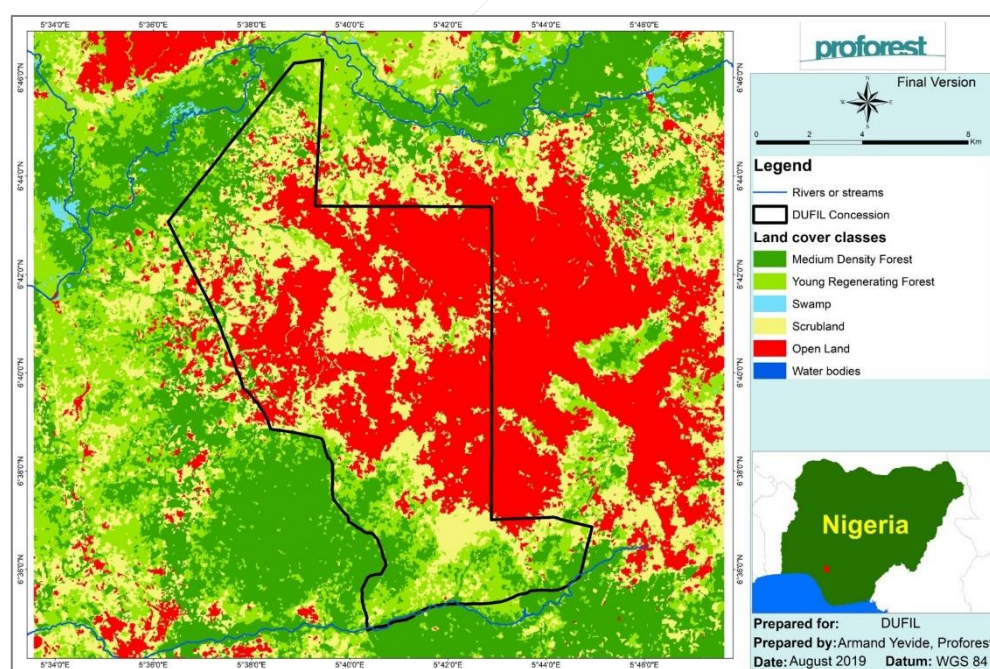


Figure 37: Landcover classification map

Data source: Concession boundaries from company; Rivers digitized from sentinel imagery used for the land cover classification.

d. Carbon stock estimates for vegetation stratification

The estimated carbon stock varies from 8.1 tC/ha for the Open Land to 57.6 tC/ha for the MDF. The estimated carbon stock for the YRF was less than 30 tC/ha. The total carbon stock estimated for the entire proposed PDA was 276,795.3 tC.

Table 22: Area, carbon stock mean and confidence intervals for each land cover class

Land cover class	Area (ha)	%	Number of plots	Average carbon stock (tC/ha)	Standard Error	Confidence limits (90%)		Total carbon stock (tC)
						Lower	Upper	
MDF	1,873.7	12.6	20	57.6	9.8	37.0	78.2	107,925.1
YRF	2,179.2	14.6	39	25.2	3.2	18.8	31.6	54,915.8
SCR	4,490.1	30.1	146	13.9	1.4	11.1	16.7	62,412.4
OL	6,363.2	42.7	10	8.1	1.9	3.8	12.4	51,541.9
SW	0.48	0.0	NA	NA	NA	NA	NA	NA

e. Statistical analysis of carbon stock summary

In order to appraise the existence of statistically significant difference between the carbon stock of the land cover classes, an ANOVA followed by the pairwise Scheffe test was conducted. The table 23 presents the results of the ANOVA and show the existence of statistically significant difference between the carbon stock of the various land cover classes as the probability associated to the analysis was below 0.05. The Scheffe test has revealed that the MDF has the highest carbon stock which is significantly different from the carbon stock of the other land cover type. On the other hand, the carbon stock of the Young Regenerating Forest is significantly greater than the carbon stock of the Scrubland. However, there was no significant difference between the carbon stock of these two land cover classes compared to the Open Land. Though the fewer number of Open Land sampled plots might explain this fact, a T-test was carried out to affirm the observation made. The test was conducted in R and a significant difference was observed between the carbon stock of three land cover class. .

Table 23: Results of the ANOVA assessing for differences in carbon stock between the land cover classes

	Sum of Squares	df	Mean Square	F	P-value
Land cover class	36181.383	3	12060.461	28.828	.000
Residual	94853.997	211	449.545		
Total	131035.380	214			

Table 24: Results of Scheffe pairwise test for differences in carbon stock between land cover classes

Pair Conversion	Mean diff	Lower	Upper	P-value
MDF - YRF	32.43199	15.9983	48.8657	.000
MDF - SC	43.70873	29.4619	57.9556	.000
MDF - OL	49.56650	26.4244	72.7086	.000
YRF - SC	11.27675*	.5063	22.0472	.036
YRF - OL	17.13451	-4.0453	38.3143	.161
SC - OL	5.85777	-13.6740	25.3896	.870

Table 25: Results of t test for differences in carbon stock between YRF, SC, and OL

Pair Conversion	Mean diff	Lower	Upper	t-value	P-value
SC - YRF	- 11.27675	-18.229395	-4.324097	-3.2513	0.001975
OL - YRF	- 17.13451	-24.572622	-9.696404	-4.6387	2.993e-05
OL - SC	- 5.85777	-10.8020440	-0.9134903	-2.4611	0.02242

Table 26: Grouping of the land cover classes based on the Scheffe pairwise comparison and the t test on YRF, SC, and OL

Land cover classes used	Average carbon stock (tC/ha)	Group
Medium Density Forest (MDF)	57.6	A
Young Regenerating Forest (YRF)	25.2	B
Scrubland (SCR)	13.9	C
Open Land (OL)	8.1	D

NB: The average carbon stock of the land cover classes with the same letters are not statistically different

Table 27: Forest inventory data

Land cover class	Average carbon value (tC/ha)	Physical description of the land cover
Medium Density Forest (MDF)	57.6	Remnant forest that is more disturbed than the HDF. This vegetation type within the PDA is dominated by <i>Hevea brasiliensis</i> and <i>Tectona grandis</i> . The density of tree species is 483 trees/ha.
Young Regenerating Forest (YRF)	25.2	Mostly young re-growth forest, but with occasional patches of older forest within the stratum. This vegetation type within the PDA is dominated by <i>Musanga cecropioides</i> and <i>Dialium guineense</i> . The density of tree species is 194 trees/ha.
Scrubland (SCR)	13.9	Vegetated land with some woody regrowth and shrub. This might include some relatively old fallow. This vegetation type within the PDA is dominated by <i>Ricinodendron heudelotii</i> and <i>Gmelina arborea</i> . The density of tree species is 107 trees/ha.

Open Land (OL)	8.1	Cleared or grassland as well as buildup or urban area. This also includes newly planted oil palm.
Swamp	NA	Area covered by water and natural woody or non-woody vegetation with aquatic or water tolerant species.
Water bodies	NA	Rivers, streams and pond

Additional relevant information is provided in the Annex.

See Figure 36 above for map of land cover classes.

7.2.4 HCV 1: Concentrations of biodiversity

HCV	Key question	Finding
HCV 1	Species diversity. Concentrations of biological diversity including endemic species, and rare, threatened or endangered (RTE) species that are significant at global, regional or national levels.	PRESENT

Identification

HCV 1 refers to areas that contain significant concentrations of species including rare, threatened, endangered or endemic species, unusual assemblages of ecological or taxonomic groups and extraordinary seasonal concentrations of species. It may also refer to areas that contain critical habitats that are used seasonally or in extreme years and which are needed for the survival of the species using these areas. All areas which contain such species or the habitats necessary for their continued survival may be considered as HCV areas. However, these species must be present in global, regional or nationally significant concentrations.

The process to identify HCV 1 areas has involved review of available reports, flora and fauna surveys (in the proposed PDA), and consultations with stakeholders (including experts and community representatives).

Protected areas

The limits of the PDA itself fall within the limits of the de-reserved portions of the much degraded Ekiadolor forest reserve. There are 10 forest reserves in the assessment landscape. None of these shares boundary or overlaps with the Ekiadolor FR (within which the PDA is contained).

Fauna

Herpetofauna species of conservation concern

Of the 22 herpetofauna species recorded, only the Dwarf crocodile (*Osteolaemus tetraspis*), is of global conservation concern and listed on the IUCN Red List of Threatened species. *Osteolaemus tetraspis*, is listed as Vulnerable (VU), with habitat loss through deforestation and forest degradation being among its threats. The species occurs in West and Central Africa and prefers streams, small rivers, swamps, pools and mangroves in lowland forested areas. With declining habitats stemming from increasing deforestation and forest degradations, the species is increasingly becoming vulnerable. The rest of the

species are listed as Least Concern (LC) on the IUCN Red List. Nevertheless, at the national level, three of the herpetofauna species; *Osteolaemus tetraspis*, West Africa Nile Monitor (*Varanus stellatus*) and Royal python (*Python regius*) are listed as Endangered on the Nigeria national threatened species list (Nigeria Fourth National Biodiversity Report, 2010).

Large mammal species of conservation significance

Due to their socio-economic importance as a major source of animal protein and often high dependence of habitat quality, large mammal species are very prone to the vulnerability of anthropogenic pressures. Habitat loss and hunting pressure have been identified as some of the factors impacting negatively on large mammal species, especially in off-reserve areas. Three out of the 20 large mammal species recorded in the study are listed on the IUCN Red List of Threatened Species as being of conservation concern. These include two primates *Cercocebus torquatus* and *Cercopithecus erythrogaster*, which are listed as Endangered and Vulnerable respectively and *Manis tricuspis*, which is listed as Vulnerable.

At the national level two of the species recorded in the study (Putty-nosed Monkey and Red-cap Mangabey) are listed as locally extinct. Seven other species (*Cercopithecus erythrogaster*, *Civettictis civetta*, *Tragephalus evrycerus*, *Tragelaphus scriptus*, *Tragelaphus spekii*, *Cephalophus niger* and *Cephalophus maxwelli*) are listed as locally endangered. Again, species such as *Syncerus caffer nanus*, *Manis tricuspis*, *Hystrix cristata* and *Atherurus africanus* are listed as threatened. Though this finding suggests a major finding of two species recorded as extinct in Nigeria, interactions with local hunters and interviews with an environmental NGO indicate the presence of these species in the area and adjacent forest reserves. Hence their present national status may be misleading. These discrepancies call for an urgent review of the biodiversity status in the country, especially since the last fairly detailed biodiversity assessment is nearly a decade old – the Nigeria Fourth National Biodiversity Report (2010) specifically states that field surveys used for the report were very few. Checklist of the large mammal species recorded in the study at the nine sampling sites and their global and national conservation significance is presented in the annex.

Bird species of conservation concern

Although diversity and richness were relatively high in most of the sampling sites, the conservation value of the PDA with regards to birds was relatively low. Out of the 170 bird species recorded, only three are listed on the IUCN Red List as globally threatened. These included the Crowned Eagle (*Stephanoaetus coronatus*), Blue-moustached Bee-eater (*Merops mentalis*) and Grey Parrot (*Psittacus erithacus*). Crown eagle and Blue-moustached bee-eater are both listed as Near Threatened, while the Grey parrot is listed as Endangered on the IUCN Red List.

Crowned eagles occur throughout the forest regions tropical Africa. The species inhabits mainly dense woodlands, including those deep within rainforest, but it is sometimes also found in derelict patches, wooded escarpments, heavily wooded hillsides, and rocky outcrops throughout its range. Despite its apparent large range, crowned eagles are becoming locally rare in some parts of the continent due to declining habitats resulting from deforestation and forest degradation. A single individual of the species was recorded at sampling sites 2, 3 and 5. Similarly, the blue-moustached bee-eater is a resident bird of

the moist lowland forest with occurrence in West and Central Africa. A pair of the species were recorded at the edge of cocoa farm at sampling sites 3, 5 and also at Oshodin.

A few Individuals of grey parrots were recorded in overhead flights at sampling sites 1, 2, 4 and Oshodin area. A resident species of tropical forest regions of West and Central Africa with occurrence in countries such as Ivory Coast, Ghana, Nigeria, Cameroon, Angola, the Congo, Gabon, and Nigeria. Global populations of the species are declining and mainly as a result of capture for the pet trade and habitat loss in some range states. The species seems to favor dense forests but can also be found at forest edges and in more open wooded areas within the forest landscape.

Flora

IUCN Categories	Number	Percentage
Data Deficient	2	0.12
Endangered	9	0.54
Least Concern	257	15.41
Near Threatened	3	0.18
Not Assessed	1292	77.46
Vulnerable	105	6.29

Table 28: List of species of global conservation concern

Species	Genus	Family	IUCN Status	#	%
<i>Pterocarpus erinaceus</i>	Pterocarpus	Fabaceae	Endangered	9	0.54
<i>Milicia excelsa</i>	Milicia	Moraceae	Near Threatened	3	0.18
<i>Albizia ferruginea</i>	Albizia	Fabaceae	Vulnerable	42	2.52
<i>Nauclea diderrichii</i>	Nauclea	Rubiaceae	Vulnerable	13	0.78
<i>Mitragyna stipulosa</i>	Mitragyna	Rubiaceae	Vulnerable	12	0.72
<i>Pterygota macrocarpa</i>	Pterygota	Malvaceae	Vulnerable	10	0.60
<i>Allanblackia floribunda</i>	Allanblackia	Clusiaceae	Vulnerable	8	0.48
<i>Zanthoxylum zanthoxyloides</i>	Zanthoxylum	Rutaceae	Vulnerable	7	0.42
<i>Terminalia ivorensis</i>	Terminalia	Combretaceae	Vulnerable	6	0.36
<i>Entandrophragma utile</i>	Entandrophragma	Meliaceae	Vulnerable	2	0.12
<i>Lophira alata</i>	Lophira	Ochnaceae	Vulnerable	2	0.12
<i>Afzelia africana</i>	Afzelia	Fabaceae	Vulnerable	1	0.06
<i>Cedrela odorata</i>	Cedrela	Meliaceae	Vulnerable	1	0.06
<i>Malacantha alnifolia</i>	Malacantha	Sapotaceae	Vulnerable	1	0.06

<i>Musanga cecropioides</i>	Musanga	Urticaceae	Least concern	74	4.44
<i>Sterculia tragacantha</i>	Sterculia	Malvaceae	Least concern	38	2.28
<i>Cordia millenii</i>	Cordia	Boraginaceae	Least concern	28	1.68
<i>Ceiba pentandra</i>	Ceiba	Malvaceae	Least concern	27	1.62
<i>Celtis zenkeri</i>	Celtis	Cannabaceae	Least concern	24	1.44
<i>Hunteria umbellata</i>	Hunteria	Apocynaceae	Least concern	15	0.90
<i>Trichilia monadelpha</i>	Trichilia	Meliaceae	Least concern	13	0.78
<i>Cola gigantea</i>	Cola	Malvaceae	Least concern	12	0.72
<i>Irvingia gabonensis</i>	Irvingia	Irvingiaceae	Least concern	5	0.30
<i>Irvingia grandifolia</i>	Irvingia	Irvingiaceae	Least concern	5	0.30
<i>Nauclea latifolia</i>	Nauclea	Rubiaceae	Least concern	5	0.30
<i>Psidium guajava</i>	Psidium	Myrtaceae	Least concern	3	0.18
<i>Triplochiton scleroxylon</i>	Triplochiton	Malvaceae	Least concern	3	0.18
<i>Anthocleista nobilis</i>	Anthocleista	Gentianaceae	Least concern	2	0.12
<i>Baphia nitida</i>	Baphia	Fabaceae	Least concern	1	0.06
<i>Holoptelea grandis</i>	Holoptelea	Ulmaceae	Least concern	1	0.06
<i>Pterocarpus santalinoides</i>	Pterocarpus	Fabaceae	Least concern	1	0.06

Table 29: List and number of species on the national threatened list

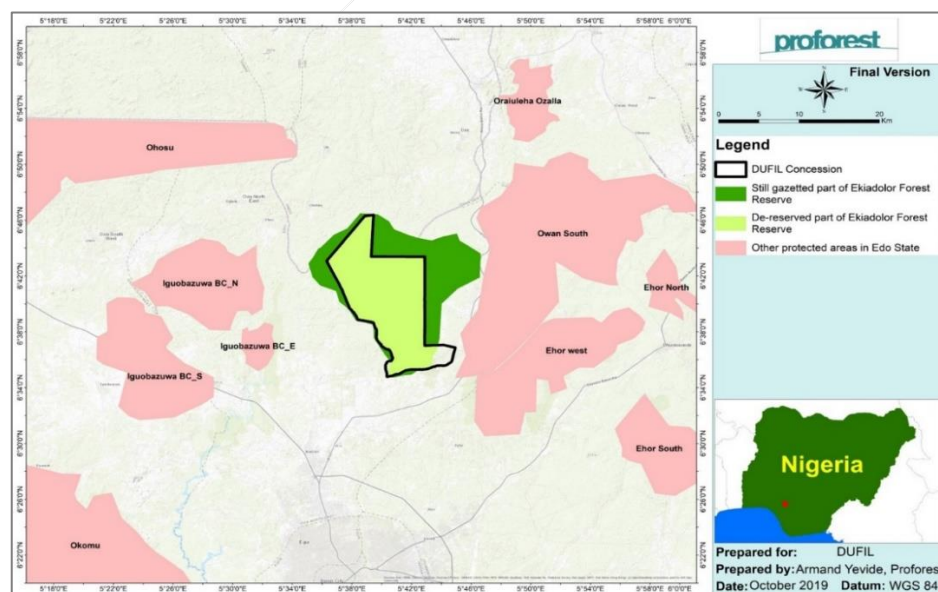
Species	Genus	Family	National Threat Status	#	%
<i>Pterocarpus erinaceus</i>	Pterocarpus	Fabaceae	Endangered	9	0.54
<i>Milicia excelsa</i>	Milicia	Moraceae	Endangered	3	0.18
<i>Terminalia superba</i>	Terminalia	Combretaceae	Endangered	29	1.74
<i>Entandrophragma cylindricum</i>	Entandrophragma	Meliaceae	Endangered	1	0.06
<i>Garcinia mannii</i>	Garcinia	Clusiaceae	Endangered	1	0.06
<i>Albizia ferruginea</i>	Albizia	Fabaceae	Endangered	42	2.52

<i>Nauclea diderrichii</i>	Nauclea	Rubiaceae	Endangered	13	0.78
<i>Pterygota macrocarpa</i>	Pterygota	Malvaceae	Endangered	10	0.60
<i>Allanblackia floribunda</i>	Allanblackia	Clusiaceae	Endangered	8	0.48
<i>Zanthoxylum zanthoxyloides</i>	Zanthoxylum	Rutaceae	Endangered	7	0.42
<i>Terminalia ivorensis</i>	Terminalia	Combretaceae	Endangered	6	0.36
<i>Entandrophragma utile</i>	Entandrophragma	Meliaceae	Endangered	2	0.12
<i>Lophira alata</i>	Lophira	Ochnaceae	Endangered	2	0.12
<i>Afzelia africana</i>	Afzelia	Fabaceae	Endangered	1	0.06
<i>Cedrela odorata</i>	Cedrela	Meliaceae	Endangered	1	0.06
<i>Triplochiton scleroxylon</i>	Triplochiton	Malvaceae	Rare	3	0.18
<i>Pterocarpus santalinoides</i>	Pterocarpus	Fabaceae	Rare	1	0.06
<i>Monodora myristica</i>	Monodora	Annonaceae	Rare	5	0.30

Discussion and justification

Protected areas

The PDA is bordered by the severely degraded Ekiadolor FR. Notwithstanding the extent of degradation, the Ekiadolor FR remains legally a Protected Area and therefore designated as HCV 1 area. All the other 10 forest reserves in the landscape, are also designated as HCV 1 areas in the landscape¹³ (Figure 38).



¹³ Apart from the Okomu National Park, the others are severely degraded and have had portions de-reserved for agriculture production.

Figure 38: HCV 1 - Protected Areas in the landscape

Data source: Protected areas from WDPA (<https://www.protectedplanet.net/en/thematic-areas/wdpa>); Concession boundaries from company.

Fauna

Table 30: Summary of the conservation significance of the fauna community in the PDA

Taxon	Conservation Status (IUCN)			National	Total Species of Conservation Interest	Total Recorded Species
	Endangered (EN)	Vulnerable (VU)	Near Threatened (NT)			
Birds	1	0	2	18	20	170
Herpetofauna	0	1	0	3	3	22
Mammals	1	2	0	15	15	20
Total	2	3	2	36	38	212

Table 31: HCV 1 species in the PDA

Taxa	Species (HCV 1)	HCV Area / MA
Herpetofauna	<i>Osteolaemus tetrapis</i> (Dwarf crocodile) <i>Manis tricuspis</i> (Tree Pangolin)	Forest patches in the northern and southern reaches of the PDA.
Mammals	<i>Cercocebus torquatus</i> <i>Cercopithecus erythrogaster</i> <i>Manis tricuspis</i> <i>Cercopithecus erythrogaster</i> , <i>Civettictis civetta</i> , <i>Tragephalus evrycerus</i> , <i>Tragelaphus scriptus</i> , <i>Tragelaphus spekii</i> , <i>Cephalophus niger</i> <i>Cephalophus maxwelli</i>	Forest patches in the northern and southern reaches of the PDA.
Birds	<i>Psittacus erithacus</i> (African Grey Parrot)	Forest patches in the northern and southern reaches of the PDA.

Out of the 1,000 bird, 247 mammal and 123 reptile species recorded in Nigeria (Fourth National Biodiversity Report, 2010), 170 bird, 20 mammal and 22 reptile species were confirmed and/or reported to be present in the PDA. The fauna community of the PDA comprised mainly (82%) species that are generally common and widespread within their natural geographic range. There were however some species (18%) within each of the three taxa surveyed that are of global and national conservation significance. Although the PDA is generally degraded, there are patches of secondary forest in relatively good condition especially in the northern and southern parts, making these parts of the PDA and surrounding areas home to remnant populations, some of which are species of global and national conservation concern.

Generally, species diversity and richness was relatively low for most species, especially mammals and herpetofauna. Both had a species diversity and richness index of below 2.90 and 5.30 respectively, suggesting that the PDA is not very rich in these species. However, bird species diversity and richness was relatively high with the highest diversity and richness recorded at a sampling site of 4.63 and 20.27 respectively. However, with the exception of the grey parrot, the rest of the species are generally common and widespread within their natural geographic range and can be considered to be generalists.

The composition of the herpetofauna community as recorded in the fauna study suggests that, the existing community is composed largely of remnant species that have persisted through the impact of habitat degradation in the PDA. Of the 22 herpetofauna species recorded, the Dwarf Crocodile and the Tree Pangolin are of global conservation concern, listed on the IUCN Red List of Threatened species as Vulnerable. Nevertheless, at the national level, three species (West African Nile Monitor, the Royal Python and the Dwarf Crocodile), are listed as Endangered on the threatened species list (Nigeria Fourth National Biodiversity Report, 2010). The African Dwarf Crocodile's range is West and Central Africa. In Nigeria, the approximate number is unknown, but it is reported to be predominant in Yobe State, and widely spread in suitable habitat areas (small rivers and pools in forests and swampy areas) forest areas. The main threat to the species is hunting and habitat loss from conversion. Tree pangolins are listed as near threatened by the IUCN and on Appendix II by CITES. They vary in number regionally, though overall numbers are decreasing. They are protected by many local governments.

The herpetofauna species recorded in the study are mainly habitat generalists with widespread distribution across the tropical lowland forests and associated habitat across the country and even more so in the West Africa region in general. Herpetofauna species in the PDA are therefore not considered to be HCV 1.

Three out of the 20 large mammal species recorded in the study are listed on the IUCN Red List of Threatened Species as being of conservation concern. These include two primates, the Red-capped Manabey and White-throated Monkey, which are listed as Endangered and Vulnerable respectively. The Red-capped Mangabey, African Civet, Bongo, Bushbuck, Sitatunga, Black Duiker and Maxwell's Duiker are listed as locally endangered, with 8 other recorded species listed as vulnerable on the national list (see Annex). No direct sightings were made of any of these species and only a few signs were recorded. However, there were several reports of frequent sightings and hunting of these species, during consultations with communities.

There is a paucity of published material on the occurrence, abundance and distribution of species in the AoI and wider landscape. Most of the limited studies have been concentrated in the Protected Areas, particularly the ONP, but these too are not recent.

Apparently, a healthy concentration of these mammal species may be more suited to occur in the Okomu National Park (ONP), which according to reports, maintains one of the highest concentrations of the large mammalian fauna of south-western Nigeria (Akinsorotan et. al). A survey of the White-throated Monkey in ONP reported a high population density of white-throated monkeys (Ajayi et. Al. 2012).

Conversely, in his study of the density and distribution of the Red-capped Mangabey in ONP, Orimaye (2017) observed very low density in the study area, casting doubt about their general wellbeing of their population in the Park and concluded that there is clear evidence that this animal is reducing in number on daily basis due to habitat degradation and hunting pressure. The species are reported to occur in some other protected forests in Nigeria including Cross River National Park (Orimaye, 2017).

Birds recorded were mainly habitat generalists, closely associated with open habitats in the forest landscapes. Out of the 170 bird species recorded, three are listed on the IUCN Red List of Threatened Species as globally threatened (Crowned Eagle, Blue-moustached Bee-eater and Grey Parrot). Crowned Eagle and Blue-moustached Bee-eater are listed as Near Threatened, whilst the Grey Parrot is listed as Endangered.

In addition to this, and at the national level, 18 birds of prey (Accipitridae) that are locally important under Nigerian law (Schedule 1), were recorded. These are all resident species of tropical forest regions of southern Nigeria and of West and Central Africa but the populations of the species are reported to be declining mainly as a result of habitat loss and particularly for the Grey Parrot, capture for the rapidly increasing pet trade (Eniang, 2008).

In conclusion, while the PDA is not a habitat critical for the survival of the recorded species of conservation importance in the country, with a presence of two Endangered, three Vulnerable and two Near Threatened species on the IUCN Red List as well as many others (i.e. a total of 36 species) on the National List, the conservation value of the fauna community in the PDA is deemed to be quite significant (Figure 39). Upon this basis, we conclude that HCV 1 is present (comprised essentially of the listed species in Table 32 above). The forest patches in the north and south of the PDA and adjacent areas, provide the most suitable habitat for these species in the landscape. This could be attributed to the fact that the animals here were less harassed compared to other parts of the PDA and vast portions of the immediate landscape in general. Many of the animals in other parts of the PDA may have moved to these patches for the relative security they provide. These forest patches have also been designated as HCV 3 areas and form part of the identified HCS forest patches, and their long-term protection under these categories will ensure the long-term conservation of the listed HCV 1 species, as well as provide for the growth of a healthy population of fauna within the PDA.

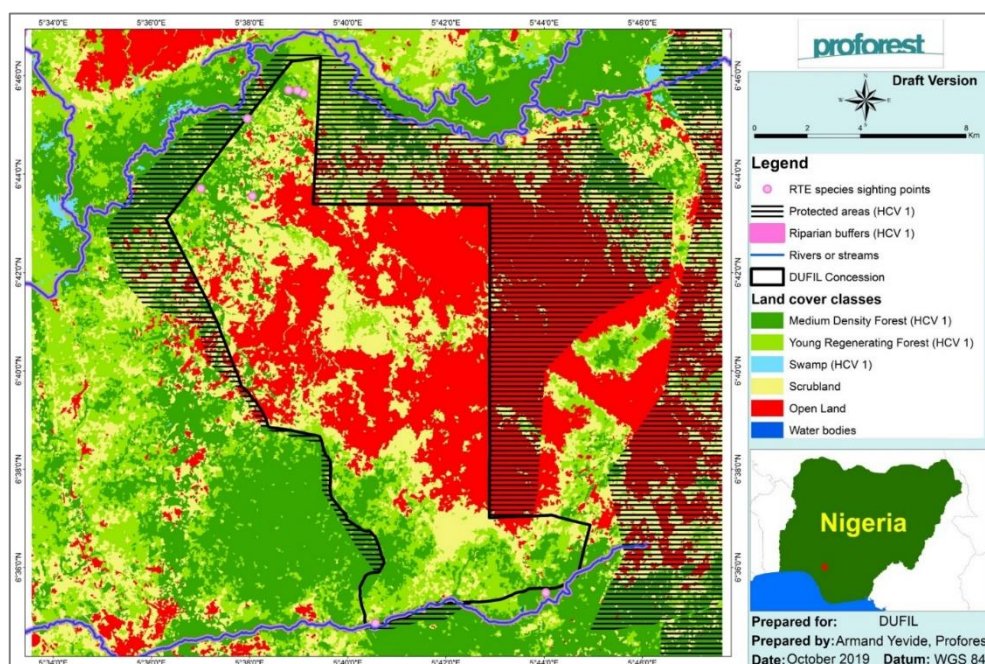


Figure 39: Map showing HCV 1 areas and distribution of RTE species

Data source: Concession boundaries from company; Rivers digitized from sentinel imagery used for the land cover classification.

Flora

All the species categorised as Endangered (including the 12 Vulnerable species on the IUCN List) are commercial tree species that are predominant in southern Nigeria, and which form considerable part of the national annual allowable cut based on sustainable yield calculations of the forestry department. There is neither absolute restriction imposed on felling them nor is there strict protection for them. This is because, while classified as 'restricted', there is recognition that if the current population is sustainably managed i.e. adhering to AAC volumes, then there is not a present threat to their population. Besides, their numbers on the PDA are not significant to maintaining the viability of the total population in the country. Therefore, these species are not concluded to be HCV 1 flora species. Notwithstanding the foregoing, most of these tree species (over 90%) were recorded in the forest patches in the north and south of the PDA, and occur in the areas identified as HCS forest patches, designated also as HCV 1 and 3 management areas.

The Endangered (IUCN-listed) *Pterocarpus erinaceus* is a species of tree that is native to the Sahelian region of West Africa and reported to be widespread in northern Nigeria (its natural habitat), where it is widely distributed and occurs abundantly, especially in Taraba State. For similar reasons as provided above, this species is not designated as HCV 1 flora species in the PDA¹⁴.

¹⁴ It is important to note that, majority (over 90%) of the recorded tree species occur in the forest patches designated as HCV 1 and 3 areas as well as HCS forest patches, which are to be set-aside for long-term conservation management.

Summary of HCV 1 areas in hectares

Value	Area in PDA	In the landscape
Forest patches (MDF, YRF, riparian vegetation)	4,936.10	43,357.49
Protected Areas / FRs	0.00	11, 153.97

NB: Riparian buffer and forest patches overlap.

7.2.5 HCV 2: Large landscapes

Definition

HCV 2 are Landscape-level ecosystems and mosaics and refers to Intact Forest Landscapes (IFL) and large landscape-level ecosystems and ecosystem mosaics that are significant at global, regional or national levels, and that contain viable populations of the great majority of the naturally occurring species in natural patterns of distribution and abundance. Generally, areas that form part of, or serve as a linkage between larger forest complexes and can thus provide connectivity between two or more forest fragments and/or act as a wildlife corridor for the movement of animals between various habitat areas may also be considered as HCV-HCSs. A threshold of 50,000 ha is widely accepted.

HCV	Definition	Finding
2		Absent

Identification

HCV 2 includes ecosystems and ecosystem mosaics that are sufficiently large and relatively undisturbed enough to support viable populations of the great majority of the naturally occurring species and (implicitly) the great majority of other environmental values occurring in such ecosystems.

HCV 2 refers mainly to large landscape level forests that are generally intact and where ecological processes and ecosystem functioning are largely unaffected by recent anthropogenic activities. In assessing the presence of HCV 2, the following questions were posed:

- Does the area contain or overlap IFLs or are there dominant forest blocks within the PDA that represent a reasonably unfragmented block of forest of at least 50,000 hectares?
- Are the forest habitat types of the PDA connected to an adjacent large landscape level forest?
- What is the status and distribution of the dominant habitat types within the PDA connected with the adjacent large landscape level forest?
- Will the loss or severe degradation of the connected forest areas significantly impact habitat or ecosystem function of the adjacent large landscape level forest?

Discussion and justification

The global IFL database does not identify IFLs in Nigeria. Most parts of the PDA (except for patches of riparian vegetation to the north and south) are severely degraded¹⁵ and located within a much-modified landscape characterized by smallholder food crop farms and bush fallows. The existing forest cover is highly fragmented throughout the landscape. There is a network of forest reserves in the landscape, but these are all highly or severely degraded, with some even denuded¹⁶. Other forested areas consist of the small and isolated swamp/riparian forest patches and some young regenerating forest. However, these are isolated and widely dispersed. Outside the degraded forest reserves, there is an absence of vegetation that qualifies as a large (i.e. greater than 50 000 ha) contiguous area of natural ecosystem or habitat. It is therefore unlikely that HCV 2 is present as contiguous block of forest or corridors with connectivity to existing Protected Areas / forested areas. Rather, it is more likely that any values related to ecosystems and habitats or species distribution would be better suited to HCV 1 (management area) and HCVs 3 and 4 classifications. In conclusion, there is evidently no representation of contiguous vegetation in a landscape dominated by highly to severely degraded forest reserves devoid of any connectivity with same (Figure 40). In view of the foregoing, HCV 2 is confirmed to be absent.

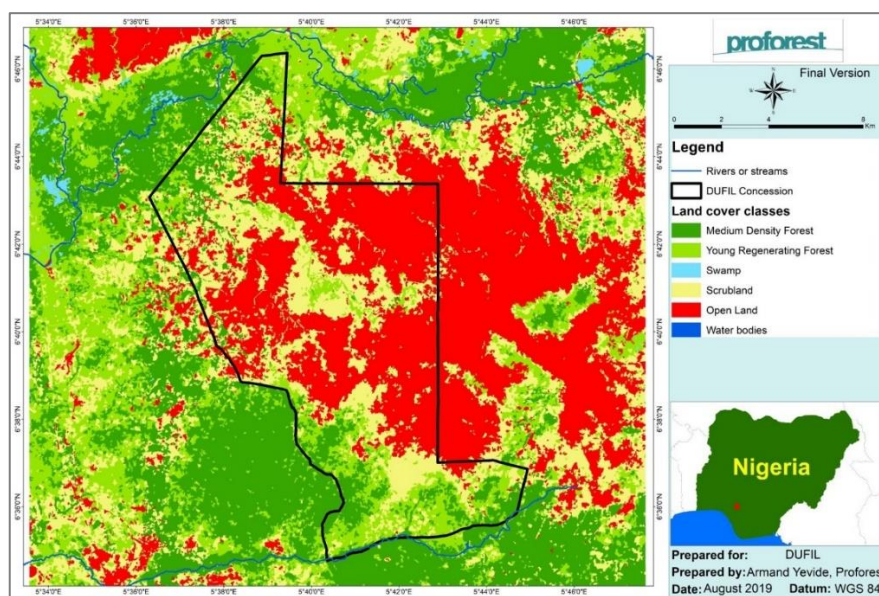


Figure 40: Map showing absence of HCV 2 in the assessment landscape

Data source: Concession boundaries from company; Rivers digitized from sentinel imagery used for the land cover classification.

¹⁵ A recent landuse and land cover study of Edo State forests reported the following about the reserve: “The Ekiadolor Forest Reserve is one of the badly degraded forest reserves in the state. Although the reserve has a total land area of over 24, 000 ha based on the maps received and digitized, only 382 ha of this reserve contains close canopy forest. This area is located to the southernmost part of the reserve”

¹⁶ A report on land use and land cover analysis prepared by Proforest for the Edo State Government in 2017

7.2.6 HCV 3: Rare ecosystems

Definition

HCV 3 refers to areas with ecosystems that are naturally rare due to geographical or climatic factors limiting their distribution and development or ecosystems whose extent and/or distribution has been reduced by anthropogenic activities.

HCV	Key question	Finding
3	Does the PDA fall within or contain an ecosystem that is rare, threatened or endangered?	Present

Identification

- The Common Guidance considers HCV 3 areas to include forest and habitat types that fall in one or more of the following categories:
- Naturally rare habitats
- Habitats which are dramatically reduced from their original extent due to the activities of man
- Habitats so threatened by existing and planned activities that they should be considered threatened/endangered.

The different types of vegetation in Nigeria include the tropical rainforests, arid savannah, coastal mangroves, freshwater swamps forests, etc¹⁷. Despite the absence of recent detailed mappings of the vegetation cover or an assessment of threats against them, it is generally accepted that the country's forest cover has been drastically reduced in extent over the last few decades. Hence all existing forests in the country would be a priority for conservation. In the absence of a National Interpretation HCV toolkit for Nigeria, consultations with stakeholders and experts, combined with the use of the precautionary approach has resulted in consideration of the following types of vegetation as HCV 3:

- All areas containing intact natural forest vegetation. This is because the natural forest cover of the country has been significantly reduced in extent.
- All areas with montane forests- due to their rarity at the national level
- All areas containing mangroves and swamps or wetlands due to their rarity and threat to their continued existence
- Areas with coastal lowland forest.

¹⁷ The five priority ecological zones in Nigeria are Arid zone, Guinea Savanna woodlands, Coastal and Marine Ecosystems, Rainforest belt including montane forests, and wetlands (including swamps) and river basins

Discussion and justification

Intact forests/vegetation

As noted, the landscape is highly modified with an absence of intact forest.

Montane forests

No montane forests were observed in the PDA as the PDA lies on a relatively flat land.

Coastal lowland forest

There are no coastal lowland forests in the landscape.

Wetlands (swamps and mangroves)

Wetlands constitute a feature of conservation concern in Nigeria. They are reported to be essential for the functioning of the ecosystem and provide niche habitats for a variety of plants and animals. Increasingly, swamps are being dramatically reduced from their original extent due to anthropogenic activities. All swamps in the PDA are identified as HCV 3 areas. The distribution of swamps that have been identified and mapped in the PDA is shown in Figure 41 and 42 below. The HCV 3 map is labelled as draft because more swamps may occur in the PDA that have been mapped and the company should ensure to map all swamps it encounters during plantation development.

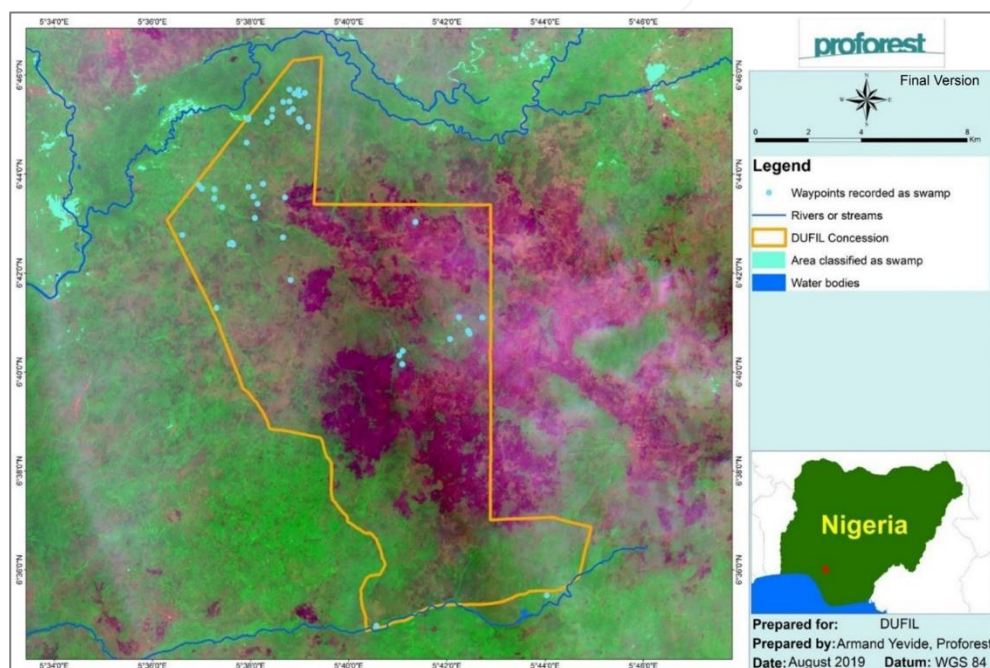


Figure 41: Map of PDA showing swamp sites

Data source: Concession boundaries from company; Rivers digitized from sentinel imagery used for the land cover classification; Other layers from field assessment.

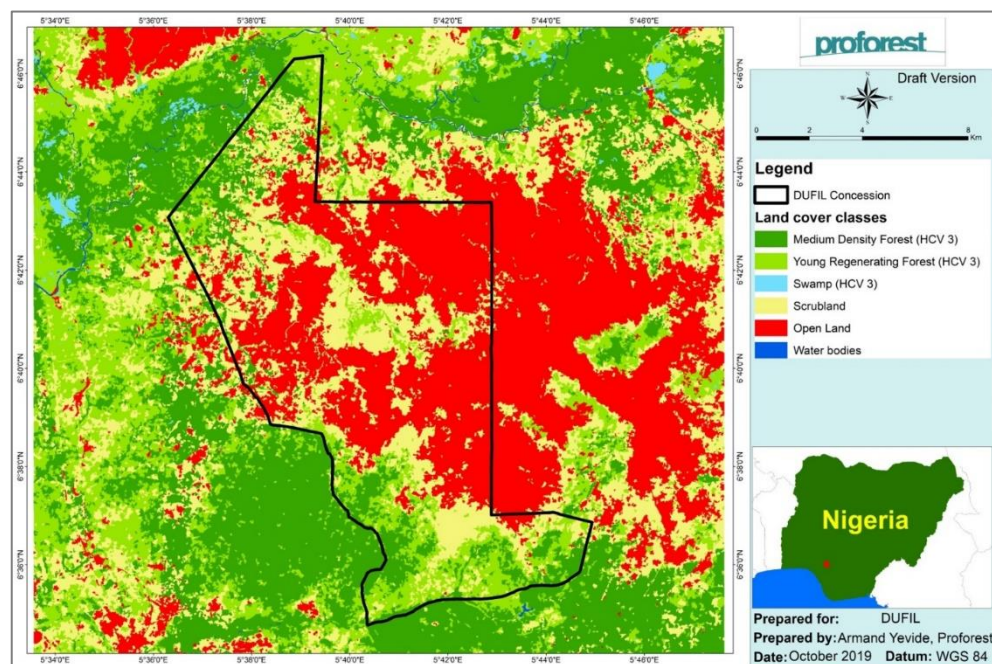


Figure 42: Map showing HCV 3 areas

Data source: Concession boundaries from company.

7.2.7 Peat

To assess the likely occurrence and distribution of peat within and outside the PDA, we conducted a review of recent literature and relied on a study on peatland distribution of tropical peatland (Gumbricht et al., 2017). An overlay of remote sensing datasets revealed a likely presence of peat in the northern part of the PDA and adjacent areas. However, considering the fact that a detailed field study is required to conclusively establish the presence of peat, we conclude that peat is potentially present in only a limited portion of the northern part of the PDA and adjacent areas, overlapping with HCV 1 and 3 areas (Figure 43).

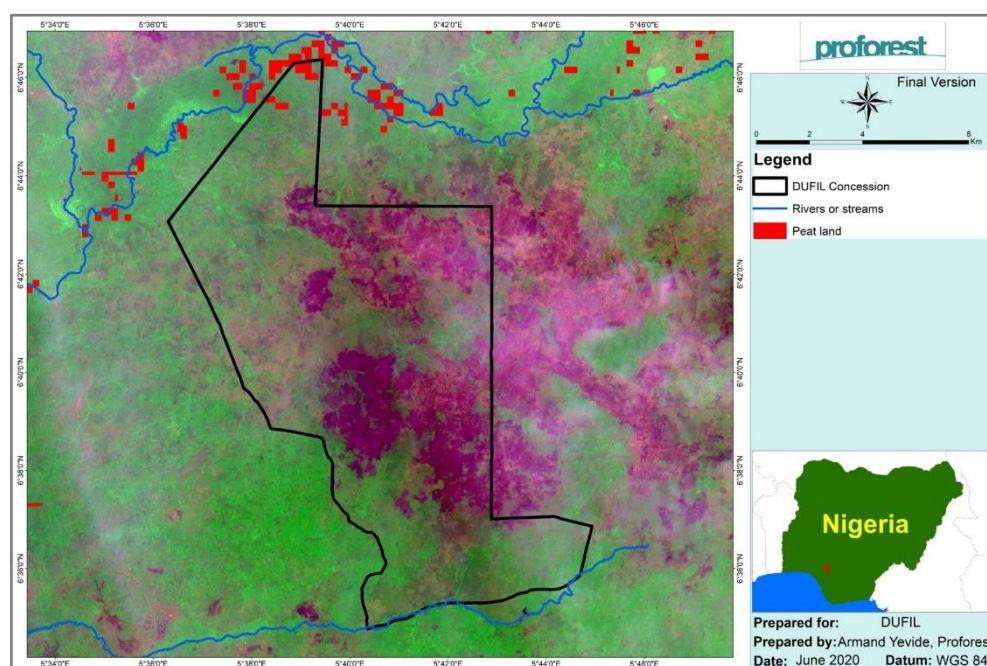


Figure 43: Distribution of peat within and around the PDA as per Gambrecht et. al. 2017

Data source: Concession boundaries from company; Rivers digitized from sentinel imagery used for the land cover classification.

Summary of HCV 3 areas in hectares

Value	Area in the PDA	Area in the landscape
Forest patches and swamps	4,936.10	43,122.33

8 Patch analysis

8.1 Description of the patch analysis

The current patch analysis was conducted on the outputs of the final classification and was mainly based on the HCS forest class patches including the swamp areas. The swamp areas were included in the HCS forest class because of the importance of wetland in ecosystem services. The figure 46 presents the distribution of the HCS forest within the AoI. A negative buffer of 100 m was used to group the HCS forest patches into High Priority Patch (core area > 100 ha); Medium Priority Patch (core area from 10 to 100 ha) and Low Priority Patch (core area < 10ha). In the AoI, 33 patches with core areas were identified (3 HPP, 2 MPP, and 28 LPP). The largest HPP extended to the ARPN PDA while the two others are completely outside. None of the MPP are located within the PDA and only 6 of the 28 LPP are within the boundaries of the PDA. A 100 m buffer was used to assess connectivity between patches. This was done to check whether LPP without core area, LPP with core area and MPP were connected to HPP in the landscape. One of the MPP in the AoI has no connectivity between HPP and therefore was supposed to undergo a risk assessment (Step

8 of the decision tree). However, since this MPP was completely outside the PDA (6.9 km) the risk assessment was not conducted on it.

All the LPP connected to HPP within the boundaries of the concession were marked for conservation. The LPP that are not connected to any HPP were supposed to undergo the pre-RBA check in the Step 9 or be selected as indicative in the give and take process in the step 11. To make our decision, the forest cover percentage in the landscape (Aol) was estimated by dividing the total area covered by forest by the total area of the landscape. It was found that the landscape has 31% of medium density forest and 52.4% of forest cover when young regenerating forest cover is included. Given that more than 30% of the landscape is forest, the area was considered as medium forest cover landscape and the remaining LPP were taken as indicative in the give and take process. During the give and take process, effort was made to ensure that non HCS area given for conservation exceed the HCS area taken for development.

The type of HCS forest patches, connectivity of LPPs and MPP to HPP, and connectivity of LPPs to MPP were used to identify the forest patches that will be marked for conservation. In order to ensure that the HCS area set aside is contiguous with very low fragmentation risk, non-HCS areas were given for conservation and isolated or small pieces of HCS areas were taken for development.

The HCS forest patches within the PDA cover an area of 4,059 ha leaving the remaining potentially for development. However, in order to make contiguous the HCS set aside area, non-HCS were given for conservation and HCS area were taken for development. It was to ensure during this process that there is more non-HCS area given for conservation than HCS area taken for development. During this process, a 25 m buffer was created to smoothen the boundaries of the HCS set aside area.

The total area marked for conservation was 5,107.8 ha which represent 34.2% of the PDA and includes 8.9% of non-HCS area. The total development area was 9,819.2 ha which represents 65.8% of the total PDA and includes about 3,288.7 ha of scrubland (proxy for area under Taungya system).

8.1.1 Map corresponding to step 1

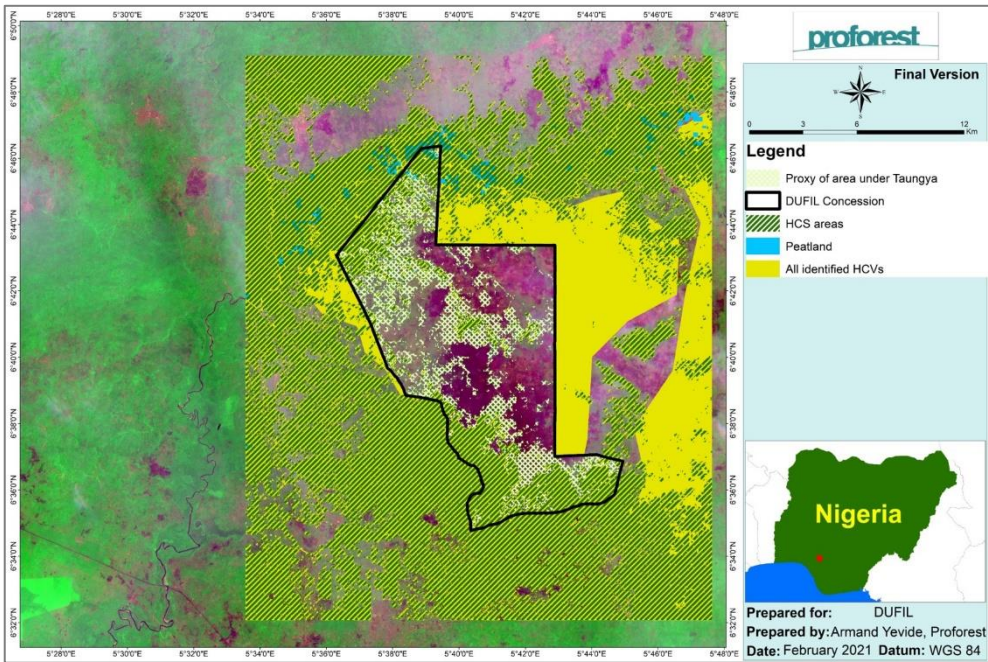


Figure 44: Map showing HCS areas overlaid with HCVs areas and the distribution of peatland.

8.1.2 Map corresponding to step 2

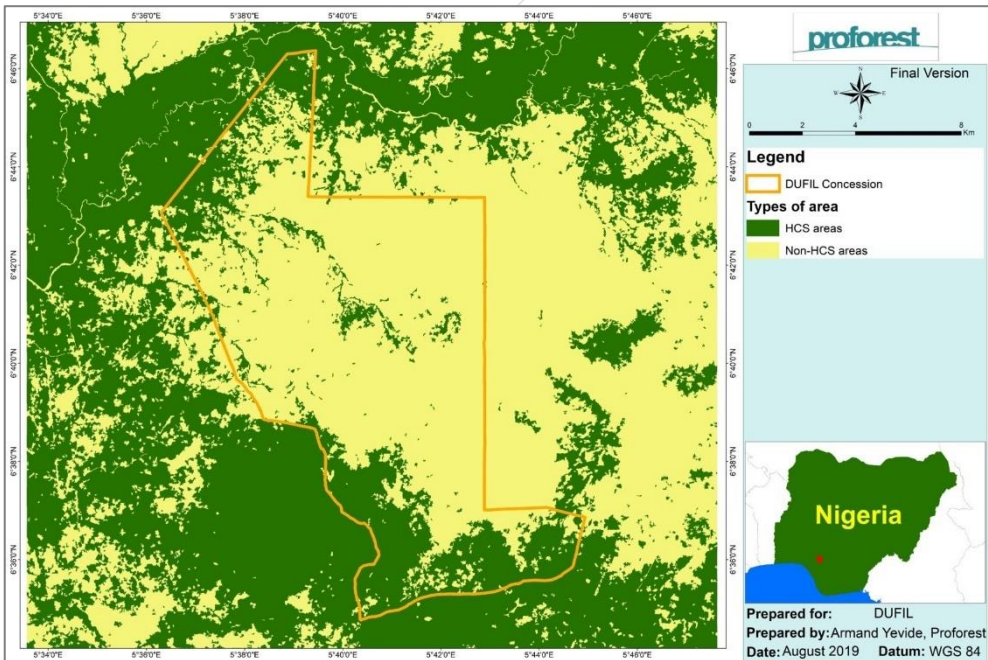


Figure 45: Map showing HCS classes merged.

8.1.3 Map corresponding to step 3

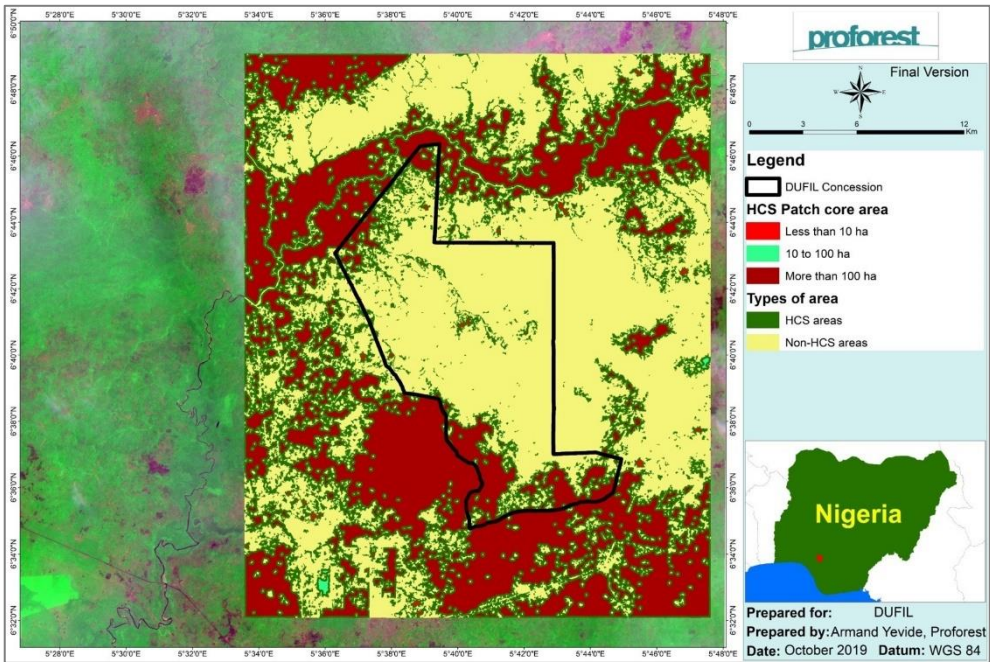


Figure 46: Map showing HCS classes and their core areas

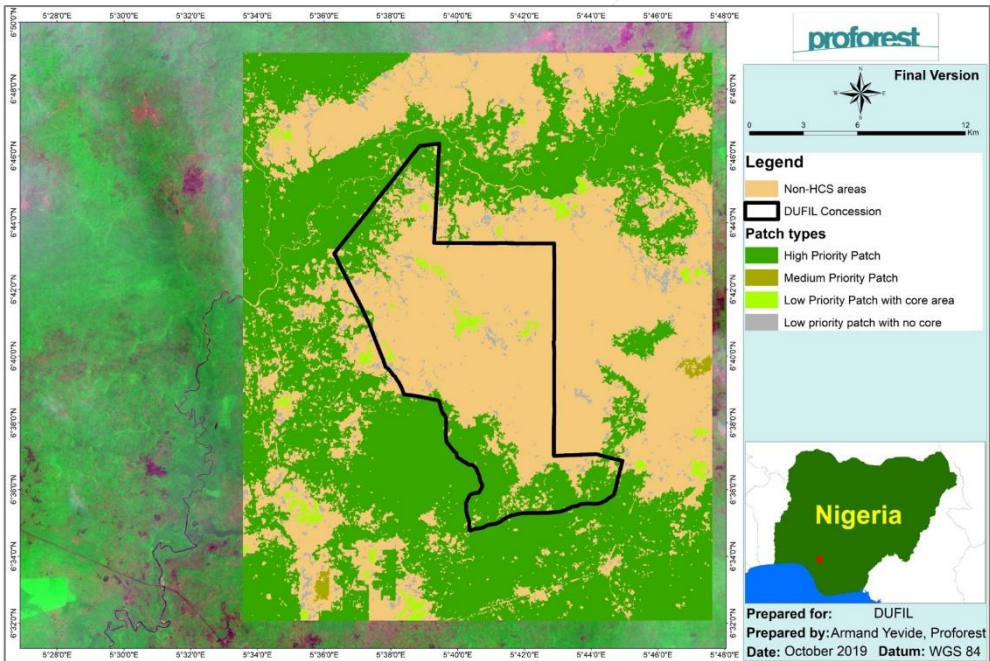


Figure 47: Map showing HCS patches categories based on their core area

8.1.4 Map corresponding to step 4 and 5

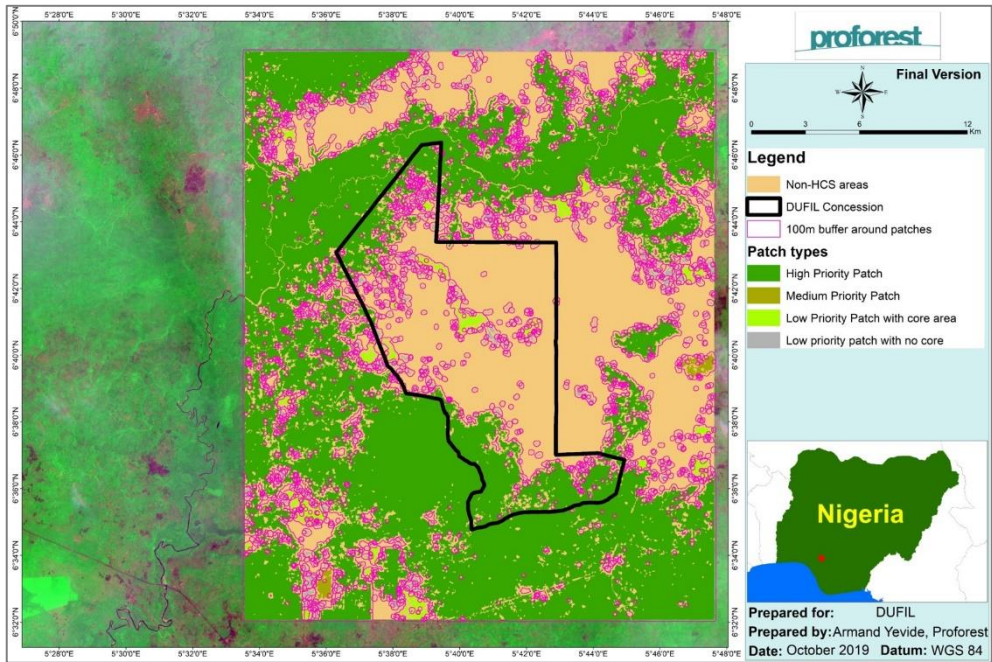


Figure 48: Map showing HCS patches and the 100m buffer around patches

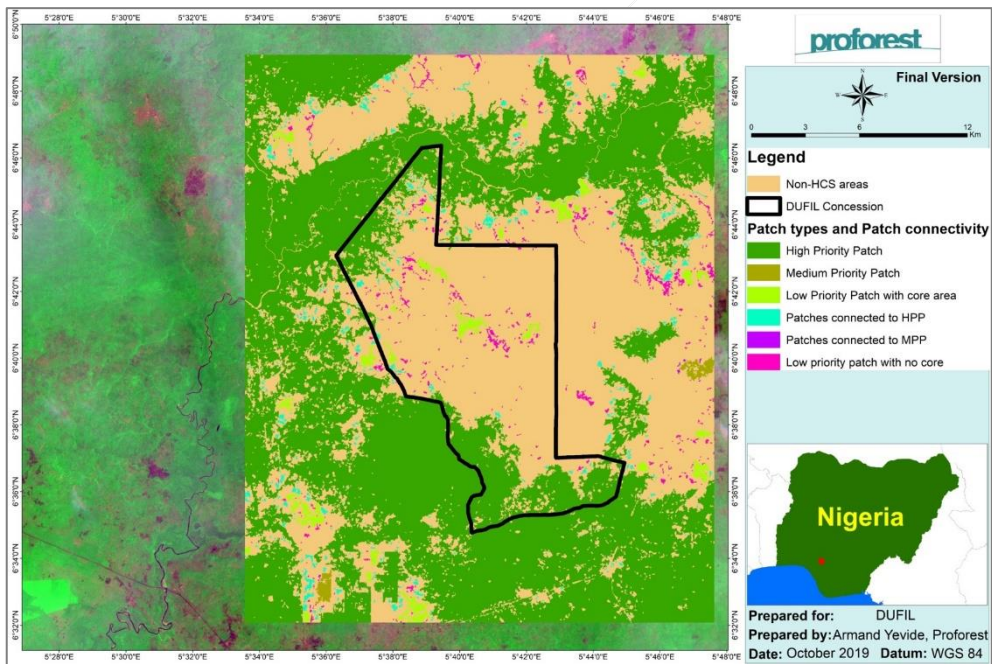


Figure 49: Map showing HCS patches categories and connectivity status

8.1.5 Map corresponding to step 11

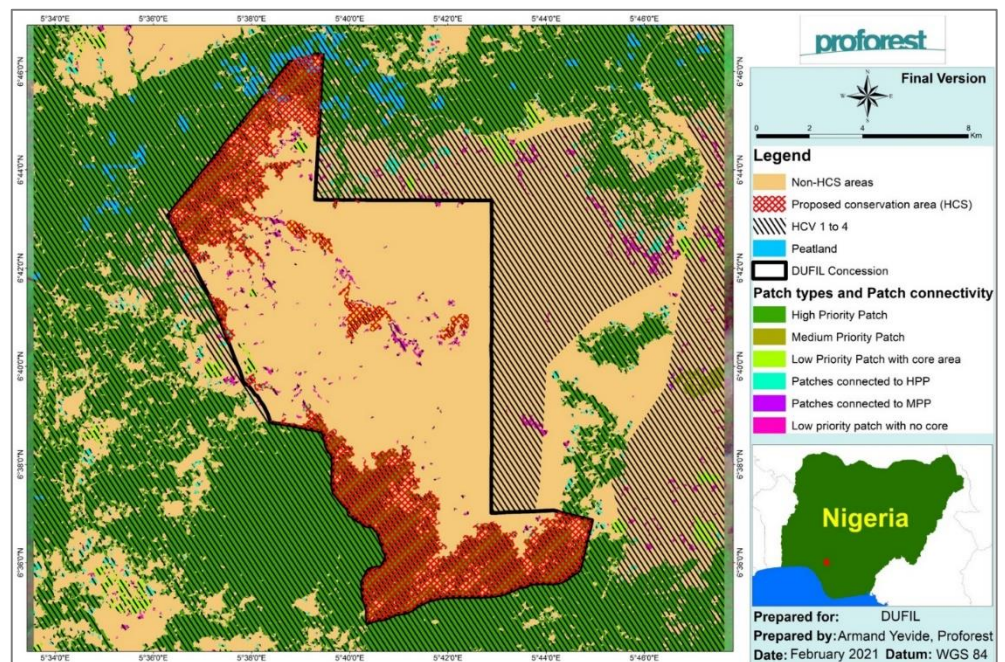


Figure 50: Map showing HCS patches categories and connectivity status overlaid with HCVs areas and peatland

8.1.6 Map corresponding to steps 12 and 13

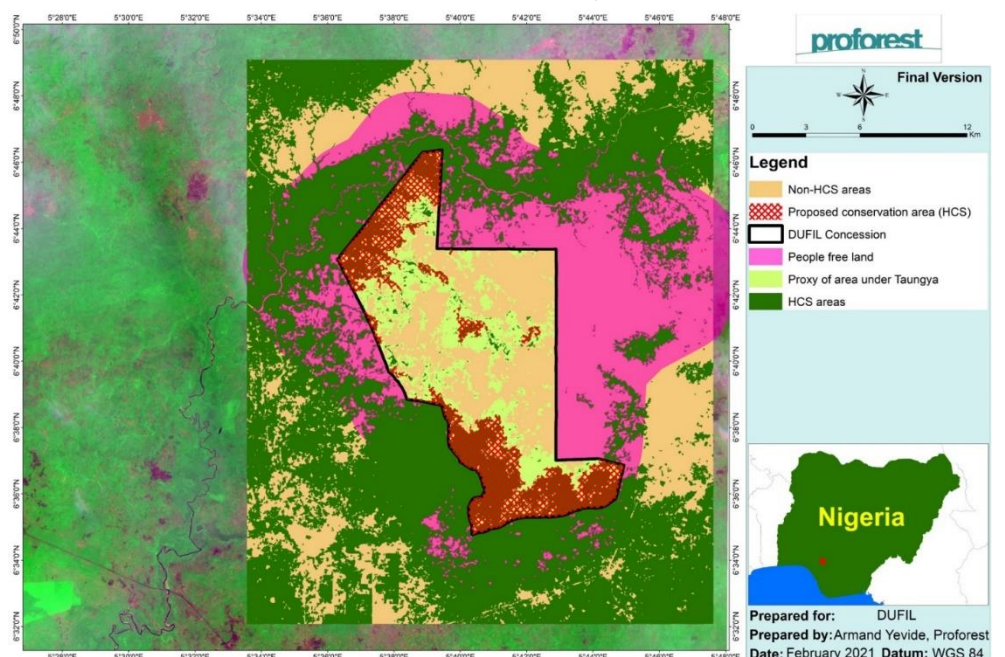


Figure 51: Map showing proposed conservation areas and areas of current (taungya farming¹⁸) and future ('free area'¹⁹) community use and non-HCS areas (or proposed development area).

¹⁸ The Taungya farming areas represents areas used for farming in the PDA under renewable annual permit by the Ministry. These are the areas subject to crop compensation and may eventually be given over for development.

¹⁹ Community land use area

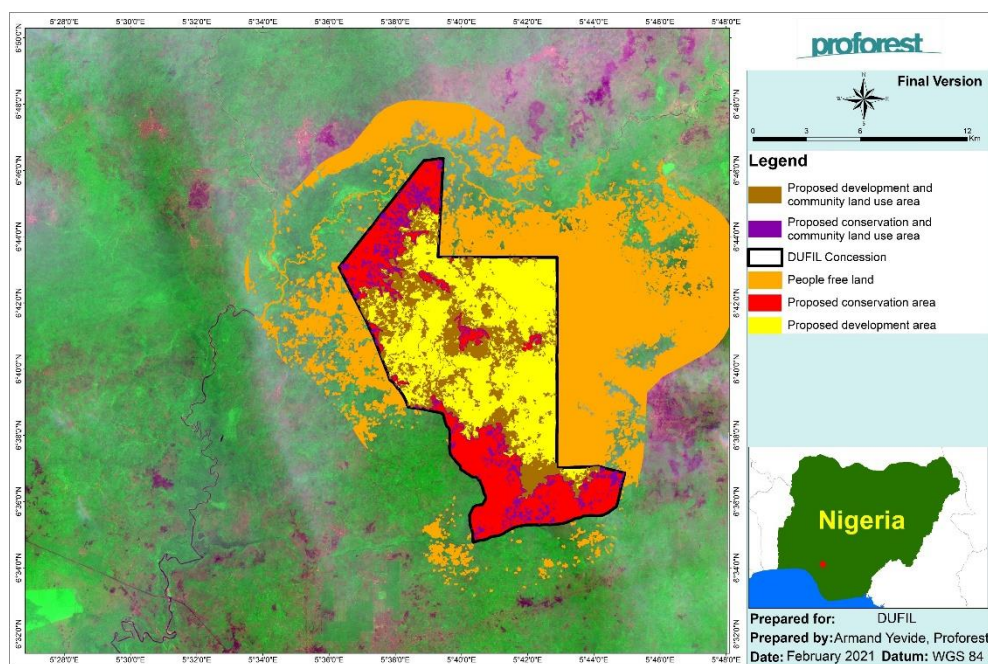


Figure 52: Distribution of proposed conservation and development area as well as community use area (People free land).

NB: The Scrubland within the HCS area is estimated at 1,201.43 ha. The scrubland within the PDA and outside HCS area is estimated at $4,490.1 - 1,201.43 = 3,288.67$ ha. This area overlaps with the area used for Taungya farming.

The Taungya farming areas represents areas used for farming in the PDA under renewable annual permit by the Ministry. Provided that FPIC is obtained from the affected communities and the completion of the ICLUP, these are the areas subject to crop compensation and may eventually be given over for development. Likewise, with the Free, Prior and Informed Consent of communities, the restoration/ conservation may occur on community-land use area as well.

8.2 Discussion and comments on the HCSA decision tree outcome

The patch analysis was done on the final vegetation classification and based mainly on the methodology in the HCSA toolkit. To ensure that, the initial and final land cover classes are as close as possible to the features on ground, during the segmentation a smaller number of pixels were used. The main negative impact of this was the fact that numerous patches of forest were small in size and not contiguous enough. This has been resolved by establishing 25 m buffer around the HCS patches and by given non-HCS area for conservation.

9 Management & monitoring recommendations

Recommendations on management and monitoring (Section 10.2) are provided based on an assessment of threats (Section 10.1) to the identified HCVs. Throughout Table 31, maps shown in the figures below are referenced to practical measures for the company to follow in establishing appropriate management and monitoring plans at both the strategic and operational levels.

HCV 1 and 3 management areas and HCS forest patches within the PDA

There is an overlap between HCV 1 and 3 management areas. All the identified HCV 1 species occur in the HCS forest patches, which are also HCV 3 management areas as shown in figures 53 and 54 below. Management and monitoring recommendations for all of these areas are provided in Table 31 below. Part of the eastern portion of the PDA is adjacent to the un-degazetted portion of the Ekiadolor forest reserve, which though severely denuded, legally remains a forest reserve (HCV 1). While no part of the PDA has been designated as management area (or buffer) in respect of this HCV 1 area because of the extent of denudation both in the reserve and within the portion of the PDA adjacent to it, plantation development activities must be undertaken with an abundance of caution, not to encroach into this area even though it is presently devoid of any HCV values. In other words, careful attention should be paid to the boundary line, which should be clearly demarcated and visibly maintained, due to its designation as a forest reserve, regardless of the fact that it does not harbour any HCV species or values. The MDF and YDF are proxies for HCV 1 in the much degraded landscape. Scrubs have not been included in this category as no evidence was found to suggest that they are critical habitat for potential HCV 1 species. The habitat needs of these species are described in the section on HCV 1 as captured from the fauna report. It is important to also note that the management objective of the remainder portion of the Ekiadolor reserve is farming, with no commitment to restoration by the responsible state agencies.

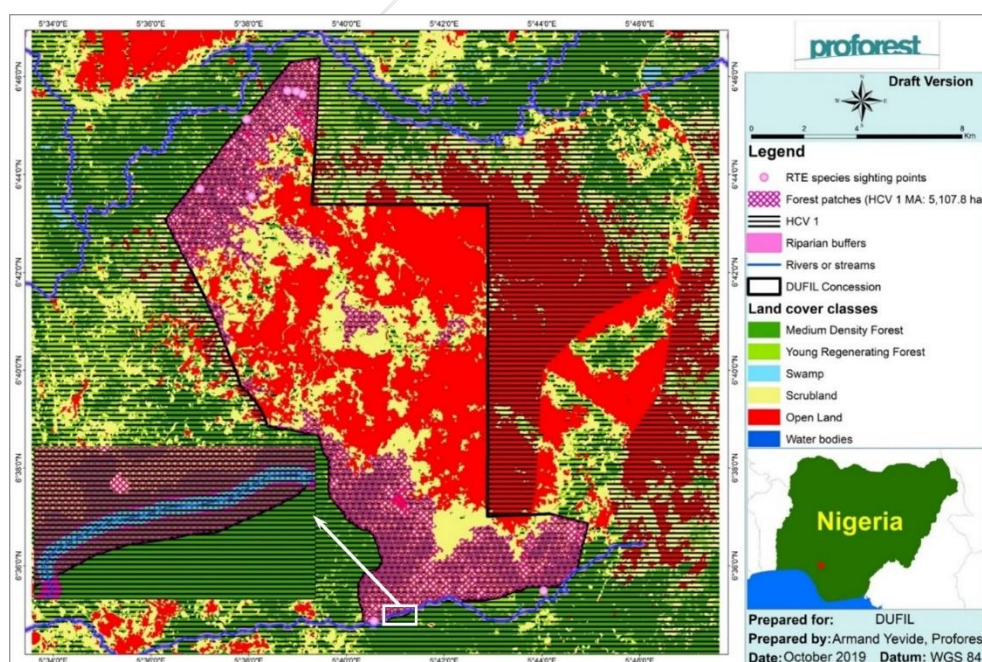


Figure 53: Map showing HCV 1 management areas

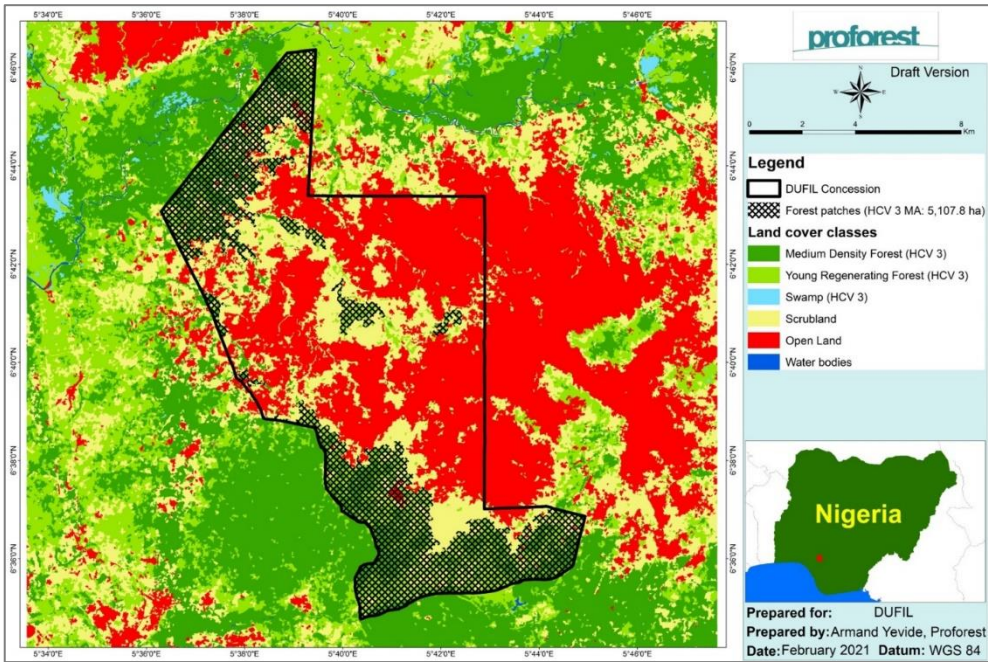


Figure 54: Map showing HCV 3 management areas

HCV 4 and 5 management areas

There is also an overlap between HCVs 4 and 5 management areas as shown in figures 55 and 56 below. The riparian buffer identified in this assessment is the overlap between the southern boundary of the PDA and the Ovia River. In addition to these, the presence of smaller streams (water supply points), critical to local community needs were revealed during consultations and participatorily mapped with affected communities (as shown in Figure 56 below). Management and monitoring recommendations for all of these areas are provided in Table 31 below.

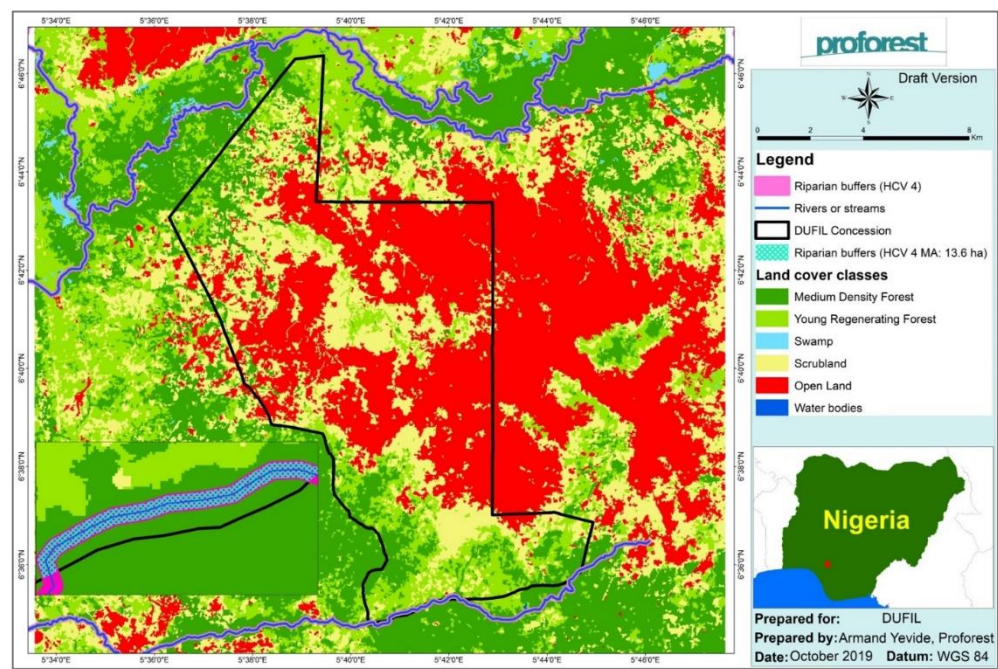


Figure 55: Map showing HCV 4 management areas

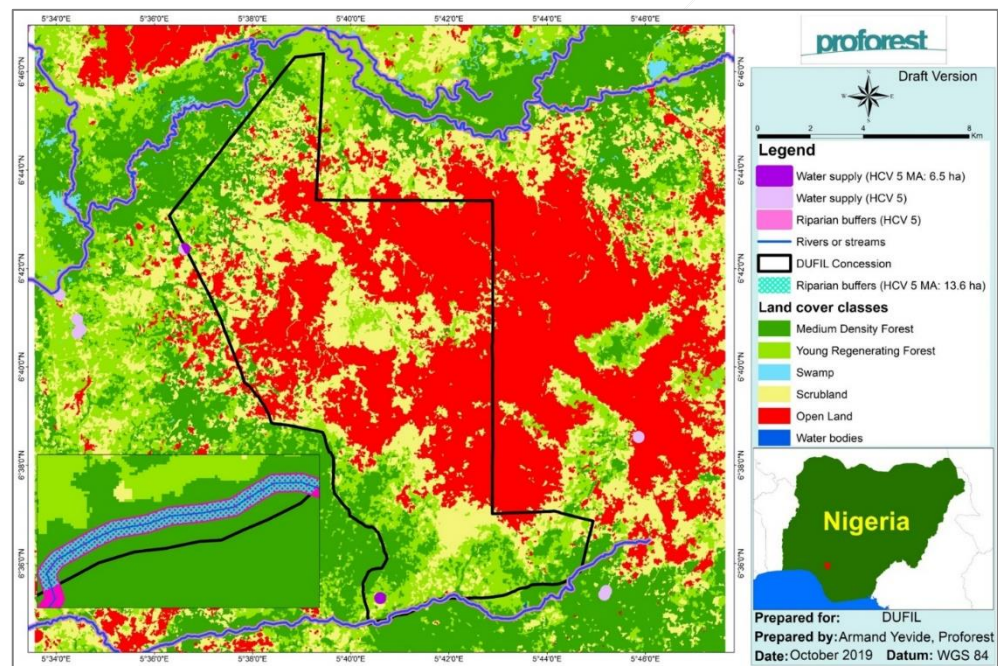


Figure 56: Map showing HCV 5 management areas

HCV 6 management areas

An overwhelming majority of shrines occur outside the PDA (Figure 57). Only three shrines lie just outside the PDA boundary at Odighi (Odighinebo and Ilahe shrines) and Igolo (Aiwor shrine). Management and monitoring recommendations for all of these areas are provided in Table 31 below.

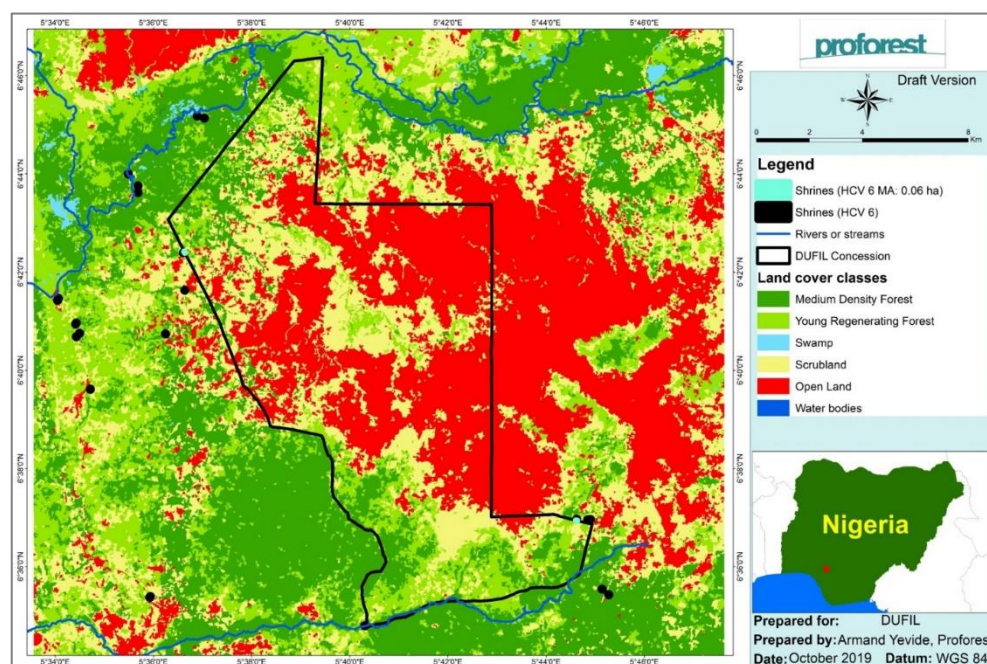


Figure 57: Map showing HCV 6 management areas

9.1 Threat assessment

Threats to identified HCVs have been assessed through observations in the field, review of literature and consultations with stakeholders including communities and with due consideration for the extent of area, and the potential severity and duration of the impact on the HCV. For HCVs 1 and 3 which overlap with the HCS forest patches, the threats are summarised as:

- Accidental clearance and planting of HCS forest by the company;
- Loss of biological diversity present in the HCS forest and disturbance of ecosystem services provided;
- Fragmentation by conversion of forest for plantations and agriculture or fire caused by hunters;
- Logging or timber harvesting as well as NTFPs collection for food, health and other needs;
- Displacement of logging from HCS forest inside PDA to outside
- Improved access to HCS forest via improved roads;
- Disturbance during land preparation, road building etc.

Table 32 below details threats to each identified HCVs.

Table 32: HCV threat assessment

HCV/HCS Ref	Brief description of value present in assessment area	Main threats
HCV 1, 3; HCS forest	RTE species (HCV 1) HCS forest patches including riparian forest and YRF (HCS) Swamps/wetlands (HCV 3 but also HCV 1 management areas)	Encroachment into HCS forest patches and conversion to farmland / habitat loss (including riparian forest and YRF) Agricultural production has been the single biggest contributor to deforestation in Nigeria in general, and in the landscape in particular. Due to increasingly shortening fallows, farmers continuously seek new land to clear and burn for establishment of new farms, including in swamp areas. The reduction in farming areas resulting from oil palm development could lead to encroachment into forest reserves. These areas also stand at risk of being converted during land preparation. In addition, the integrity of set-aside forest areas and forest reserve boundaries is threatened by adjacent farming activities. Encroachment and pressures of land conversion, illegal felling of timber, poaching, conflicts between wildlife and local communities, pollution, among others threaten the integrity of these protected areas and complicate their management. Habitat loss particularly of the remnant patches of forest in in the reserves as well those in some wetlands pose an important threat to the existence of the current population of threatened bird species (African Grey Parrot). Encroachment into adjacent forest reserve There is a threat of encroachment into the adjoining Ekiadolor FR, which remains legally a forest reserve due to unclear boundaries. Hunting The threat of hunting is present especially in riparian forests and swamps with relatively high biodiversity including habitat areas for HCV 1 species. Plantation agrochemical use/pollution of the swamp and buffers Swamp sites are at risk of pollution from run-off agro-chemicals, following future development of surrounding areas for oil palm establishment. Aside establishing and maintaining a buffer, it is important to avoid the situation that run-off water containing chemicals and fertilizer find its way into these swamps and water bodies (Savilaako et. al., 2014). Sedimentation risks to swamps and waterways An additional threat important to highlight is sedimentation risk to swamp/waterways. The problem of soil erosion is increasing with time. Poor agricultural practices, such as cultivation on steep slopes, contribute to erosion and siltation of water bodies, thereby altering ecosystems and species composition.
4, 5	- River buffers (HCV 4) - Drinking water from streams and rivers (HCV 5) - Steep slopes (HCV 4)	Farming and land preparation Loss of riparian vegetation expose streams and rivers to diverse deleterious effects including erosion and eutrophication among others. However, indiscriminate farming and inadequately planned land preparation could undermine both the structural and functional integrity of existing riparian vegetation including river buffers with deleterious effects. If unchecked, this would reduce the capacity of the forests to moderate stream flow,

		stabilize the terrain, reduce riverbank erosion, regulate runoff, trap sediments and promote infiltration of sediment-borne nutrients and pesticides. This would affect the water quality of water of rivers and streams lying in valley bottoms adjacent to surrounding forest patches. Pollution from agrochemical use Like swamps, all streams and rivers flowing through the Aol stand the risk of pollution by agro-chemicals. Aside establishing and maintaining a buffer, it is important to avoid the situation run-off water containing chemicals and fertilizer finding its way into these swamps. All streams and swamps for domestic use could be at risk of pollution by agro-chemicals, following the future development of surrounding areas for oil palm establishment. Conversion of vegetation on slopes The highest slope is around 15 degrees, meaning there is no steep slope in the PDA. However, measures such as terracing, platforms and cover crops should be applied to prevent erosion and possible loss of soil and nutrients.
6	Shrines	Conversion during plantation development Sacred sites i.e. shrines, stand the risk of conversion during land preparation and subsequent plantation development activities (including associated development) if active effort to secure their integrity is not maintained. Encroachment / desecration by workers Sacred sites stand the risk of encroachment or desecration by workers or persons residing in the established plantation that may not be aware of their presence and location.
Local peoples' lands	Areas designated as 'free areas'	Conversion during plantation development Areas designated as local peoples' land or 'free areas' (available for farming) stand the risk of encroachment by plantation development activities that should be avoided.

9.2 Recommendations for each value

Table 33: HCV management recommendations

Value identified	Threats	Management prescriptions/activities/design	Monitoring recommendations
1 3 HCS patches	- Encroachment into forest reserves / conversion to farmland / habitat loss - Hunting - Plantation agrochemical use / pollution of the swamp and buffers.	- Plantation boundaries particularly where bordering the existing Ekiadolor forest reserve (to the north and east) and around HCS forest patches should be properly demarcated and visibly maintained always (Fig 53). - Retain large trees within the PDA during land preparation to provide for the wide foraging ranges of birds that are expected to utilize habitats scattered within and beyond the PDA.	- Periodic surveys on occurrence and distribution of species including those of conservation importance (see table 32 – HCV 1 species). - Regular monitoring of human activities including hunting and farming in the set-aside patches. - Joint review (including relevant state agencies and

	• Sedimentation risk to swamps/waterways • Charcoal production / vegetation burning • Firewood collection •	• Swamps should be protected from encroachment by farming or plantation development as well as protected from pollutants from plantation activities (Fig 53 and 54). • Protection of those areas that have been set aside is critical. ARPN should explore options to adequately involve relevant state agencies including the Forestry Department and fringe communities in efforts to prevent encroachment into the set-aside areas in the north (Osse river area) and south (Ovia river area) of the PDA forest reserves particularly areas where PDA and forest reserve overlap or share boundaries. • The company should take direct responsibility for management and monitoring of swamps within the PDA (Fig 54) as well as explore measures to work with other stakeholders including local authorities and communities to maintain and or enhance the integrity of wetland/swamps outside the PDA. • Furthermore, company should take further action to identify and conduct participatory mapping of any additional swamps that occur in the PDA. • SOPs should be established for managing HCV 1 species including the threatened bird species and swamps. • Avoid application of agrochemicals within the swamp site buffer zones (Fig 54). • Erection of no hunting (of protected species) or illegal logging signposts within and around the forest patches (Fig 53 and 54) and sensitization of communities of the ecological, biodiversity and livelihood importance of swamps. • Existing or new roads leading to the HCS forest should be close or have restricted access to prevent illegal activities such as logging, hunting, farming etc within the HCS forest (Fig 53 and 54).	community representatives) of the effectiveness of SOPs at least bi-annually. • Positive outcomes from regular monitoring effort should be innovatively linked to a reward system that addresses the needs of local communities. • Periodic monitoring (e.g. weekly) of the HCS boundaries during the land clearing operation to avoid accidental HCS forest conversion; • No burning during land preparation which should be monitored once or twice a week during land clearing operations; • Engage with communities and sensitize them on the importance of the HCS forest identified for the good of people and environment. This could be done through development of trainings which should be periodic and cover various topics aligned with conservation and best management practices as well as the benefits for people and environment; • Monitor HCS patch boundaries through patrol at least once in a month;
4, 5	• Farming and land preparation.	• Prepare SOPs that recognise all set-aside areas including riparian buffers, watersheds and swamp sites and ensure those areas are precluded from conversion and development activities.	• Regular monitoring of riparian buffers and watersheds. • Review of effectiveness of related SOPs at least yearly

	• Pollution from agrochemical use. • Conversion of slope vegetation	• Establish buffers for the parts of the Ovia River that overlap the PDA in the south using the recommended buffer widths in Section 7.2.4, dependent on the size of the river/stream (Fig 55 and 56). • Identify and map any remaining riparian buffers in the PDA, applying the recommended buffers in Section 7.2.4. • All other riparian reserve areas identified must be precluded from conversion activities. Note that only the parts of the Ovia River overlapping with the southern boundary of the PDA has been identified and mapped in this assessment and for which reason the HCV 4 and 5 maps are draft. • Avoid application of agrochemicals in riparian vegetation (Fig 55 and 56). • During plantation establishment and development (road planning and other related infrastructural development) it will be critical to consider waterways and their protection. Run-off of noxious pesticides and other chemicals must be avoided and controlled, and appropriate SOPs developed for chemical application and waste management. Appropriate buffers should be established along all waterways, including small streams including those identified in Fig 55 and 56. • Enrichment planting, using indigenous plant species, should be considered as an option to rehabilitate all degraded riparian buffers. • While no slopes have been identified as HCV 4, erosion risks particularly of slopes of moderate to high gradient (particularly between 9-25 degrees) should be addressed by implementing protection measures such as terracing, platforms and cover crops.	
5	• Plantation agrochemical use / pollution. •	• Buffering of all rivers and streams. Set-aside recommended buffers on each side of all streams flowing within and adjacent the PDA (Fig 56). • Avoid application of agrochemicals in riparian (Fig 56).	• Regular sampling from rivers and streams for testing, including water quality monitoring system using the "before-after control-impact design model".
6	• Conversion during plantation development.	• Establish, maintain and secure buffers around all shrines occurring within/on the boundary of the plantation (Figure 57). Particularly, the Odighinebo and Ilaho	• Regular review meetings with community representatives to check

	Encroachment / desecration by workers	shrines (at Odighi on the south-eastern boundary) and Aiwor shrine(at Igolo on the north-western boundary). - Sensitize workers and all visitors to the plantation on the presence and location of sacred sites within and adjacent to the plantation. - Ensure no part of company operations impedes on this HCV through access routes or other means. - Identify and/or map any shrines or sacred areas that has not been mapped, in consultation with affected communities.	effectiveness of management measures. Consult communities on status of sacred sites over time.
Community use areas	Development for palm	- Free areas as recognised by the State government and relevant agencies should be respected and plantation activities should not extend to these areas (Fig 59). - M&M plans to be developed by the company should indicate whether and how the above maps are to be used in community-based monitoring, and how they will be updated.	Periodic monitoring of the boundaries of HCS areas as well as delineated 'free areas' in collaboration with local communities and relevant local authorities.

9.3 Cross-cutting recommendations

Secure community livelihoods

ARNP must work proactively with the Ministry of Agric and communities to secure alternative farmlands (as intended in the delineation of 'free areas' or areas potentially available to farming) and/or guarantee support to communities through alternative livelihoods programmes under a robust CSR programme.

Strengthen community engagement

The FPIC process was ongoing at the time of the assessment. Since the completion of the fieldwork, the company has shared evidence of FPIC from all affected communities, demonstrating completion of the compensation process and wide acceptance of the project. Subsequently, there is a need for ARPN to expand the scope of the agenda for community meetings to include discussion and participation in HCV-HCS management and monitoring.

Strengthen training and capacity building

GIS capability should be deployed for effective management and monitoring of HCV and HCS management areas with the objective to maintain and/or enhance all areas identified as such. The capacity to accurately capture geospatial data for subsequent analysis is crucially important, not least in the continued and effective monitoring of the status of HCV and HCS areas over time.

Develop SOPs for HCV management and monitoring

It is extremely important and considered best practice for general plantation operations to be 'check-listed' for easy reference by operational staff and field workers. Similarly, HCV and HCS area management and monitoring protocols should be developed in the form of checklists for active use by relevant field workers, after they have received adequate training.

Employ adaptive management approaches

Adaptive management entails several turns of the wheel of planning, implementing and monitoring. It is extremely important that results of monitoring of management actions to maintain and/or enhance HCVs and HCSs and their respective management areas are incorporated into on-going planning and implementation strategies. In other words, where monitoring results suggest that the HCV value is diminishing, then strategies should be revised (in collaboration with communities) with a view to securing better results. Regular monitoring and review is therefore crucial in the management of all HCVs and HCS areas.

9.4 Summary map of values and HCV-HCS management area maps

A summary of HCV-HCS areas is presented in Table 36 and a synthesis map in Figure 58.

Table 34: Summary of identified values in the PDA and wider landscape

HCV Ref	Description	HCV area (ha)	Management Area (ha)
1	Species ²⁰ in forest patches / swamps/wetlands	<u>4,058.9</u>	<u>5,107.8</u>
	Species ²¹ in riparian buffers	<u>13.6</u>	<u>13.6</u>
3	Forest patches / Swamps/wetlands	<u>4,058.9</u>	<u>5,107.8</u>
4	Riparian buffers	13.6	13.6
5	Riparian buffers	13.6	13.6
	Water supply points	6.5	6.5
6	Shrines	<u>0.06</u>	<u>0.06</u>
	HCS forest	<u>4,058.9</u>	<u>5,107.8</u>

²⁰ See Table 33

²¹ See Table 33

Local people's lands ²²	Area designated as 'free land' for farming	(33,587.04 ha) ²³	N.A
Gross HCVMA (with overlaps unaccounted for)		10,262.96	
Net HCVMA (with overlaps accounted for)		5,107.8	

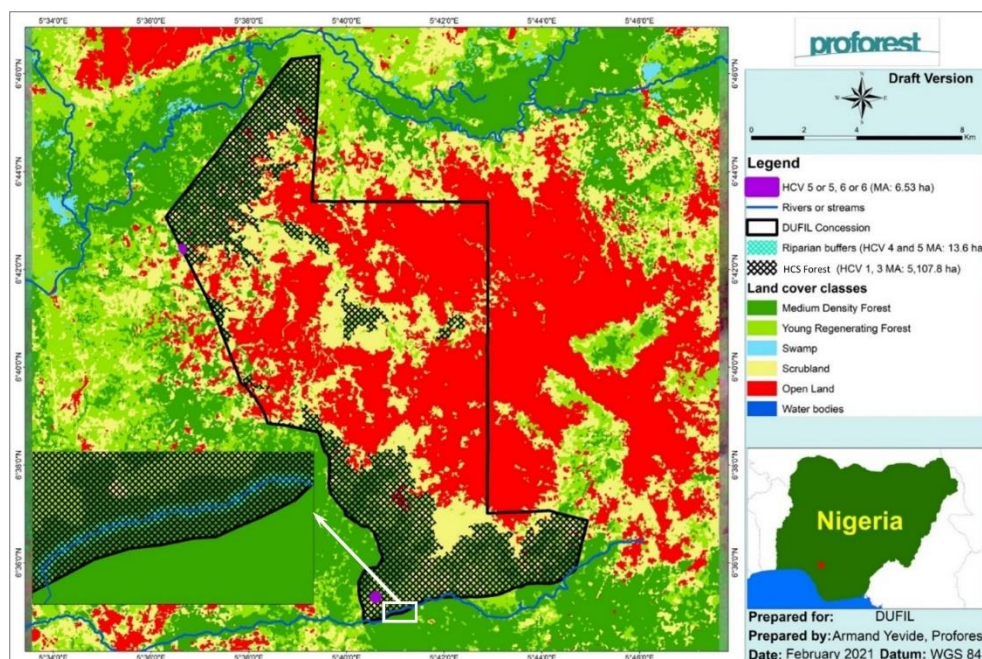


Figure 58: Composite HCV management area map showing all HCVMA and HCS forest

The proposed 'free areas' or areas available to meet current and future livelihoods and food security includes existing farmlands in and around the various communities, the 3 km buffer extending from the boundary of the reserve, excluding HCS forest patches (ca. 15,098 ha) and, parts of the remainder portions of the reserve (also excluding HCS forest patches) are shown Figure 59.

²² This represents areas designated as 'free areas' outside the PDA and comprises the portions of the Ekiadolor forest reserve set aside for Taungya farming (10,749.52 ha) and a 3 km buffer from the reserve boundary (22, 837.52), totaling 33,587.04 ha

²³ The net area after excluding HCS forest patches is 15,096.29 ha as shown in Figure 56



Final consultation at Odighi

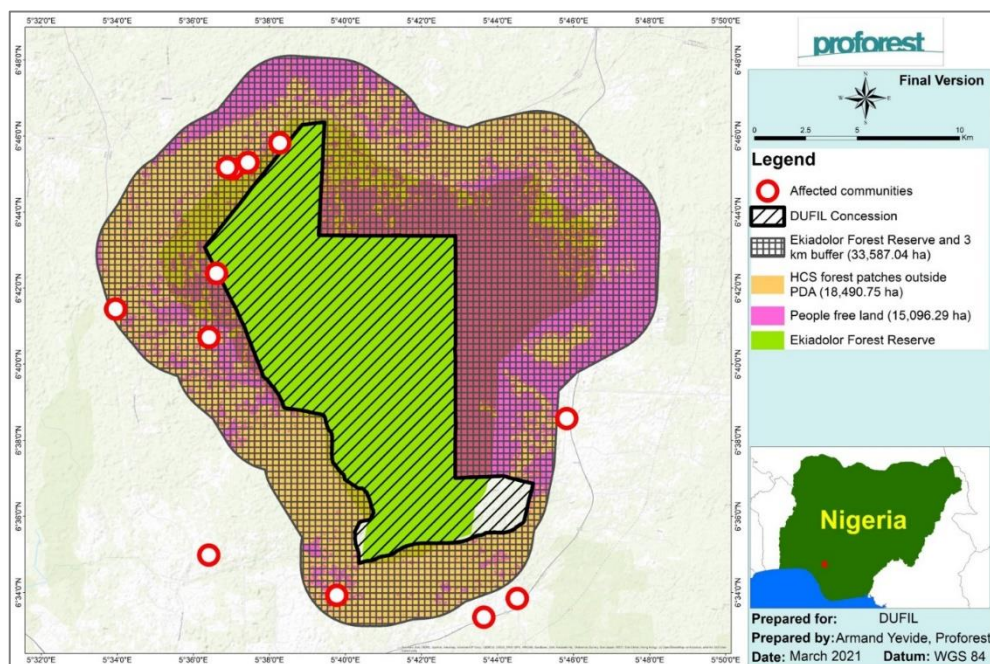


Figure 59: Map showing the extent of the indicative 'free areas' forming part of the areas to meet current and future land needs of communities

10 Final consultation

The final stakeholder consultations were organised at both the community and State levels.

Community-level consultation

Process

For practical purposes, the community-level meetings were held in 3 locations on the 4th and 5th of September 2019, to which representatives from all communities were invited. Representatives from 8 out of 13 communities turned up (Box 1).

Box 1: Final consultations participating communities²⁴

Venue 1: Iguoghor	Venue 2: Agekpanu	Venue 3: Odighi
Igolo	Ugboke	Odighi
	Oshodin 1&2	Aihuobabekun
	Abunwenre	Idunmwengie
	Okokodo	



Final consultation at Iguoghor

²⁴ Lists of participants is provided in Annex

NB: Representatives from Osasinwonmba, Igbekue, Ekonobore, Eko-Ekpetin and Ariyan were unable to attend and the team was unable to go to these communities due to unmotorable conditions. However, all 5 communities are under the paramount chieftaincy of the Enogie of Iguoghor, who was present with some of his council at the meeting at Iguoghor.

Discussion and outcomes

Some of the salient points²⁵ discussed during the meetings were:

Current and future land needs / free areas

The extent of 'free area' to be delineated for the use of affected communities was discussed and clarified. It was reiterated that the 'free area' will comprise existing farmlands and a 3 km buffer from the boundaries of the Ekiadolor forest reserve as well as the portion of the reserve not de-reserved, but which will be placed under a Taungya scheme, under the management and coordination of the Ministry of Agric.

HCV identification, management and monitoring

HCVs 1 and 3

Identified RTE species and ecosystems concluded to constitute HCV 1 was communicated to participants and management and monitoring recommendations were discussed. It was clarified that there is an overlap in the extent of HCV 1 and 3 management areas as well as HCS forest areas.

HCVs 4 and 5

The responsibility of the company to identify and map all streams and rivers within the PDA as well as establish and maintain the recommended buffers was reiterated and supported. There was affirmation that NTFPs were distributed across the landscape, and not concentrated in any particular places, and therefore generally agreed that HCV 5 was absent in the PDA.

HCV 6

It was confirmed that cemeteries are not commonplace in the landscape and indeed, that no community cemeteries existed in the landscape. Rather, most people travelled to bury their dead in their home towns and few buried their dead in their homes. and that none of the few in existence are present in the PDA. On the contrary, the landscape is scattered with shrines and sacred sites which should be protected from plantation development activities. A draft map of shrines in the immediate landscape was shown to participants to validate their relative locations.



Final consultation at Agekpanu

²⁵ These were issues discussed in all 3 meetings

Compensation and FPIC

It was confirmed that most farmers had been fully compensated and that all affected communities will express their satisfaction in this regard in writing and by so doing document their acceptance of the project. It was also affirmed that since the fieldwork, there is a much improved awareness of the planned project including knowledge of the boundaries and the estimated extent of the proposed “free area”.

Questions, confirmations and clarifications

- Will a copy of the report be shared with communities?
 - **Response:** The full HCV-HCS report will be shared with ARPN, and a public summary will be published on the HCVRN website. Due to challenges with access, ARPN can print and share this version with each community. ARPN will also be engaging actively will affected communities in the management and monitoring of HCV values.
- What is the guarantee that the Ministry will not give out the remainder of the Ekiadolor forest reserve to another company²⁶?
 - **Response:** The team cannot guarantee that but the Ministry has indicated that, it is committed to making sure that the Taungya scheme is successful this time and therefore ensuring that the forest cover is ultimately restored²⁷.
- Want MoU with ARPN on CSR including providing jobs for locals to augment access to free area. Envisaged that free area would prove insufficient in the long-term²⁸.
- HCVMA for shrines should not be more than 20ft radius for those within or adjacent PDAs²⁹.
- No cemeteries but mainly individual cemeteries in houses. Dominant practice is for people to be buried ‘home’³⁰.

State-level consultations

The State level consultation took place on the 6th of September at the Government Secretariat. Individual engagements (phone interviews) were also had with those invited to the event but who could not attend including NGO representatives (NCF and ERA). Draft outcomes from the assessment were presented and discussed during the final consultation meetings. Justification for the identified HCVs and proposed management areas were presented to participants. The extent of HCVMA was discussed and comments from participants incorporated in the revision of some of the areas.

²⁶ This was raised at the meeting at Akekpanu

²⁷ The assessment team is aware that under the intention of HCSA, the company needs to go further and following HCSA, need to minimize unintended consequences for community livelihood and “go beyond” to safeguard livelihoods by working proactively with the Ministry of Agric. Therefore, we have provided strong recommendations in this regard, including the cross-cutting recommendations as well as in the next steps.

²⁸ This was raised at the meeting at Odighi

²⁹ Discussed at all 3 meetings

³⁰ Discussed at all 3 meetings



Final consultation at Iguoghor

Group consultation (government stakeholders)³¹

Name	Title/role of spokesperson	Organisation	Place & date
Godwin Okonofa	Permanent Secretary	Edo State Government	Edo State Government
P. I. Obazee	DAS	Edo State Government	Secretariat
Peter Aikhuomobhogbe	Programme Manager	Agric Support Programme	6 th September 2019
Sunday Ehunmwonsere	Director	Agric Service	
F. Ehimare	Director Fisheries	Agric Service	
Dr. Ihevbie Eric	SPC Fadama	Edo State Govt	
Dr. T. A. Hanna	Dir Vet Service		
Mrs. K. I. Egiebor	G.M T.C.U		
David Ogunbor	Asst Dir Agric	Min of Agric	
Lucky Ehioaun	Dir Communal farms		

Consultation method:

Key concerns/questions and recommendations:

1. Why the difference in PDA size?
2. What is the difference between main and sub-plots forest inventory and how many plots were there?
3. What are the next steps?
4. Does it mean without RSPO approval, ARPN cannot start operations on the land?
5. What's the acceptable gradient for slopes?
6. Do HCVs include fauna?
7. Is it that you have discovered a species believed to be extinct in the PDA?
8. Any aquatic study?

Additional clarifying comments:

- No cemeteries but mainly individual cemeteries in houses. Dominant practice is for people to be buried 'home'
- Confirmed that historically, free areas are areas made available to fringe communities for their livelihoods. Boundaries not precisely defined and pillared but stretches about 3 km from the FR boundary.

³¹ List of participants is provided in Annex

Assessment team's response:

1. The map of the PDA used in the HCV-HCS assessment is that contained in the Certificate of Occupancy, which is the legal lease title covering the allocation to ARPN and which defines the legal limits of the PDA.
2. The main difference lies in the kind of data collected. The main plot has a radius of about 12 m used to collect data on trees more than 10 cm dbh, while the sub-plot has a radius of about 5 m and targets trees above 5 cm dbh. There were 306 survey plots.
3. The inputs from the final round of consultations will be used to finalise the report which will be shared with ARPN for review. Upon adoption by ARPN, the report will be sent for quality review by the HCVRN. The final report will form part of the documents to be reviewed and approved by the RSPO before ARPN can start operations on the land.
4. As a company committed to achieving RSPO certification, ARPN has an obligation to adhere to RSPO requirements on developing new oil palm plantation.. This includes completing all required impact assessments including HCV-HCS and social and environmental impact assessment (in compliance to national laws) and getting approval from RSPO after demonstrating how it will incorporate the results of these assessment in responsible development of the oil palm development.
5. There are no national guidelines. However, the RSPO National Interpretation states that areas with slope gradient exceeding 25 degrees should be precluded from planting with oil palm and area with gradient between 9-25 degrees can be planted but subject to implementing appropriate management practices such as terracing, contouring, etc.
6. Yes, HCVs include both fauna and flora. In the case of this assessment, HCV 1 species include identified species of global and national conservation concern including the dwarf crocodile, tree pangolin, some species of monkey, duiker, bushbuck, among others. The full list of HCV one species was provided to the group.
7. It appears that the present status may be misleading. This discrepancy calls for an review of the status of biodiversity to reflect the current situation. This is because the last assessment, carried out in 2010 might be outdated and specifically states that field survey used for the report was limited. It is therefore likely that there was not adequate nationwide information on the two species for their assessment. The Putty-nosed Monkey and Red-cap Mangabay are recorded as extinct on the National Biodiversity List. However, we recorded presence of both species in four transects and interactions with local hunters indicate the presence of these species in the forest patches.

8. No aquatic studies have been conducted as part of the assessment.

In conclusion, there was general acceptance and support for the defined HCVMA and the HCV process. Participants called for ARPN to implement the recommendations in good faith.

Individual consultations

Name	Title/role of spokesperson	Organisation	Place & date
Godwin Ojo	Executive Director	ERA/FoE Nigeria	Phone interview 6 th September 2019
Consultation method: Phone interview			
Key concerns & recommendations			
1. That due process has been followed in acquiring the land 2. And that tenurial rights of farmers and communities are respected in the acquisition process 3. Compensation process is transparent and payments are fair and reflect market value 4. FPIC is respected and followed 5. Pollution prevention (particularly from POME and fertilizer use) should be a top priority for ARPN			
Assessment team's response			
1. The team could not confirm this but could assure that ARPN has a legal lease or approved Certificate of Occupancy 2. Area is de-reserved forest owned by government. Previous use by communities was subject to short-term leases by the Ministry of Agric to plant annual crops. Compensation to be paid for all crops. 3. Compensation process is managed by the Ministry of Agriculture working with an independent valuer. 4. To date FPIC has been followed and is ongoing in terms of the company's commitment to secure FPIC for all planned impact assessments and management of identified HCVs. 5. Company is committed to RSPO certification.			

Name	Title	Organisation/social group	Place & date
Joseph Onoja	Programme Director	NCF	Phone interview 13 th October 2019

Consultation method:

Phone interview

Key concerns & recommendations

1. Really concerned that Putty-nosed Monkey and Red-cap Mangabey remain in as Extinct in the National Biodiversity Report.
2. NCF is ready to be a partner in the management of the identified forest patches in the northern and southern parts of the reserve as is the case with Okomu.

Assessment team's response

1. Stakeholders in Nigeria should take this up with the relevant authorities to correct the error. The team has brought this to the attention of the Ministry.
2. That's a great idea which the ARPN should welcome. Part of our recommendations would be to encourage the company to involve relevant stakeholders including NGOs and communities in the management and monitoring of HCVs and HCS areas in the landscape.



Discussing results with women at Emah

11 Next steps

Immediate needs or activities to be conducted

The following activities should be completed by company as soon as possible:

- The maps of free area shown in the report are not final and are presented as indicative only. Maps must be refined and agreed through FPIC during the development of the proposed ICLUP. This is the company's responsibility to finalise in discussion with the Ministry of Agriculture if needed.
- ARPN should socialise the result of the HCV-HCS assessment with the representatives of the 5 communities that could not attend the final stakeholder consultation. These are: Osasinwonmba, Igbekue, Ekonobore, Eko-Ekpetin and Ariyan.
- The company (jointly with gov?) should also support as a minimum with training/awareness raising to minimise risk of communities clearing forest in the wider landscape for new farmland?
- ARPN must work proactively with the Ministry of Agric and communities to secure alternative farmlands (as intended in the delineation of 'free areas' or areas potentially available to farming) and/or guarantee support to communities through alternative livelihoods programmes under a robust CSR programme.

Status of maps

Finalisation of maps

Explanation has been provided where maps occur as draft versions. The company should ensure that draft maps are finalised prior to the development of the ICLUP by following the specific recommendation provided to finalise each map labelled as draft. For the HCV 4 map, the company should therefore ensure that all streams encountered during land preparation are mapped or that it obtains an accurate recent shapefile of waterbodies in the PDA and use these to update and finalise the (draft) HCV map, applying the same buffer width recommendations as indicated.

Similarly, the HCV 3 map is labelled as draft because more swamps may occur in the PDA that have not been mapped and the company should ensure to map all swamps it encounters during plantation development.

Some shrines in 6 communities could not be mapped because the required rites could not be performed during the field work. The company should therefore work with these communities to map the shrines. It was indicated that all the shrines are within the communities, with none of them inside the PDA. The communities in question are indicated in the table below. It is challenging to show indicative locations of these shrines on the map as no hint was given about where they are located in the communities.

1	Ariyan	Osa shrine	1
2	Okokodo	Oposomi shrine	1
3	Igolo	Aiwor shrine	1
4	Eko-Ekpetin	Osagbaye shrine	1
5	Idunmwenhigie	Okhuoniyomo, Okhuo and Ulele shrines	3
6	Osasinwonmba	Ekpengbe shrine	1

For the map of the proposed 'free area' (Figure 58) – detailed mapping should be completed of the 'free areas' for an accurate representation of the limits. ARPN should jointly lead in this effort in consultation with affected communities (see section on next steps).

Status of FPIC at the end of the assessment

The only community that refused the right to be consulted and participate in this assessment is Okokhuo. At the time of the assessment, the community had taken the Ministry to court in respect of grievances related to the crop compensation. At the time of finalising this report, the company provided evidence that FPIC had been secured from Okokhuo and the court case was being settled out of court.

All other communities agreed to, and participated in the assessment. At the start of the fieldwork, the team learned that while all communities had been engaged about the project, there was some concern about the depth of engagement and adequacy of information provided. However, the company staff used the opportunity of the HCV-HCS assessment fieldwork to provide additional and adequate information about the project at the consultation meetings with each community. The assessment team also

complemented this by providing a background to the project and detailed information about the purpose, scope, methods and outputs of the assessment.

Status of progress on local people's future farming land needs

Delineation of the free area or local people's land

The maps of areas to be delineated as community land shown in the report are not final and are presented as indicative only.

- The company should work with the relevant state agencies and affected communities to identify, delineate and map out the exact limits of the 'free areas' and secure areas for community farming and other livelihoods as least equivalent to the areas lost, and without further forest clearance.

Status of outstanding potential 'Give and Take' that could implicate community lands

All HCS areas are within the PDA or de-reserved forest boundary. There is no situation of give and take that implicate areas designated for community use.

Risk or unresolved issues that need to be addressed

- Demarcation and participatory mapping of the 'free areas'.

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Annexes

Required Annexes

Annex 1: Curriculum vitae for each team member

Nana Darko Cobbina

Position: Projects / Consultancy Director

Qualifications: MSc. Environmental Resources Management, October 2011

College of Engineering, Kwame Nkrumah University of Science & Technology (K.N.U.S.T), Kumasi, Ghana BSc. Natural Resources Management (Forestry), July 2003

Institute of Renewable Natural Resources, K.N.U.S.T; ISO QMS Lead Auditor (Certificate No. 76855/14/02/02); FSC Forest Management & Chain of Custody Lead Auditor

RSPO Lead Auditor (Certificate No. 2013-RSPOLA-AFR-01-03); HCV Licensed Assessor (ALS15034NC)

Expertise / Experience: Nana Darko has fourteen years of experience working in the development and sustainability sectors, with a range of stakeholders. Works on a range of social and environmental sustainability projects in agriculture and forestry in Africa, providing support to key actors including producers to understand, implement and monitor the requirements of sustainability standards.

Has excellent understanding of the HCV concept and considerable experience in leading HCV assessments in West, East and Central Africa including Ghana, Liberia, Sierra Leone, Cameroon, Uganda and Nigeria.

Has considerable certification experience in both the forestry (FSC) and palm oil (RSPO) sectors, with good understanding of certification systems, processes and requirements. Since 2013 at Proforest, provided step-wise support to oil palm growers committed to achieving RSPO certification in Ghana and Nigeria including carrying out gap assessments and providing active support to implement certification action plans.

Previously worked on several environmental governance and conservation projects at Friends of the Earth-Ghana (including support to WWF's Global Forest & Trade Network implementation in Ghana), Christian Aid and Care International, where he managed and led the implementation of the USAID-funded Trans-Boundary Area Natural Resources Initiative – between Ghana and Cote d'Ivoire – working extensively with diverse stakeholders in both countries at the national and sub-national levels.

Abraham Baffoe

Position: Africa Regional Director

Qualifications: MSc (Forestry and Environmental Economics); Louisiana State University, Baton Rouge, USA. 2008-2009. Postgraduate Certificate. Natural Resources Management Economics; Wageningen University and Agricultural Centre, Netherlands, 2001. BSc Hons. Forestry. Kwame Nkrumah University of Science and Technology, Kumasi, Ghana. 1996.

Expertise: Forest ecology, biodiversity conservation, social forestry and hydrology. Over 21 years extensive experience and knowledge on forest ecology, species identification and forest hydrology. Decades of experience working with local pARPNations on sustainable management and use of community natural resources. Has worked with HCVs since 2001, including leading tens of HCV assessments for forestry and agricultural commodity production companies in many countries Africa including Ghana, Liberia, Gabon, Nigeria, Zambia, Ethiopia and Ethiopia. Have also provided several HCV trainings since 2005 and a facilitator and co-author of the Ghana National Interpretation of the HCV Toolkit in 2006.

Dr. Emmanuel Danquah

Current position: Head of Department and Senior Lecturer/Ecologist at the Department of Wildlife and Range Management, FRNR, KNUST

Qualifications: PhD (Wildlife and Range Management), KNUST, Ghana 2012

MPhil (Wildlife and Range Management), KNUST, Ghana 2003

BSc Hons. (Zoology; Dip Education), UCC, Ghana 1997.

Expertise: Interdisciplinary background with extensive experience in biodiversity assessments in HCVs and natural resources management since 2005. Focal project countries in Africa are Ghana, Cote d'Ivoire, Burkina Faso, Togo, Liberia, Guinea, Sierra Leone, Senegal, Gambia, Nigeria, Cameroun, Kenya and Nigeria. Recent areas of research include biodiversity monitoring in HCV assessments of oil palm, rubber and teak plantations.

Dr. Adesoji Akinwumi Adeyemi Current position: Senior Lecturer, Department of Forestry and Wildlife Technology, Federal University of Technology, Owerri, Nigeria Qualifications: PhD (Forest Resources Management), University of Ibadan, Nigeria MSc (Forest Biometrics and Remote Sensing), University of Ibadan, Nigeria BSc (Forest Resources Management), University of Ibadan, Nigeria Expertise: Dr Adeyemi has extensive experience in Forest Inventory and Biometrics with competences in Forest Mensuration and Measurement, Botanical Survey and Species Identification, Forest Ecology, Biodiversity Assessment and Monitoring, Fauna Survey, Wildlife Population Analysis, Conservation, Forest Management, Remote Sensing/GIS, and a PhD in Forest Resources Management.

S. Afolabi Kumoye Current position: Freelance consultancy. January 2012 to date. Qualifications: MAF. Master of Science in Agroforestry, (2008 – 2011). B.Sc. (Hons) Forestry Management, 2004. University of Ibadan (1997 - 2004).

Expertise: Forest assessment and management. Experience: Kumoye has several years of experience working as freelance consultant in forestry and forest management, in affiliation with the Faculty of Renewable Natural Resources, University of Ibadan. He is specialized in ethnobotany, agroforestry, seedling production, fruit trees management in agroforestry, tree crop production and plant taxonomy across Nigeria. with the Cross-River State Forestry Commission (CRSFC).

Dr. Armand Yevide Sedami

Current Position: Project Manager, Proforest Ghana since July 2015.

Qualification: PhD (Natural Resources Management), University of Abomey-Calavi, Benin, Oct 2011. MSc. (Natural Resources Management), University of Abomey-Calavi, Benin, February 2009. BSc (Agronomic Engineering/Natural Resources Management (Water and Forests, Fishing and Wildlife), University of Abomey-Calavi, Benin, December 2007. General Agronomy Certificate, University of Abomey-Calavi, Benin, July 2006.

Expertise: Outstanding knowledge in Natural Resources Management with special focus on Forestry and Agroforestry. Armand's background is in agronomy, natural resources management especially ecology, forestry and agroforestry, in species distribution modelling under climate change scenarios, in long-term ecosystem monitoring, and in social network analysis. He has worked as consultant on the dynamic of cash crop chains (Cashew, Sugar cane, Pineapple and Tabaco) in Benin. Additionally, he has more than 5 years of experience teaching undergraduate students in many private and public universities in Benin.

Dr Augustus Asamoah, Principal Project Manager

Current position: Principal Project Manager, Proforest Africa Regional Office

Qualifications: PhD (Biodiversity Studies), Univ. of Ghana, Legon. Ghana 2011.

MRes (Ecology and Environmental Management), University of York, UK, (2002).

BSc (Wildlife and Range Management), KNUST, Ghana 1997.

Expertise: A conservation ecologist with over sixteen years of professional experience in natural resources and environment management with specific expertise in forest management, conservation planning and assessment of high conservation value (HCV), ornithology, habitat appraisal and project management.

Augustus has been working on community based natural resources management concepts such as CREMA and also has a good working knowledge REDD+ concepts and a certified RSPO High Conservation Value (HCV) Assessor with HCV assessment experience in Ghana, Cameroon and Liberia.

Helena Tettey

Current Position: Assistant Project Manager

Qualifications: MSc. Environmental Science

University of Ghana, Legon (2009-2011)

BSc Natural Resources Management (Fisheries and Watershed Management).

Kwame Nkrumah University of Science & Technology, Ghana (2004-2008)

Expertise: Prior to joining Proforest, Helena spent five years of her early career actively engaging with industries (mining, manufacturing, hospitality, energy) and conducting assessments on impacts of their operations on local communities and the biophysical environment as part of the Environmental Impact Assessment and legal compliance with the Environmental Protection Agency of Ghana. Her specialisation and experience in the

natural resource management sector includes community engagements, water quality sampling and analysis, and solid waste management, which ultimately led to the publication of research papers. She actively served on several technical and statutory planning committees to review and make decisions on proposed developmental applications in the Region.

Helena is now based in Proforest Africa Regional Office in Accra as an Assistant Project Manager supporting the implementation of projects and programmes, and doubles as the Gender Focal Point and the lead person responsible for implementing smallholder strategy in the region. Her role includes working with stakeholders in the region to create an enabling environment for increased implementation of sustainability requirements and providing direct technical support for oil palm growers to meet certification requirements. She has undertaken a number of field assessments including RSPO baseline, SIA and HCV assessments in both forestry and agricultural sectors in East and West Africa, and provides operational support to TFA 2020 APOI, and Africa Legality as part of Proforest's ongoing Africa Responsible Sourcing and Production programme.

John Amonoo

Current Position: Senior Project Manager

Qualifications: M.Sc. Agroforestry, KNUST, Kumasi, Ghana

Post Grad. Cert., NGO Management, GIMPA, Achimota, Ghana

Cert., Tropical Forest Ecology, KNUST, Kumasi, Ghana

B.Sc. (Hons.) Natural Resources Management, KNUST, Kumasi, Ghana

Expertise / Experience: Community mobilization, participatory mapping, social forestry.

A natural resource management professional with expertise in project development, capacity building, technical aspects of natural resource management and facilitation of multi-stakeholder linkages. John has been involved in project design and development. He has designed and facilitated capacity building programmes for over a thousand beneficiaries. He has also assisted community groups to adapt to climate change by helping them engage in sustainable income generating livelihood activities such as forest plantation, agroforestry, bamboo plantation, charcoal production, sustainable cocoa farming, grass-cutter rearing, and bee-keeping.

James Olabi Odey – James is a PhD. Candidate (Geography) and holds a Master's degree in Geography of Forest Ecology from the University of Calabar, Cross River States, Nigeria as well as Bachelor's degree in Geography and Environmental Science. He has completed certificate courses in development, livelihoods and markets. He is currently the Project Manager, Entrepreneurship and value chain development, at Cuso International, Nigeria. He previously worked with the African Research Association of Nigeria and carried out several social studies (and co-authored several publications on strengthening rural communities and rural food security). He has extensive community experience and has provided support to men, women and community opinion leaders in about 30 communities in Cross Rivers State in community forestry, alternative livelihoods, conflict management and community-based developmental planning.

As a social sustainability expert, he conducted field assessments with local communities and plantation workers in a number of certification baseline assessments for oil palm

companies in Nigeria, conducting analyses and compiling comprehensive reports. He has expertise in PRA/PLA methodologies and has applied these extensively in most of his work.

Omere Abraham Esosa – Omere Abraham Esosa is a Researcher, Biochemist and a Crop Scientist (Biotechnology). He has a Bachelor of Science (B. Sc) Degree in Biochemistry, Master of Science (M.Sc) Degree in Crop Science (Biotechnology Option) and is currently a Doctorate student in Crop Science (Biotechnology) in the Department of Crop Science, Faculty of Agriculture, University of Benin, Edo State, Nigeria.

Omere has worked with numerous Development Agencies notably Market Development in Niger Delta (MADE) and Partnership Initiative in the Niger Delta (PIND) as a Field Research Officer. His research is geared towards improving the Livelihoods of Local Farmers in Rural Communities and also enhancing the various species of staples grown by the farmers. He was a Lead Community facilitator during the ARPN's Social Impact Assessment.

Kenechukwu Nwandu – He is a graduate of the University of Benin, Benin City with an (LL.b Hons) Degree and the Nigerian Law School with a (B.L). He is a Legal Practitioner with experience in criminal and civil litigation. Kenechukwu specializes in administrative technology and has an up to date knowledge of Microsoft office. Kenechukwu is inspired daily by a very supportive family. In his free time he loves to delve into sports and all works of life."

During the ARPN's Social Impact Assessment, he was a community facilitator and provided the SIA team with legal advice on community consent procedures and engagement.

Osaretin Idele – an indigene and resident of Odighi community and has extensive local and spatial knowledge of the landscape including Odighi and surrounding communities. A member of the Ministry of Agriculture local participatory mapping team that supported the farm identification, survey and demarcation processes as part of the crop compensation process.

Vincent Omoegbee Idehen – an indigene and resident of Odighi community and has extensive local and spatial knowledge of the landscape including Odighi and surrounding communities. A member of the Ministry of Agriculture local participatory mapping team that supported the farm identification, survey and demarcation processes as part of the crop compensation process.

Osayamen Orihionkpaiyo – an indigene and resident of Odighi community and has extensive local and spatial knowledge of the landscape including Odighi and surrounding communities. A member of the Ministry of Agriculture local participatory mapping team that supported the farm identification, survey and demarcation processes as part of the crop compensation process.

Annex 2: Stakeholder and community engagement during the field work

Name of Individual / Group / Community	Date	Attendance	Summary of key issues/comments/questions	Assessor response
Edo State Government Secretariat Ministry of Agric Ministry of Environment Forestry Department Ovia North East LGA	6 th June 2019	Okonofua Godwin (Permanent Secretary) Bashiru S. Kadiri (Outgoing P.S) Tony Imafidon (Asst Director Forestry) M.I. Anogie (Director of Agric Services)	The Land Use Decree (1978) abolished all pre-existing free hold systems and vested urban and non-urban land in the State Governors and Local Governments respectively. Ekiadolor FR gazetted in 2017 and since then three stakeholder meetings have been held by the Ministry of Agric to discuss plans for the area including agricultural development. Allocation of the area to ARPN was followed by a farm survey to inform compensation payment to persons with farms in the proposed development area. Enumeration was done in 2014/15 by Min of Agric and Lands Department. Ministry of Agric undertook to work with ARPN on enumeration and compensation. Enumeration done between 2014-16 and verification and reporting done in 2016. In 2019 payment made and completed except few persons left. There's been challenge with grievances but generally okay. Concerns on gap between enumeration and payment. Estate valuer tried to instigate people. Some communities in the northern and eastern part (Odighi) of the PDA originally part of the FR but lands have been left for them by government. Size of FR is 24,946.34 ha out of which 14 928 ha has been de-reserved and allocated to ARPN. The remainder 10, 749 ha is part of the 'free area' available under Taungya farming to fringe communities. This is in addition to the 3 km buffer around the current limits of the reserve, and together with the area under Taungya, intended to meet the current and future farming needs of the communities (about 14 of them). There are some camps within the FR comprising of temporary residents from neighbouring villages who have moved closer to their farms. Only farms and not these temporary structures are covered by the valuation and compensation process. The State Government requires every large-scale commodity Agric investor to have CSR with the communities and implement an outgrower system.	The team picked up several reports of dissatisfaction with the enumeration and compensation process. Several communities reported that not all affected farmers have received compensation and some farms were even yet to be enumerated. The Ministry on the other hand, maintained that the process is completed and that it has a detailed written record of the process covering all affected farms. It further explained that, there appears to be an misconception that farms irrespective of whether or not they would be affected by the proposed development should qualify for compensation, noting that this has been severally explained but appears to still be misunderstood. The team advised ARPN management to take additional steps to clarify any such misunderstanding, and brought this up for discussion during the public meetings. While 14 communities were mentioned, a total of 20 communities were consulted. Explained to the group that, as much as practical all communities in the immediate landscape and/or using resources from the PDA were selected for consultations as part of this HCV-HCS assessment.
Principal Agric Officer		David Ogunbor	Government owns all land and free areas provided for nearby communities to farm. 100% compensation by ARPN comprising 2,050 farmers affected. 2039 collected their certificate of completion of crop enumeration and have been paid compensation (as contained in enumeration	The team informed him about widespread complaints of an incomplete process in the communities. He maintained that this could be due to a lack of

			certificate report). 11 outstanding but processing completed and awaiting payment.	understanding that only affected farms have been considered.
Consultant Surveyor		Henry Oriakhi	Total leased land size for the project as in CoFo is 17,981 ha but after computation of CoFo survey plan that was provided got 14,928 ha. Now about to begin process of participatory beaconing of the entire plot in consultation with Forestry and fringe communities. Plan is to 'cut out' what is contained in CoFo and expand if there is more land available. Government is considering opening up the buffer as part of the free area.	The team informed him that per our computation from shapefiles made available by ARPN, the total land size of 14, 906.70 ha, and that the assessment is in respect of this defined area. Any additional areas to be acquired by ARPN will be subject to a separate HCV-HCS assessment, as they would be covered by a different land title.
HoD Agric Department		Bright Umweni	Department has a community-phasing role, fostering improved relationship between company and community. Ministry has played a lead role in the engagement with ARPN thus far, with the department being involved only to a limited extent. Previously, we have engaged communities/farmers on how the Taungya is working.	No comment.
Nigeria Conservation Foundation		Joseph Onoja (Programme Director)	NCF's activities in Edo State has been limited to being an implementation partner to the Okomu National Park Project, where most of its community engagement work has happened in the past. No studies undertaken in the Aol but believes HCVs are likely to occur in the landscape. This may not only be limited to social HCVs but even some animal species that may occur in the patches of forest in the landscape. Particularly interested to know which HCV 1 species are identified from the bio-surveys and concerned about the likelihood of shortage of land for farming as a result of the planned development.	Promised to share the draft findings and access to the public summary report. Explained that part of the assessment process is to address the question of current and future land needs of affected communities and that the outcome from this consultative process will be captured in the final report.
Environmental Rights Action		Mrs. Obaseki (Administrator) Godwin Ojo (Executive Director)	ERA (or Friends of the Earth – Nigeria) has been active in the Niger Delta Region for many years and have undertaken extensive community work in many communities in the Edo State, advocating and protecting local communities' rights to FPIC and amplifying related grievances. Aware that most of these areas proposed for oil palm development are currently being farmed and therefore concerned about the livelihoods impact and food security needs of affected communities. Area likely to contain all HCV categories so rigorous methods should be applied to identify them. Have heard reports that there are many issues with the enumeration and compensation process and not sure how these grievances and being addressed by the company.	Explained that that there is a deliberate process, as part of this assessment, to understand and address current and future land needs of local communities. Also explained that the HCV-HCS identification process is rigorous and combines evidence from multiple sources including primary and secondary data and stakeholder consultations to identify these values. Noted his concern to follow-up the progress with the compensation process in the affected communities.
HRH Omokharo	3/6/19	Enogie	Together with the Enogie of Odighi, paramount chiefs of the entire area under whom all the Odionwere's operate. The Odionwere and his 'cabinet' comprise the 2 nd , 3 rd , 4 th in command called the Edion-nene form the highest decision-making body – as part of a wider group of elders. These four	Informed that as part of the assessment, every effort will be made to identify and shrines and areas critical to the

			elders particularly lead sacrifices at the shrines and trade-religious festivities. Most of these shrines are in and around the communities and not many in the PDA. Knows the PDA very well and aware that it was part of the Ekiadolor FR. Any issue above them, taken to Enogie and escalated to Oba as necessary. Development is generally lacking in the area with bad roads, few schools and clinics and no pipe-borne water but electricity in most communities.	communities in meeting their livelihoods needs.
Odighi	3/6/19	74	A community of native and migrant/settler farmers, with a recent history of antagonistic relationship with nomadic herdsman whose cattle have frequently destroyed their farms. Community was informed by the Ministry and ARPN that settlement area will not be affected by the proposed development. According to them, several complaints with respect to the compensation process which is characterised by partial payments and lack of transparency in the government-led process. Sources of water include a borehole (for domestic activities), and a river (Obue river) that runs through the reserve for irrigation. Common species hunted include antelopes, bush pigs, grasscutters, buffalos, duikers, monkeys, squirrels. No community cemetery as most people bury their dead at home or in their home towns. There are no wetland areas for yam nor rice cultivation; fodder, construction material, medicinal plants obtained from the reserve are scattered everywhere in the surrounding areas. 4 shrines namely Ugheagbevbo shrine (for community protection and accessed anytime all year round), Efa shrine (celebrated every year for hunter's protection against danger, and in difficult times when catch is low), Odighinebo shrine (male shrine; husband of Ugheagbevbo shrine – protects community from oppression by strangers, Ilaho shrine (for hunters. visited once every 5 years for thanksgiving sacrifice and good harvest for the years head).	No comment.
Abumwenre	4/6/19	54	Community confirmed being sensitized about the project by a team from ARPN and the Ministry but indicated that they still are not well-informed about the proposed oil palm development. Worried about inadequate engagement process with regards to compensation issues, although some community members have received payments for loss of crops. Fear of losing farmlands and not having alternative land for farming outside the reserve. Exact areas acquired and affected farms are not yet known. Osa and Era streams serves as sources of water for domestic purposes (also shrines). During annual festivals (Iyogo festival), community gathers around these streams (sacred area) to pray for protection	Concern expressed about inadequate engagement has since been addressed by the ARPN and full consent obtained from the community as indicated in the consent letter attached. Explained that part of this assessment process is to ascertain the needs for current and future land areas and that the Ministry has indicated it is looking into this by making available more land from the un-dereserved areas of the FR in addition to the FR buffer which will extend 1 km from the boundary. They agreed that if this

			and long life. School at Iguohor. Clinic and market at Ekiadolor. There are no cemeteries.	is done, it will go a long way to meeting current and future farmland needs.
Ekonobore	3/6/19	86	Mostly settler farmers who are engaged in farming activities in and around the reserve. Ministry of Agriculture led the community sensitization about the project and the enumeration (excluding cocoa farms) process successfully with affected individuals and have since been compensated for the loss of crops. Have requested the Ministry to make available to them for farming, part of the areas not de-reserved and in the buffer. Concerned about the resulting reduction of areas for collection of NTFPs including medicinal plants, raffia palm fronds for making brooms, roofs, Oziza, Ogbolor, Okor, Bitter Cola, wild fruits, etc. Generally acknowledged though that these are invariably scattered in the surrounding areas and that there is not a particular location where any of these is concentrated and collected. Wildlife species commonly hunted are buffalos, antelopes, bush pigs, porcupine, grasscutter, deer and alligators. The Okhuo stream serves as a source of water for drinking and other domestic chores. Fishing in the Okhuo river is prohibited. Community visits Odudu shrine once every year (in February) to pray for abundant rainfall which is usually granted on the 7th day after prayers. No community cemetery. Questions/suggestions include; a) How long will it take for the oil palm plantation development to commence? b) Whether ARPN would strengthen their engagement process to provide communities with more information about the project? c) Whether farming will be allowed in other parts of the reserve since a big portion of the area leased to ARPN was under Taungya? d) Why communities cannot permanently own land to avoid the risk of having to give up farmlands anytime government wants to take back its land?	In response to questions asked: a) ARPN is committed to completing all impact assessments including this HCV-HCS assessment, ESIA, etc. and getting the requisite approvals before commencing land preparation. b) Assured that this concern will be transmitted to ARPN to strengthen its community engagement process. c) The Ministry has indicated that 'free areas' will be demarcated and made available to affected communities. d) The Landuse Decree (1978) places all land in the country in the hands of the government and allows grants usufruct rights to communities.
Ugboke	4/6/19	91	Main livelihoods are fishing (in the Ovia river) and farming (in and around the reserve). Expressed disappointment in the crop compensation process and claimed that, out of 120 affected farmers, only 18 had been compensated. They added that the compensation process had been fraught with irregularities, including incomplete enumeration and valuation process. Expressed concern that they could not negotiate the value of compensation to be paid and viewed the outcome as very top-down. They further claimed that the community had very little information about the process ARPN acquired the land for oil palm plantation development and that they neither knew the extent of the land nor the boundaries. Sources of animal protein include rabbit, bush pig, guinea fowl, porcupine and deer. Reported sightings of monkeys and Bongo. There are 3 rivers which also serves as shrines, and an earthen mound	Explained that ARPN has a valid CofO, which includes the legal limits of the PDA A copy of a map (including the area) of the PDA within the the Ekiadolor FR and the immediate landscape, with all the surrounding communities was shared at the public meeting. Participants confirmed that the map represented reality as they knew it. Assured that every effort will be made to map shrines and rivers and where not possible at this time, recommendations will be made to the company to identify

			shrine (Osun shrine) surrounded by 4 trees in the centre of the community. This shrine protects the community from attackers and oppressors. Ovia river; rituals are performed annually under a tree located by the river for bumper harvest of fish and to prevent drowning. Ezenuyormo river is main source of drinking water and for other domestic purposes. Osun shrine located in the centre of the community. Rituals are performed annually for long life and prosperity, female fertility. Ora river; for domestic activities. According to them, NTFPs are spread all over. Other concerns include; - Adequate engagement and sensitization required on the project - Will community have access to other land for farming.	and map these features in consultation with all affected communities. The following answers were provided to questions asked: - In addition to the general overview provided by the team, the company will intensify its sensitization efforts - Community will have access to free land to be demarcated by Min
Oshodin 1&2, Ariyan, Okokodo	4/6/19	34, 46, 12, 14 = 132	Predominantly settler farmers, with fishing as another source of livelihood activity. Heard about ARPN's intention to secure part of the reserve for oil palm plantation development, but there hasn't been any formal engagement with ARPN since the process of land acquisition begun. An official from the Ministry of Agriculture led the compensation process following enumeration and valuation of crops, but the process is incomplete. An initial concern about undervaluation led to rejection of compensation by most affected farmers. This has since been resolved but payments remain incomplete. Others were not available as at the time payments were being made. Other concerns/questions include; - Whether land in the proposed free area will be adequate to cater for the needs of all affected communities on the one hand, and whether, adequate land will be allocated to farmers under a renewed allocation scheme? - Why ARPN seems to have taken a backseat in engaging with the local communities, while the Ministry of Agriculture has been very active and appears to be leading the compensation process. Source of water is the Ovia river. Poles and palm fronds used as building materials are scattered all over, in addition to herbs for medical purposes. Hunting of bush pigs, squirrels, duikers, deer, etc. There are 3 shrines; Osa shrine (for yearly worship and sacrifice) for the people of Ariyan; Oposomi shrine (for community protection) for the people of Okokodo, and Iyantor shrine (deity that governs the traditional ethics of the individual communities), for Oshodin. No cemeteries in any of the villages – people bury in their homes or hometowns.	In response to questions: - The team will try to make a reasonable estimate of the adequacy of areas left to meet current and future land needs but the Ministry assures that land will be sufficient both at the community and individual farmer levels. - According to ARPN, they preferred to work closely with the Ministry since they had started the Taungya scheme and were deeply knowledgeable on all its aspects including participating communities and farmers.
Igolo	5/6/19	20	Farming and fishing and farming activities. Some learned about the project for the first time while attending a funeral in a nearby community. Later, an official from the Ministry of Agric later initiated discussions about the planned project and related compensation, but this remains incomplete, with reports of many farmers yet to be compensated. Have	Shrines were not accessible by the team because community demanded an amount of 75,000 naira to perform rituals before the site could be visited. The team indicated that the said shrine has

			received assurances from the Ministry that all affected farmers will be compensated. They are not well informed of progress and do not where to channel their concerns. Source of water for drinking (Aiwor river, also a shrine) is about 3 miles from the community. There are no swamps and community cemetery. Aiwor shrine for spiritual cleansing, male and female fertility issues, delayed and safe delivery. Hunting of bush pigs, deer, monkeys, duikers, bush rats, civets, monkeys, buffalo, snakes, deer and crocodiles etc.	been noted and part of the recommendations on the next steps to the company will be to, together with the community identify and map all features including HCVs that have not been mapped at the time of drafting the report.
Eko-Ekpetin	5/6/19	64	Settler farming community. Limited information about the project from Ministry of Agriculture although community very welcoming of ARPN's oil palm project as it is expected to bring employment opportunities and local development. Only 2 affected persons have received compensation out of the initial 17 people who were available for enumeration at the time. Concerns channeled through the official from the Agric Ministry but no feedback as to when compensations would be paid to all affected persons. Remaining free areas (less than an acre) woefully inadequate as an alternative land for farming and therefore request that communities have access to the available buffer to continue farming. NTFPs collected from the reserve include nuts, fruits, snails, mushrooms, which are also readily available outside the reserve area. One borehole and Okhuo river as source of drinking water. Osagbaye shrine is located around the banks of Okhuo river. The goddess is mostly worshiped by women for healing and childbirth. No fishing is allowed in the river. NTFP's including medicinal plants are scattered and could also be attained outside the reserve. Community has no cemetery. Antelopes and porcupines are the most common wildlife accessed from the forest reserve.	Noted, and indicated to look into concern that the proposed free area may be inadequate to meet the needs of all the communities. Added that, authoritative sources have indicated that the free area will now be expanded to include the remainder portion of the FR (under reservation) as well as an area extending 1 km from the FR boundary. Promised to get a sense of the estimated area to be allocated per community and clarify this as soon as possible.
Aihuobabekun	7/6/19	34	The community members aware of the proposed project. The community has had no direct interaction with ARPN but rather with the Ministry of Agriculture and Elaiho & Partners (Surveyors/Valuers). The community eagerly wants the project to proceed. They have farmlands located in the proposed area. The farms of those who are currently farming there have been enumerated and compensation has been received by majority of those affected. Those who have not received their compensation were absent at the time compensation was being paid. They have however been promised that they will be paid. Those who have old farms (i.e. cocoa tree crops) have neither been enumerated nor compensated. No reason was provided by the Ministry of Agriculture for excluding these. The sources of drinking water are two streams called the Okhuo and the Omozaye. Fishing	The Ministry clarified that tree crops have never been part of the crops for which compensation was paid and that this was made clear to the communities from the outset. This clarification was relayed during the final consultations to the satisfaction of all present. The shrines could not be visited by the team because the community demanded an amount of 75,000.00 Naira to perform rituals before they could be visited. The team indicated that the said shrine has been noted and part of the recommendations

			is only permitted in the Omozaye stream. There are marshy areas around the two streams. Common wildlife species that are hunted in the proposed area include rabbits, chimpanzees, guinea fowl, pangolins, antelopes, monkeys, buffalo, bush-pigs, boa constrictor, deer and crocodiles. Medicinal plants are scattered and not concentrated in one place. The community also obtains fuelwood, yam stakes, timber, bamboo and other construction materials including clay from the forest reserve. There is no community cemetery. The shrines are the Arue-Omozaye shrine (rituals are at the beginning of each planting season for bounty harvests, for cleansing, and in emergencies); the Okhuo shrine (rituals are performed as and when necessary for protection against external aggression). The community expect to have the following benefits from the proposed project: police station with a vehicle; hospital; access road; town-hall; permanent employment (not short-term employment contracts); contracts in construction, plantation, weeding and distribution; scholarships; honoraria for elderly members of the community; electricity; boreholes; a market and microfinance for the women. The community would also want ARPN to establish a transparent grievance mechanism.	on the next steps to the company will be to, together with the community identify and map all features including HCVs that have not been mapped at the time of drafting the report.
Idunmwenhigie	6/6/19	32	The community members became aware of the proposed project through the Ministry of Agriculture. They know that the proposed area is in the forest which has been de-reserved, but they do not know the actual boundaries. The community also does not know which crop will be planted. There are farmlands located in the proposed area. Their crops have been enumerated by the Ministry of Agriculture and compensation has been paid to all affected farmers. The Ministry indicated that a buffer area will be reserved for the community to use for farming. The community is eagerly expecting that the project should proceed since they hope it will provide them with employment and community development opportunities in the form of electricity, roads, health centre, boreholes, school, market, women empowerment, scholarship scheme. They would also want ARPN to provide the community with an amount of money every year. The main concerns are that ARPN will not provide community development projects, and that ARPN staff may take other peoples' wives. Also, they are concerned that ARPN's operations might pollute their source of drinking water. The source of drinking water is the Okhuo river. Fishing in the Okhuo river is prohibited. Animals that are hunted in the proposed area include monkeys, buffalo, bush-pig, boa constrictor, deer and crocodiles. Medicinal plants are also scattered and not concentrated in one place. Hunting of various animals including deer, duiker, bush pigs, civets. There is no community cemetery. The dead are either buried at home, in the farms or	The team showed a map of the proposed development area as part of a general introduction to the project and the HCV-HCS full assessment. It was confirmed to the community that this would be an oil palm plantation by ARPN. Explained that the assessment was being done within the context of RSPO certification and that ARPN is committed to certification, which addresses pollution and water management. The shrines could not be visited by the team because the community demanded an amount of 65,000.00 Naira to perform rituals before they could be visited.

			in Benin City. The shrines are Okhuoniyomo shrine located near the river Okhuo (protects the community from external aggression, helps female fertility); the Ulele shrine (anyone who wants to become the Odionwere – Head of the community – must go there to perform rituals). The community is open to relocating the shrine should it be found to be in the PDA.	
Igbekhue (FGD)	7th June	4	Only few persons have farms in the PDA as earlier communicated to ARPN and Agric Officials but areas likely in free area and not PDA, as no farms have been identified for enumeration and therefore no one yet compensated. Primary school and market at Ogbojiobo. No clinic (Benin City) and no light. Source of water is Okhuo River (which flows through Okokhuo village).	Company maintained that compensation has been paid. Suggestions made to the company to follow up with the community and the Ministry of Agric officials to address any possible issues.
Osasinwonmba (FGD)	7th June	5	Have had meetings with a joint ARPN and Ministry of Agric team. Have an idea of the limits of the PDA. Only 14 persons compensated out of over 30 farmers. Some own rubber stands in the area. Have light, school and market. No clinic but borehole as source of drinking water. Use of PDA for collection of herbs, building materials, some farms and shrines. Ekpengbe shrine in the Ekiadolor FR (tree site where sacrifices are made – put there to prevent evil occurrences in the community and to avoid getting lost in the bush. Annual sacrifices (30, 000 naira needed to perform sacrifices) before each visit. Concerned that locals including youth will not be employed and that outstanding compensation will not be paid and this will have a long-term negative effect on the relationship with ARPN.	The team could not visit and capture the location of the shrine on GPS. ARPN to follow this up as stated in the next steps section. Assured that all their concerns will be passed on to the company verbally and in writing (i.e. captured in the report).

Annex 3: Land cover classification: Accuracy assessment

Land cover and forest inventory supplemental information

Initial classification accuracy table

Land cover class	HDF	LDF	MDF	OL	SCR	SW	YRF	Total	User accuracy
HDF	40	10						50	80.0%
LDF		39	10				1	50	78.0%
MDF	6	10	34					50	68.0%
OL		1		49				50	98.0%
SCR		3		8	38		1	50	76.0%
SW	2					48		50	96.0%
YRF		11		3	8		28	50	56.0%
Total	48	74	44	60	46	48	30	350	
Producer accuracy	83.3%	52.7%	77.3%	81.7%	82.6%	100.0%	93.3%		78.9%

Final classification accuracy table

Land cover class	MDF	OL	SCR	SW	WB	YRF	Total	User accuracy
MDF	42					8	50	84.0%
OL		49	1				50	98.0%
SCR	1	9	36			4	50	72.0%
SW	2			48			50	96.0%
WB					50		50	100.0%
YRF	4		3			43	50	86.0%
Total	49	58	40	48	50	55	300	
Producer accuracy	85.7%	84.5%	90.0%	100.0%	100.0%	78.2%		89.3%

Plots table details

Plot_Code	Latitude	Longitude	altitude	Land use
7	6.76039	5.64831	30	Scrub
8	6.76183	5.64656	31	Young regenerating forest
9	6.76171	5.64962	28	Medium density forest
10	6.75977	5.64988	34	Young regenerating forest
11	6.75778	5.64654	41	Scrub
14	6.76066	5.65174	39	Medium density forest
15	6.72214	5.62373	32	Scrub
16	6.7251	5.62098	37	Scrub
17	6.74077	5.6508	53	Scrub
18	6.72842	5.61676	15	Young regenerating forest
19	6.72815	5.62105	31	Scrub
20	6.72331	5.61056	47	Medium density forest
21	6.71154	5.61462	43	Scrub
22	6.70979	5.62624	44	Young regenerating forest
23	6.68822	5.62171	62	Medium density forest
24	6.69158	5.63398	77	Scrub
26	6.62146	5.67185	227	Scrub
27	6.59847	5.68239	161	Scrub
28	6.60405	5.73033	210	Young regenerating forest
29	6.60508	5.73236	217	Scrub
30	6.6076	5.73365	218	Scrub
31	6.60474	5.74346	156	Medium density forest
32	6.60385	5.7451	151	Young regenerating forest
33	6.6008	5.74333	144	Medium density forest
34	6.60106	5.74069	159	Medium density forest
35	6.59887	5.74238	139	Medium density forest
36	6.60241	5.74385	146	Young regenerating forest
37	6.59713	5.74208	116	Medium density forest

38	6.59157	5.7367	104	Medium density forest
39	6.59342	5.73673	112	Medium density forest
40	6.59526	5.73697	121	Medium density forest
42	6.592	5.73131	117	Medium density forest
43	6.59142	5.7339	78	Young regenerating forest
45	6.61061	5.73712	211	Scrub
52	6.737	5.62281	51	Young regenerating forest
53	6.73512	5.62323	53	Scrub
54	6.7332	5.62482	52	Scrub
55	6.73161	5.62874	44	Scrub
56	6.7309	5.62484	54	Scrub
57	6.72894	5.63265	36	Scrub
58	6.74391	5.63197	43	Young regenerating forest
59	6.74667	5.62876	50	Scrub
60	6.74162	5.62636	53	Scrub
61	6.73938	5.62999	41	Young regenerating forest
62	6.73583	5.63221	39	Scrub
63	6.72315	5.62352	46	Scrub
64	6.74637	5.63735	40	Scrub
65	6.72975	5.61566	37	Young regenerating forest
66	6.72741	5.61661	40	Scrub
67	6.72687	5.61553	34	Scrub
68	6.72617	5.61456	40	Scrub
69	6.72577	5.61331	37	Scrub
70	6.72462	5.61375	40	Scrub
71	6.72334	5.61471	44	Scrub
72	6.72351	5.61781	53	Scrub
73	6.72195	5.61895	54	Young regenerating forest
80	6.75535	5.65431	46	Scrub
81	6.75885	5.65342	43	Scrub
83	6.75153	5.63639	51	Scrub
84	6.75084	5.63898	42	Young regenerating forest
85	6.71693	5.61682	33	Scrub
86	6.71655	5.61514	33	Scrub
87	6.7153	5.61385	52	Young regenerating forest
88	6.71483	5.61263	49	Scrub
89	6.71487	5.60965	50	Open land
90	6.71461	5.60848	44	Young regenerating forest
91	6.71281	5.61017	49	Scrub
92	6.70992	5.6165	43	Scrub

93	6.71454	5.6173	45	Scrub
94	6.71738	5.61519	32	Scrub
95	6.70307	5.6159	59	Scrub
96	6.70383	5.61576	59	Scrub
97	6.70888	5.61678	45	Scrub
98	6.68466	5.62312	69	Scrub
100	6.68315	5.62251	77	Scrub
107	6.64622	5.65585	181	Scrub
110	6.64559	5.65615	184	Scrub
112	6.64516	5.65737	191	Scrub
113	6.64417	5.6583	205	Scrub
114	6.64288	5.65949	210	Scrub
115	6.64266	5.66109	214	Scrub
116	6.64169	5.66063	212	Scrub
117	6.64355	5.66074	208	Scrub
118	6.64072	5.6607	241	Scrub
120	6.63886	5.66548	248	Scrub
121	6.63577	5.66423	252	Scrub
122	6.63351	5.66379	243	Scrub
123	6.63254	5.6641	240	Scrub
124	6.63167	5.6647	240	Scrub
125	6.63305	5.66249	241	Scrub
126	6.63016	5.6657	238	Scrub
127	6.6296	5.6667	240	Scrub
128	6.62918	5.66838	253	Scrub
129	6.62989	5.6693	253	Scrub
130	6.62696	5.66785	236	Scrub
131	6.62649	5.66693	234	Scrub
132	6.6265	5.66551	234	Scrub
133	6.62593	5.66435	230	Scrub
134	6.6251	5.66727	232	Scrub
135	6.62245	5.66794	232	Scrub
136	6.6282	5.66976	250	Scrub
137	6.62266	5.67638	225	Scrub
138	6.62232	5.67543	222	Scrub
139	6.62197	5.67423	222	Scrub
140	6.6204	5.67409	219	Scrub
141	6.62012	5.68007	215	Scrub
142	6.61811	5.6817	211	Scrub
143	6.61862	5.68312	214	Scrub

144	6.61598	5.68196	203	Scrub
145	6.61747	5.68232	210	Scrub
146	6.61367	5.682	192	Scrub
147	6.61456	5.67752	207	Scrub
148	6.61539	5.67874	205	Scrub
149	6.61394	5.67857	204	Scrub
150	6.61798	5.67778	212	Scrub
151	6.68297	5.67193	86	Scrub
152	6.68198	5.66918	86	Scrub
153	6.68484	5.67612	84	Scrub
156	6.67372	5.68492	89	Young regenerating forest
157	6.67774	5.70108	121	Medium density forest
158	6.58749	5.71839	106	Scrub
159	6.59213	5.71697	124	Scrub
160	6.59982	5.71571	158	Scrub
161	6.59499	5.71603	142	Scrub
162	6.58781	5.68053	94	Scrub
163	6.58783	5.68564	73	Scrub
164	6.59127	5.68616	100	Young regenerating forest
165	6.58678	5.72322	101	Open land
166	6.59147	5.72252	119	Scrub
167	6.60467	5.70613	89	Scrub
168	6.60831	5.73976	192	Scrub
169	6.60636	5.7361	193	Scrub
170	6.60638	5.73997	179	Scrub
171	6.62907	5.67378	241	Scrub
172	6.62693	5.67409	232	Scrub
173	6.62887	5.67581	240	Scrub
175	6.6194	5.66766	221	Scrub
176	6.61751	5.66907	210	Scrub
177	6.60937	5.6783	184	Scrub
178	6.61141	5.67811	198	Scrub
179	6.61004	5.68083	184	Scrub
180	6.60794	5.67913	181	Scrub
181	6.60811	5.68537	197	Scrub
182	6.60539	5.69334	172	Young regenerating forest
183	6.59878	5.68576	170	Scrub
186	6.64049	5.66233	242	Scrub
189	6.63956	5.66242	244	Scrub
190	6.63139	5.66635	242	Scrub

191	6.63057	5.66408	236	Scrub
192	6.63107	5.6615	236	Scrub
193	6.62615	5.66986	238	Young regenerating forest
194	6.62836	5.66655	237	Young regenerating forest
195	6.62351	5.67232	230	Scrub
196	6.62356	5.66978	238	Scrub
197	6.6188	5.67436	216	Scrub
198	6.61737	5.67537	210	Scrub
199	6.61681	5.67403	210	Scrub
200	6.61212	5.67797	201	Scrub
201	6.61274	5.67374	196	Scrub
202	6.5981	5.68003	160	Open land
203	6.58117	5.67606	65	Young regenerating forest
204	6.59722	5.72251	162	Scrub
205	6.5974	5.72007	142	Scrub
206	6.59757	5.72416	151	Scrub
207	6.59495	5.72272	140	Scrub
208	6.60009	5.71967	156	Medium density forest
209	6.60293	5.72075	176	Scrub
210	6.60748	5.71915	173	Scrub
211	6.58778	5.72907	106	Medium density forest
212	6.59055	5.72909	119	Medium density forest
213	6.5895	5.7258	116	Medium density forest
214	6.5863	5.72932	99	Medium density forest
215	6.58404	5.7235	87	Scrub
216	6.58899	5.72357	113	Scrub
217	6.59083	5.71998	105	Scrub
218	6.75766	5.64951	38	Scrub
219	6.75516	5.64765	45	Young regenerating forest
220	6.75561	5.64457	38	Scrub
221	6.75766	5.64441	34	Scrub
222	6.75414	5.64629	42	Scrub
223	6.75338	5.64437	48	Scrub
224	6.75206	5.64445	46	Scrub
225	6.74894	5.6471	40	Scrub
226	6.74868	5.64868	37	Scrub
227	6.75257	5.64058	45	Scrub
228	6.75512	5.64072	37	Scrub
229	6.74722	5.6381	44	Scrub
230	6.74841	5.63524	32	Young regenerating forest

231	6.74524	5.64489	43	Young regenerating forest
232	6.74707	5.64198	44	Scrub
233	6.74591	5.64233	44	Scrub
234	6.74923	5.6529	45	Young regenerating forest
235	6.75188	5.64975	42	Scrub
236	6.75096	5.65041	44	Scrub
237	6.74569	5.63644	41	Scrub
238	6.74177	5.63638	45	Scrub
239	6.73966	5.63396	46	Scrub
240	6.73919	5.63887	39	Scrub
241	6.74094	5.64054	42	Scrub
242	6.74292	5.64005	42	Scrub
243	6.74276	5.64223	43	Scrub
244	6.73936	5.64404	47	Scrub
245	6.73812	5.64678	48	Scrub
246	6.73743	5.64822	46	Young regenerating forest
247	6.73629	5.64267	48	Scrub
248	6.73003	5.63756	38	Scrub
249	6.72859	5.63809	39	Scrub
250	6.728	5.64104	48	Scrub
251	6.7359	5.63671	43	Scrub
252	6.72602	5.62905	43	Scrub
253	6.72706	5.62957	43	Scrub
254	6.72878	5.62546	47	Scrub
255	6.72582	5.63426	40	Scrub
256	6.72329	5.63571	47	Scrub
257	6.72496	5.64983	67	Scrub
258	6.7213	5.63203	41	Scrub
259	6.72128	5.63071	40	Scrub
260	6.71856	5.63477	50	Young regenerating forest
261	6.71908	5.63682	57	Scrub
262	6.72073	5.63711	56	Young regenerating forest
263	6.72057	5.64013	57	Young regenerating forest
264	6.72121	5.64158	56	Scrub
265	6.71333	5.63368	57	Scrub
266	6.71135	5.62895	52	Scrub
267	6.7099	5.6407	57	Scrub
268	6.71199	5.64433	63	Scrub
269	6.70993	5.64725	65	Scrub
270	6.71029	5.65299	62	Scrub

271	6.70965	5.63553	56	Scrub
275	6.68038	5.67083	98	Scrub
276	6.67872	5.6705	104	Scrub
277	6.67694	5.67153	105	Scrub
279	6.67644	5.67552	109	Scrub
280	6.67371	5.67546	112	Scrub
281	6.68759	5.67734	80	Scrub
283	6.67219	5.68378	94	Young regenerating forest
284	6.66929	5.68482	106	Young regenerating forest
285	6.67794	5.6961	139	Medium density forest
286	6.60972	5.70106	150	Scrub
287	6.61346	5.7022	146	Scrub
288	6.61143	5.70554	160	Scrub
289	6.611	5.69796	184	Scrub
290	6.60652	5.7016	134	Scrub
291	6.64293	5.68591	210	Scrub
294	6.61679	5.69843	172	Scrub
295	6.61519	5.7104	151	Scrub
296	6.6144	5.70744	174	Scrub
297	6.6027	5.72471	190	Scrub
298	6.60496	5.72542	189	Scrub
299	6.60788	5.69868	179	Scrub
300	6.61851	5.70488	189	Scrub
301	6.70597	5.62109	51	Scrub
302	6.7078	5.62347	49	Scrub
303	6.70758	5.62714	54	Scrub
304	6.69316	5.63203	68	Young regenerating forest
305	6.69035	5.63187	81	Scrub
306	6.68459	5.62587	77	Scrub
308	6.70081	5.61509	49	Scrub
310	6.64102	5.68493	216	Scrub
311	6.64491	5.68475	178	Scrub
313	6.5856	5.67698	84	Scrub
314	6.60327	5.69893	165	Scrub
315	6.61101	5.7193	176	Scrub
324	6.6943	5.62159	53	Scrub
325	6.72547	5.64499	53	Scrub
326	6.7313	5.64699	57	Scrub
330	6.6691	5.67787	113	Scrub
331	6.6909	5.68347	98	Open land

333	6.64853	5.66966	211	Scrub
334	6.6436	5.67078	225	Scrub
335	6.64516	5.6783	192	Scrub
336	6.65404	5.67687	163	Scrub
340	6.65557	5.70209	227	Open land
341	6.66186	5.70727	223	Open land
342	6.64836	5.7077	236	Open land
343	6.65897	5.69655	189	Open land
344	6.66505	5.7006	188	Open land
346	6.6449	5.70431	240	Scrub
348	6.63939	5.67407	241	Scrub
349	6.64258	5.67803	230	Scrub
351	6.71413	5.69906	75	Open land
353	6.71039	5.68792	75	Open land
354	6.70786	5.6953	88	Open land
358	6.67176	5.69684	145	Open land
360	6.68403	5.7079	119	Scrub
361	6.68314	5.7085	121	Open land
362	6.67959	5.70773	102	Young regenerating forest
363	6.68501	5.70405	84	Scrub
364	6.68057	5.70717	93	Young regenerating forest
365	6.68495	5.71201	109	Young regenerating forest
367	6.61562	5.73583	214	Scrub
368	6.61523	5.73203	205	Scrub
369	6.61339	5.73292	211	Scrub
370	6.70964	5.6274	42	Scrub
371	6.71016	5.62708	42	Scrub
372	6.7521	5.63259	33	Young regenerating forest
373	6.75178	5.63255	32	Young regenerating forest
374	6.75227	5.6326	36	Young regenerating forest
375	6.70297	5.69068	81	Open land
377	6.71718	5.68932	64	Open land
380	6.66106	5.67488	145	Scrub
382	6.6632	5.68634	156	Open land
383	6.65242	5.69105	182	Scrub
384	6.66909	5.70604	188	Open land
385	6.69675	5.68794	92	Open land
386	6.69762	5.64691	58	Scrub

- a) Indicative photos of each vegetation class. Five images (N, S, E, W, and canopy views) per class.



Figure 60: Photos of Medium Density Forest land cover

NB: Top = North; Right = East; Bottom = South; Left = West; Centre = skywards



Figure 61: Photos showing the Young Regenerating Forest land cover

NB: Top = North; Right = East; Bottom = South; Left = West; Centre = skywards



Figure 62: Photos showing the Swamp land cover

NB: Top = North; Right = East; Bottom = South; Left = West; Centre = skywards



Figure 63: Photos showing the Scrubland land cover

NB: Top = North; Right = East; Bottom = South; Left = West; Centre = skywards



Figure 64: Photos showing the Open Land cover

NB: Top = North; Right = East; Bottom = South; Left = West; Centre = skywards

b) Statistical analyses (allometric used, confidence texts, justification)

Annex 4: Patch Analysis

Patch analysis supplemental information

Table of forest patches details

Patch Number	Patch area (ha)	Core area (ha)	Priority
3	39722.21	21924.80	HPP
1314	333.91	127.42	HPP
2360	277.93	106.84	HPP
50	27.84	1.12	LPP
293	7.90	0.00	LPP
418	41.56	1.58	LPP
653	34.66	1.62	LPP
747	74.52	4.37	LPP
761	7.68	0.01	LPP
785	16.74	0.84	LPP

959	12.75	0.64	LPP
1051	45.20	0.05	LPP
1115	29.45	3.41	LPP
1141	18.63	0.04	LPP
1312	90.33	1.06	LPP
1317	5.88	0.00	LPP
1323	29.20	0.03	LPP
1456	22.12	0.68	LPP
1487	41.30	2.12	LPP
1784	29.05	0.53	LPP
1795	23.62	1.17	LPP
1948	54.36	0.01	LPP
2004	22.87	4.41	LPP
2175	13.54	0.36	LPP
2199	18.89	0.09	LPP
2219	88.93	2.98	LPP
2336	9.73	0.33	LPP
2376	23.82	0.31	LPP
2445	11.80	0.12	LPP
2505	103.66	3.76	LPP
2560	16.21	0.01	LPP
1403	113.65	12.66	MPP
2444	100.50	33.26	MPP

Annex 5: Stakeholder consultations evidence



Community_consultations_participants.zip (Command Line)



Final_stakeholder_consultations_participants.zip (Command Line)

Annex 6: Social survey tools



Social survey tools.zip (Command Line)

Annex 7: Flora species list

Species	Family	IUCN Status	National Threat Status
<i>Afzelia africana</i>	Fabaceae	Vulnerable	Endanger
<i>Albizia ferruginea</i>	Fabaceae	Vulnerable	Endanger
<i>Albizia zygia</i>	Fabaceae	Not assessed	Not assessed
<i>Alchornea cordifolia</i>	Euphorbiaceae	Not assessed	Not assessed
<i>Alchornea laxiflora</i>	Euphorbiaceae	Not assessed	Not assessed
<i>Allanblackia floribunda</i>	Clusiaceae	Vulnerable	Endanger
<i>Allophylus africanus</i>	Sapindaceae	Not assessed	Not assessed
<i>Alstonia boonei</i>	Apocynaceae	Not assessed	Not assessed
<i>Anthocleista djalensis</i>	Gentianaceae	Not assessed	Not assessed
<i>Anthocleista nobilis</i>	Gentianaceae	Least concern	Not assessed
<i>Anthocleista vogelii</i>	Gentianaceae	Not assessed	Not assessed
<i>Antiaris toxicaria</i>	Moraceae	Not assessed	Not assessed
<i>Baphia nitida</i>	Fabaceae	Least concern	Not assessed
<i>Blighia sapida</i>	Sapindaceae	Not assessed	Not assessed
<i>Blighia unijugata</i>	Sapindaceae	Not assessed	Not assessed
<i>Bombax buonopozense</i>	Malvaceae	Not assessed	Not assessed
<i>Bombax glabrum</i>	Malvaceae	Not assessed	Not assessed
<i>Bosquea angolensis</i>	Moraceae	Not assessed	Not assessed
<i>Brachystegia eurycoma</i>	Fabaceae	Not assessed	Not assessed
<i>Bridelia ferruginea</i>	Phyllanthaceae	Not assessed	Not assessed
<i>Bridelia micrantha</i>	Phyllanthaceae	Not assessed	Not assessed
<i>Cedrela odorata</i>	Meliaceae	Vulnerable	Endanger
<i>Ceiba pentandra</i>	Malvaceae	Least concern	Not assessed
<i>Celtis brownii</i>	Cannabaceae	Not assessed	Not assessed
<i>Celtis zenkeri</i>	Cannabaceae	Least concern	Not assessed
<i>Chrysophyllum albidum</i>	Sapotaceae	Not assessed	Not assessed
<i>Cleistopholis patens</i>	Annonaceae	Not assessed	Not assessed
<i>Cola gigantea</i>	Malvaceae	Least concern	Not assessed
<i>Cola millenii</i>	Malvaceae	Not assessed	Not assessed
<i>Cordia millenii</i>	Boraginaceae	Least concern	Not assessed
<i>Deinbollia pinnata</i>	Sapindaceae	Not assessed	Not assessed
<i>Dialium guineense</i>	Fabaceae	Not assessed	Not assessed
<i>Diospyros dendo</i>	Ebenaceae	Not assessed	Not assessed
<i>Entandrophragma cylindricum</i>	Meliaceae	Not assessed	Endanger
<i>Entandrophragma utile</i>	Meliaceae	Vulnerable	Endanger
<i>Ficus capensis</i>	Moraceae	Not assessed	Not assessed
<i>Ficus exasperata</i>	Moraceae	Not assessed	Not assessed
<i>Ficus mucoso</i>	Moraceae	Not assessed	Not assessed
<i>Ficus vogelii</i>	Moraceae	Not assessed	Not assessed

<i>Funtumia elastica</i>	Apocynaceae	Not assessed	Not assessed
<i>Garcinia mannii</i>	Clusiaceae	Not assessed	Endanger
<i>Gmelina arborea</i>	Lamiaceae	Not assessed	Not assessed
<i>Harungana madagascariensis</i>	Clusiaceae	Not assessed	Not assessed
<i>Hevea brasiliensis</i>	Euphorbiaceae	Not assessed	Not assessed
<i>Holoptelea grandis</i>	Ulmaceae	Least concern	Not assessed
<i>Hunteria umbellata</i>	Apocynaceae	Least concern	Not assessed
<i>Irvingia gabonensis</i>	Irvingiaceae	Least concern	Not assessed
<i>Irvingia grandifolia</i>	Irvingiaceae	Least concern	Not assessed
<i>Irvingia wombolu</i>	Irvingiaceae	Not assessed	Not assessed
<i>Lannea welwitschii</i>	Anacardiaceae	Not assessed	Not assessed
<i>Lecaniodiscus cupanioides</i>	Sapindaceae	Not assessed	Not assessed
<i>Lonchocarpus sericeus</i>	Fabaceae	Not assessed	Not assessed
<i>Lophira alata</i>	Ochnaceae	Vulnerable	Endanger
<i>Magaritaria discoidea</i>	Phyllanthaceae	Not assessed	Not assessed
<i>Malacantha alnifolia</i>	Sapotaceae	Vulnerable	Not assessed
<i>Mangifera indica</i>	Anacardiaceae	Data deficient	Not assessed
<i>Manikara obovata</i>	Sapotaceae	Not assessed	Not assessed
<i>Margaritaria discoidea</i>	Phyllanthaceae	Not assessed	Not assessed
<i>Milicia excelsa</i>	Moraceae	Near threatened	Endanger
<i>Mitragyna stipulosa</i>	Rubiaceae	Vulnerable	Not assessed
<i>Monodora myristica</i>	Annonaceae	Not assessed	Rare
<i>Monodora tenuifolia</i>	Annonaceae	Not assessed	Not assessed
<i>Morinda lucida</i>	Rubiaceae	Not assessed	Not assessed
<i>Morus mesozygia</i>	Moraceae	Not assessed	Not assessed
<i>Musanga cecropioides</i>	Urticaceae	Least concern	Not assessed
<i>Myrianthus arboreus</i>	Urticaceae	Not assessed	Not assessed
<i>Myrianthus preussii</i>	Urticaceae	Not assessed	Not assessed
<i>Nauclea diderrichii</i>	Rubiaceae	Vulnerable	Endanger
<i>Nauclea latifolia</i>	Rubiaceae	Least concern	Not assessed
<i>Newbouldia laevis</i>	Bignoniaceae	Not assessed	Not assessed
<i>Pentaclethra macrophylla</i>	Fabaceae	Not assessed	Not assessed
<i>Psidium guajava</i>	Myrtaceae	Least concern	Not assessed
<i>Pterocarpus erinaceus</i>	Fabaceae	Endanger	Endanger
<i>Pterocarpus santalinoides</i>	Fabaceae	Least concern	Rare
<i>Pterocarpus soyauxii</i>	Fabaceae	Not assessed	Not assessed
<i>Pterygota macrocarpa</i>	Malvaceae	Vulnerable	Endanger
<i>Pycnanthus angolensis</i>	Myristicaceae	Not assessed	Not assessed
<i>Rauvolfia vomitoria</i>	Apocynaceae	Not assessed	Not assessed
<i>Ricinodendron heudelotii</i>	Euphorbiaceae	Not assessed	Not assessed
<i>Spathodea campanulata</i>	Bignoniaceae	Not assessed	Not assessed
<i>Spondias mombin</i>	Anacardiaceae	Not assessed	Not assessed

<i>Spondias stundii</i>	Anacardiaceae	Not assessed	Not assessed
<i>Sterculia tragacantha</i>	Malvaceae	Least concern	Not assessed
<i>Tabernaemontana pachysiphon</i>	Apocynaceae	Not assessed	Not assessed
<i>Tectona grandis</i>	Verbenaceae	Not assessed	Not assessed
<i>Terminalia avicennioides</i>	Combretaceae	Not assessed	Not assessed
<i>Terminalia ivorensis</i>	Combretaceae	Vulnerable	Endanger
<i>Terminalia superba</i>	Combretaceae	Not assessed	Endanger
<i>Tetrapleura tetraptera</i>	Fabaceae	Not assessed	Not assessed
<i>Treulia africana</i>	Moraceae	Not assessed	Not assessed
<i>Trema orientalis</i>	Cannabaceae	Not assessed	Not assessed
<i>Trichilia monadelpha</i>	Meliaceae	Least concern	Not assessed
<i>Triplochiton scleroxylon</i>	Malvaceae	Least concern	Rare
<i>Uapaca staudtii</i>	Phyllanthaceae	Not assessed	Not assessed
<i>Vernonia amygdalina</i>	Asteraceae	Not assessed	Not assessed
<i>Vitex doniana</i>	Lamiaceae	Not assessed	Not assessed
<i>Vitex ferruginea</i>	Lamiaceae	Not assessed	Not assessed
<i>Voacanga africana</i>	Apocynaceae	Not assessed	Not assessed
<i>Zanthoxylum zanthoxyloides</i>	Rutaceae	Vulnerable	Endanger

Annex 8: Fauna species list

Appendix 1b: The Fourth National Biodiversity Report, 2010

S/NO	ORDER	FAMILY	COMMON NAME	SCIENTIFIC NAME	STATUS
1	Chelonia	Pteomedusidae	African keeled mud turtle	<i>Pelosiso carinus</i>	Endangered
2			African keeled mud turtle	<i>Pelusions castaneus</i>	Endangered
3			African keeled mud turtle	<i>Pelusions nanus</i>	Endangered
4			William's African Mud turtle	<i>Pelusions williamsi</i>	Endangered
5		Trionychidae	Abry's flapshell turtle	<i>Cycloderma aubryi</i>	Endangered
6			Namibain flapshell turtle	<i>Cyslonorbis elegans</i>	Endangered
7			Senegal flapshell turtle	<i>Cyclonorbis senegansis</i>	Endangered
8		Dermochelidae	Leatherback turtle	<i>Dermochelys coriacea</i>	Endangered
9		Chelonidae	Green turtle	<i>Chelonia mydas</i>	Endangered
10			Olive ridley	<i>Lepidochelys olivacea</i>	Endangered
11			Hoaksbill turtle	<i>Eretmochelys imbircata</i>	Endangered
12	Crocodylia		Nile crocodile	<i>Crocodylus Loticus</i>	Endangered
13			Slender snouted crocodile	<i>Crocodylus catapractus</i>	Endangered
14			African dwarf crocodile	<i>Osteolamus tetrapis</i>	Endangered
15	Squamata	Veranidae	Nile monitor lizard	<i>Varamus niloticus</i>	Endangered
16			Monitor lizard	<i>Varanus exanthematicus</i>	Endangered

17		Pythonidae	Royal Python	<i>Python regius</i>	Endangered
18			Rock Python	<i>Python sebae</i>	Endangered
19	Struthioniformes	Struthionidae	Ostrich	<i>Struthio camelus</i>	Endangered
20	Pelecaniformes	Pelethronodae	Pinkbacked pelican	<i>Pelecanus rufescens</i>	Endangered
21	Coconiforms	Adeidae	Grey heron	<i>Ardea cinerea</i>	Endangered
22			Goliath heron	<i>Ardea goliath</i>	Endangered
23			Breen heron	<i>Bruorides virescens</i>	Endangered
24			Purple heron	<i>Ardea purpurea</i>	Endangered
25			Great Egret	<i>Egretta alba</i>	Endangered
26			Little egret	<i>Egretta garzetta</i>	Endangered
27			Cattle egret	<i>Ardeola ibis</i>	Endangered
28			Squocco heron	<i>Ardeola rolloides</i>	Endangered
29			Black-crowned night heron	<i>Nycticorax nycticorax</i>	Endangered
30		Scopidae	Hammercop	<i>Scopus unbretta</i>	Terminated
31		Ciconodae	White stork	<i>Ciconia ciconia</i>	Endangered
32			Abdims stork	<i>Ciconia abdimii</i>	Endangered
33			Saddle-billed stork	<i>Ephippiorhynchus senegalensis</i>	Endangered
34			Marabou stork	<i>Leptoptilus crumeniferus</i>	Endangered
35			Wood ibis	<i>Ibis ibis</i>	Endangered
36		Threskiornithidae	African spoonbill	<i>Platelea alba</i>	Endangered
37			Sacred ibis	<i>Threskiomis aethiopica</i>	Endangered

38			Glossy ibis	<i>Plegadis falcinellus</i>	Endangered
39			Hadada ibis	<i>Bostrychia hagedash</i>	Endangered
40	Falconiforms	Accipitridae	Nubian vulture	<i>Aegypius tracheliotus</i>	Endangered
41			Rappels griffon vulture	<i>Gyps ruppellii</i>	Endangered
42			White-backed vulture	<i>Gyps bengalensis</i>	Endangered
43			Palm-nut vulture	<i>Gypohierax angolensis</i>	Endangered
44			Hooded vulture	<i>Neophron monachus</i>	Endangered
45			West African River Eagle	<i>Haliaeetus vocifer</i>	Endangered
46			Short toed eagle	<i>Circus gallicus</i>	Endangered
47			Marital eagle	<i>Polemaetus bellicosus</i>	Endangered
48			Bateleur eagle	<i>Terathopius ecaudatus</i>	Endangered
49			Common buzzard	<i>Buteo buteo</i>	Threatened
50			Montaguas harrier	<i>Circus pygargus</i>	Threatened
51			Goshawk	<i>Accipiter gentilis</i>	Threatened
52			Sparrow hawk	<i>Accipiter nisus</i>	Threatened
53		Falconidae	Hobby	<i>Falco subbuteo</i>	Threatened
54			Kestrel	<i>Falco tinnunculus</i>	Threatened
55		Sagittariidae	Secretary bird	<i>Sagittarius serpentarius</i>	Endangered
56		Phasianidae	Helmet guinea-fowl	<i>Numida meleagris</i>	Threatened
57			Crested guinea-fowl	<i>Guttera edourdi</i>	Endangered
58			Blue-breasted kingfisher	<i>Halcyon malimbica</i>	Threatened
59			Malachite kingfisher	<i>Alcedo cristata</i>	Threatened

60			Pied kingfisher	<i>Ceryle rudis</i>	Threatened
61			Pigmy kingfisher	<i>Ceryx picta</i>	Threatened
62			Senegal Kingfisher	<i>Halcyon senegalensis</i>	Threatened
63		Upupidae	Hoopoe	<i>Upupa epos</i>	Endangered
64		Bucerotidae	Abyssinian Ground Hornbill	<i>Bucorvus abyssinicus</i>	Endangered
65		Ploeceidae	Ibadan malimbus	<i>Malimbus ibadensis</i>	Endangered
66			Black mountain weaver	<i>Ploceus melanogaster</i>	Endangered
67	Primates	Cercopithecidae	Colobus monkey (Guereza)	<i>Colobus polykomos</i>	Endangered
68			Olive Colobus	<i>Procolobus verus</i>	Endangered
69			Red-eared Guenon	<i>Cercopithecus erythrotis</i>	Endangered
70			Moustached Monkey	<i>Cercopithecus cephus c.</i>	Endangered
71			Mona Monkey	<i>Cercopithecus mona</i>	Threatened
72			White throated monkey	<i>Cercopithecus eruthrogaster</i>	Endangered
73			Patas monkey	<i>Erythrocebus patas</i>	Threatened
74			Olive baboon	<i>Papio anubis</i>	Threatened
75		Ceropithecus	White hosed monkey	<i>C. Nictitans</i>	Extinct
76			Green (tanelus) monkey	<i>C. aethiops</i>	Extinct
77			Rensiss monkey	<i>C. preussi</i>	Extinct
78			Ground monkey	<i>C. Poganis</i>	Extinct
79			Grey-checked mangabey	<i>C. albigenia</i>	Extinct
80			Red-capped mangabey	<i>C. torquatus</i>	Extinct

81			Drill baboon	<i>Mandrillus leucocphaeus</i>	Endangered
82			Chimpanzee	<i>Pan troglodytes</i>	Endangered
83		Pongidae	Western lowland gorilla	<i>Gorilla gorilla</i>	Endangered
84			Manis gigantean	<i>Giant pangolin</i>	Threatened
85	Pholidota	Manidae	Treep pangolin	<i>Manis tricuspis</i>	Threatened
86			Crested porcupine	<i>Hystrix cristata</i>	Threatened
87	Hystricomorpha	Hystricidae	Brush-tailed porcupine	<i>Atherurus African</i>	Threatened
88			Hunting dog	<i>Lycaon pictus</i>	Endangered
89	Carnivora	Canidae	Side-striped jacka	<i>Canis adustus</i>	Rare
90			Pale fox	<i>Vulpes pallida</i>	Rare
91			Honey badger	<i>Mellivora capensis</i>	Rare
92		Mustelidae	Cape clawless otter	<i>Aonys capensis</i>	Rare
93		Viverridae	African Civet cate	<i>Civettictis civetta</i>	Endangered
94			Cusimanse	<i>Crossarchus crossarchs</i>	Rare
95			Cusimanse	<i>Crossrchus crossarchs</i>	Rare
96			Spotted hyaena	<i>Crocuta crocuta</i>	Rare
97		Hyaenidae	Striped hyaena	<i>Hyaena hyaena</i>	Endangered
98			Serval cat	<i>Leptailuru serval</i>	Rare
99		Feidae	Caracal or desert hynx	<i>Caracal caracal</i>	Rare
100			Leopard	<i>Panthera pardus</i>	Endangered
101			Lion	<i>Panthera leo</i>	Endangered
102			Cheetah	<i>Acinonyx jubatus</i>	Endangered

103	Tubulidentata	Orycteropidae	Aardvark	<i>Orycteropus afer</i>	Extinct
104	Proboscidea	Elephantidae	African bush elephant	<i>Loxodonta africana</i>	Endangered
105			African forest elephant	<i>Loxodonta cyclotis</i>	Endangered
106	Hyracoidea	Procaviidae	Rock hyrax	<i>Procavia capensis</i>	Rare
107			Three hyrax	<i>Dendrohyrax</i>	Rare
108	Sirenia	Trichechidae	Manatee	<i>Trichechus senegalensis</i>	Endangered
109	Artiodactyla	Suidae	Red river hog	<i>Potamochoerus aethiopicus</i>	Rare
110			Wart hog	<i>Phocochoerus aethiopicus</i>	Threatened
111			Giant forest hog	<i>Hylochoerus meinertzhageni</i>	Endangered
112		Hippopotamidae	African hippopotamus	<i>Hippopotamus amphibius</i>	Endangered
113			Pigmy hippopotamus	<i>Hexaprotodon liberiensis</i>	Endangered
114		Tragulidae	Water chevretain	<i>Hymoschus aquaticus</i>	Endangered
115		Giraffidae	Giraffe	<i>Giraffa camelopardalis</i>	Endangered
116		Bovidae	African buffalo	<i>Cyncerus cafer cafer</i>	Threatened
117			Dwart buffalo	<i>Cyncerus cafer nanus</i>	Threatened
118			Mountain reedbuck	<i>Redunca fulvivirula</i>	Endangered

NB:
= EN,
= TN, Rare =
Terminated
= EX

Checklist of

herpetofauna species

119			Bohor reedbuck	<i>Redunca redunca</i>	Endangered
120			Giant eland	<i>Taurotragus derbianus</i>	Endangered
121			Western hartebeest	<i>Alcelaphus b. major</i>	Endangered
122			Roan antelope	<i>Hippotragus equines</i>	Endangered
123			Korrigum (topi)	<i>Damaliscus l. korrigum</i>	Endangered
124			Western kob	<i>Kobus kob kob</i>	Endangered
125			Bush buck	<i>Tragelaphus scriptus</i>	Endangered
126			Sitatunga	<i>Tragelaphus spekii</i>	Endangered
127			Red-fronted gazelle	<i>Gazalla rufifrons</i>	Threatened
128			Dorcas gazelle	<i>Gazelle dorcas</i>	Endangered
129			Dama gazelle	<i>Gazelle dama</i>	Endangered
130			Yellow backed duiker	<i>Cephalophus sylvicultor</i>	Endangered
131			Red flanked duiker	<i>Cephalophus rufilatus</i>	Endangered
132			Maxwells duiker	<i>Cephalophus maxwellii</i>	Endangered
133			Black duiker	<i>Cephalophus niger</i>	Endangered
134			Blue duiker	<i>Cephalophus monticlla</i>	Endangered
135			Bay duiker	<i>Cephalophus dorsali</i>	Endangered
136			Klipspringer	<i>Oreotragus oreotragus</i>	Endangered
137			Royal antelope	<i>Neotragus pygmaeus</i>	Endangered

Endangered
Threatened
RA,
= TM, Extinct

Conservation Status

Transects

Swamps

Common Name	Scientific Name	IUCN	National	1	2	3	4	5	Odighi	Ogolo	Ekonobore	Oshodin	Total	RA
REPTILES	REPTILIA													
CROCOGYLIDAE														
Dwarf crocodile	<i>Osteolaemus tetraspis</i>	VU	EN	0	2	0	0	0	1	0	4	6	13	6.7
VARANIDAE														
West Africa Nile Monitor	<i>Varanus stellatus</i>	LC	EN	3	1	1	0	1	2	3	5	12	28	14.5
AGAMIDAE														
Agama Lizard	<i>Agama agama</i>	LC		5	2	6	2	4	2	1	3	1	26	13.5
GEKKONIDAE														
Cameroon dwarf gecko	<i>Lygodactylus conraui</i>	LC		3	2	0	0	1	0	0	0	0	6	3.1
SCINCIDAE														
Fires Skink	<i>Lepidothyris striatus</i>	LC		2	2	1	1	0	0	0	0	0	6	3.1
Five-lined mabuya	<i>Trachylepis quinquetaeniata</i>	LC		0	3	0	0	1	0	0	0	0	4	2.1
African striped skink	<i>Trachylepis striata</i>	LC		1	0	2	0	2	0	2	0	1	8	4.1
PYTHONIDAE														
Royal python	<i>Python regius</i>		EN	1	1	0	0	0	1	0	1	1	5	2.6
VIPERIDAE														
Gabon Viper	<i>Batis gabonica</i>	LC		1	1	0	0	0	1	0	0	0	3	1.6
Green bush viper	<i>Atheris squamigera</i>	LC		1	1	0	0	0	0	0	1	0	3	1.6
ELAPIDAE														
Forest Cobra	<i>Naja melanoleuca</i>	LC		1	1	1	0	0	1	0	2	1	7	3.6

COLUBRIDAE														
Boomslang	<i>Dispholidus typus</i>	LC		0	1	0	0	0	0	0	0	0	1	0.5
PELOMEDUSIDAE														
West African black mud turtle	<i>Pelusios niger</i>	LC		0	0	0	0	0	3	4	2	4	13	6.7
AMPHIBIANS	AMPHIBIA													
BUFONIDAE														
Hallowell's Toad	<i>Amietophrynus maculatus</i>	LC		2	3	0	3	2	0	0	2	0	12	6.2
Common African Toad	<i>Amietophrynus regularis</i>	LC		1	1	2	2	1	2	1	3	4	17	8.8
ARTHROLEPTIDAE														
Forest treefrogs	<i>Leptopelis spiritusnoctis</i>	LC		0	2	0	0	1	0	2	3	1	9	4.7
PHRYNOBATRACHIDAE														
Ahl's River Frog	<i>Phrynobatrachus latifrons</i>	LC		3	2	0	0	0	0	0	0	0	5	2.6
Allen's River Frog	<i>Phrynobatrachus alleni</i>	LC		0	1	1	0	2	0	0	0	0	4	2.1
Dwarf Puddle Frog	<i>Phrynobatrachus natalensis</i>	LC		0	2	1	0	0	0	2	2	1	8	4.1
Puddle frog	<i>Phrynobatrachus calcaratus</i>	LC		2	0	0	0	1	1	0	2	1	7	3.6
Ridged frogs	<i>Ptychadena longirostris</i>	LC		0	1	0	0	1	0	0	0	1	3	1.6
DICROGLOSSIDAE														
Crowned Bullfrog	<i>Hoplobatrachus occipitalis</i>	LC		1	1	0	1	0	1	0	1	0	5	2.6
Number of signs				27	30	15	9	17	15	15	31	34	193	100.0
Number of species				14	19	8	5	11	10	7	13	12	22	

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Checklist of large mammal species recorded in the ARPN PDA for Oil Palm Development

Common Name	Scientific Name	Conservation Status		Transects					Swamps				Total	RA
		IUCN	National	1	2	3	4	5	Odighi	Ogolo	Ekonobore	Oshodin		
PRIMATES														
Cercopithecidae														
Mona Monkey	<i>Cercopithecus mona</i>		TN	2	4	0	0	4	3	4	5	6	28	8.8
Putty-nosed Monkey	<i>Cercopithecus nictitans</i>		EX	0	3	2	0	2	0	0	0	0	7	2.2
Red-cap mangabey	<i>Cercocebus torquatus</i>	EN	EX	2	2	1	0	0	0	0	0	0	5	1.6
White-throated Monkey	<i>Cercopithecus erythrogaster</i>	VU	EN	1	1	1	0	2	0	0	0	0	5	1.6
INSECTIVORA														
Manidae														
Tree pangolin	<i>Manis tricuspis</i>	VU	TN	1	1	0	0	1	1	0	1	1	6	1.9
RODENTIA														
Hystricidae														
Crested Porcupine	<i>Hystrix cristata</i>		TN	1	5	1	0	0	2	4	1	3	17	5.4
Brush-tailed porcupine	<i>Atherurus africanus</i>		TN	2	4	0	0	2	0	9	2	2	21	6.6
Sciuridae														0.0
Striped Ground Squirrel	<i>Euxerus erythropus</i>			3	0	4	1	2	2	1	1	3	17	5.4
Western Palm Squirrel	<i>Epixerus ebii</i>			2	3	0	0	2	2	3	2	0	14	4.4
Thryomyidae														

Marsh Cane Rat	<i>Thryonomys swinderianus</i>			5	3	4	2	2	1	1	3	2	23	7.3
Etomidae														
Giant Gambian Rat	<i>Cricetomys gambiensis</i>			2	3	2	1	2	1	6	3	2	22	6.9
CARNIVORA														
Herpestidae														
Slender Mongoose	<i>Galerella sanguinea</i>			2	1	1	0	1	2	2	3	1	13	4.1
Viverridae														
African Civet	<i>Civettictis civetta</i>		EN	3	2	0	0	3	2	2	0	4	16	5.0
ACTIODACTYLA														
Suidae														
Red River Hog	<i>Potamochoerus porcus</i>		Rare	5	6	0	0	3	8	11	12	14	59	18.6
Bovidae														
Bongo	<i>Tragephalus evrycerus</i>		EN	0	2	0	0	0	0	0	0	0	2	0.6
Bushbuck	<i>Tragelaphus scriptus</i>		EN	6	4	2	2	3	2	4	4	6	33	10.4
Sitatunga	<i>Tragelaphus spekii</i>		EN	0	0	0	0	0	0	0	2	2	4	1.3
Black duiker	<i>Cephalophus niger</i>		EN	0	3	0	0	0	0	0	0	0	3	0.9
Maxwell's Duiker	<i>Cephalophus maxwelli</i>		EN	2	3	2	2	0	3	2	3	2	19	6.0
Buffalo	<i>Syncerus caffer nanus</i>		TN	0	0	0	0	0	0	0	0	3	3	0.9
Number of signs				39	50	20	8	29	29	49	42	51	317	100.0
Number of species				15	17	10	5	13	12	12	13	14	20	

Checklist of bird species recorded in the ARPN PDA for oil palm development

Common Name	Scientific Name	Conservation Status		Transects					Swamps				Total	RA
		IUCN	National	1	2	3	4	5	Odighi	Ogolo	Ekonobore	Oshodin		
ANATIDAE														
Hartlaub's Duck	<i>Pteronetta hartlaubii</i>			0	0	0	0	4	3	2	2	8	19	1.0
NUMIDIDAE														
Crested Guinea fowl	<i>Guttera pucherani</i>		EN	0	2	0	3	2	5	0	11	3	26	1.4
PHASIANIDAE														
Scaly Francolin	<i>Pternistis squamatus</i>			12	3	7	3	2	0	0	0	0	27	1.4
Forest Francolin	<i>Peliperdix lathamii</i>			0	3	0	0	0	0	0	3	0	6	0.3
COLUMBIDAE														
African Green Pigeon	<i>Treron calvus</i>			3	4	4	3	5	3	2	2	0	26	1.4
Blue-spotted Wood Dove	<i>Turtur afer</i>			5	4	7	2	5	0	0	1	0	24	1.2
Tambourine Dove	<i>Turtur tympanistria</i>			1	5	1	3	3	2	1	3	4	23	1.2
APODIDAE														
African Palm Swift	<i>Cypsiurus parvus</i>			7	4	6	6	3	0	3	0	2	31	1.6
Little Swift	<i>Apus affinis</i>			4	0	11	10	7	0	6	0	8	46	2.4
Mottled Spinetailed Swift	<i>Telacanthura ussheri</i>			4	2	0	3	2	0	0	3	0	14	0.7
White-rumped Swift	<i>Apus caffer</i>			6	0	2	0	0	0	2	0	1	11	0.6
CUCULIDAE														

African Emerald Cuckoo	<i>Chrysococcyx cupreus</i>			1	4	3	2	4	3	2	4	2	25	1.3
Black Cuckoo	<i>Cuculus clamosus</i>			0	2	0	0	0	0	0	0	0	2	0.1
Black-throated Coucal	<i>Centropus leucogaster</i>			0	2	1	1	2	2	0	1	0	9	0.5
Blue-headed Coucal	<i>Centropus monachus</i>			0	1	1	1	1	0	0	2	1	7	0.4
Diederick Cuckoo	<i>Chrysococcyx caprius</i>			1	0	0	0	1	0	3	1	0	6	0.3
Dusky Long-tailed Cuckoo	<i>Cercococcyx mechowi</i>			0	2	0	0	2	2	0	0	0	6	0.3
Klaas's Cuckoo	<i>Chrysococcyx klaas</i>			0	2	3	0	0	0	0	2	1	8	0.4
Red-chested Cuckoo	<i>Cuculus solitarius</i>			0	1	1	1	0	0	4	2	0	9	0.5
Senegal Coucal	<i>Centropus senegalensis</i>			4	2	4	3	4	5	3	5	2	32	1.7
Yellowbill	<i>Ceuthmochares aereus</i>			0	2	1	3	2	0	3	2	5	18	0.9
RALLIDAE														
African Crane	<i>Crex egregia</i>			1	0	1	1	0	0	2	0	0	5	0.3
SAROTHRURIDAE														
White-spotted Flufftail	<i>Sarothrura pulchra</i>			2	3	2	2	4	0	2	0	0	15	0.8
MUSOPHAGIDAE														
Great Blue Turaco	<i>Corythaeola cristata</i>			0	4	0	2	4	0	0	0	0	10	0.5
Green Turaco	<i>Tauraco persa</i>			3	6	4	4	3	3	4	3	1	31	1.6
CICONIIDAE														
Woolly-necked Stork	<i>Ciconia episcopus</i>			0	0	0	2	0	0	0	2	1	5	0.3
SCOPIDEA														
Hamerkop	<i>Scopus umbretta</i>		TM	1	0	1	1	0	0	0	0	1	4	0.2
ACCIPITRIDAE														

African Goshawk	<i>Accipiter tachiro</i>		EN	0	0	1	0	0	1	0	2	4	8	0.4
African Harrier Hawk	<i>Polyboroides typus</i>		EN	0	1	3	5	4	1	4	2	2	22	1.1
African Marsh Harrier	<i>Circus ranivorus</i>		EN	2	4	3	3	5	1	2	1	1	22	1.1
Black Sparrowhawk	<i>Accipiter melanoleucus</i>		EN	0	1	0	1	1	0	0	2	1	6	0.3
Crowned Eagle	<i>Stephanoaetus coronatus</i>	NT	EN	0	1	1	0	1	0	0	0	0	3	0.2
Lizard Buzzard	<i>Kaupifalco monogrammicus</i>		EN	2	1	3	1	2	1	1	2	2	15	0.8
Long-crested Eagle	<i>Lophaetus occipitalis</i>		EN	0	0	1	0	0	0	0	0	2	3	0.2
Palm-nut Vulture	<i>Gypohierax angolensis</i>		EN	0	0	0	1	1	0	1	0	2	5	0.3
BUCEROTIDAE														
African Pied Hornbill	<i>Tockus fasciatus</i>			0	3	4	3	3	2	2	1	4	22	1.1
Piping Hornbill	<i>Bycanistes fistulator</i>			5	4	3	5	4	3	2	2	4	32	1.7
White-thighed Hornbill	<i>Bycanistes albotibialis</i>			0	0	4	0	3	0	0	0	2	9	0.5
Black and White Casqued Hornbill	<i>Bycanistes subcylindricus</i>			0	0	0	0	0	0	2	0	3	5	0.3
INDICATORIDAE														
Cassin's Honeybird	<i>Prodotiscus insignis</i>			0	1	0	0	0	0	0	1	0	2	0.1
Greater Honeyguide	<i>Indicator indicator</i>			1	0	0	0	0	0	0	0	1	2	0.1
PICIDAE														
Buff-spotted Woodpecker	<i>Campethera nivosa</i>			0	1	0	0	2	1	0	0	1	5	0.3
Fine-spotted Woodpecker	<i>Campethera punctuligera</i>			1	0	2	0	0	0	0	0	2	5	0.3
Green-backed Woodpecker	<i>Campethera cailliautii</i>			0	1	1	0	1	0	0	0	1	4	0.2
Little Grey Woodpecker	<i>Dendropicos elachus</i>			1	0	0	0	0	0	0	0	0	1	0.1
RAMPHASTIDAE														

Bristle-nosed Barbet	<i>Gymnobucco peli</i>			0	2	2	3	0	0	0	0	0	7	0.4
Hairy-breasted Barbet	<i>Tricholaema hirsuta</i>			3	0	5	0	0	0	0	0	0	8	0.4
Naked-faced Barbet	<i>Gymnobucco calvus</i>			3	0	2	0	3	0	0	0	1	9	0.5
Red-rumped Tinkerbird	<i>Pogoniulus atroflavus</i>			0	3	0	0	1	0	0	0	0	4	0.2
Speckled Tinkerbird	<i>Pogoniulus scolopaceus</i>			0	3	2	0	1	0	2	0	0	8	0.4
Vieillot's Barbet	<i>Lybius vieilloti</i>			6	0	2	0	2	0	0	0	0	10	0.5
Yellow-billed Barbet	<i>Trachylaemus purpuratus</i>			3	5	5	3	5	0	0	0	1	22	1.1
Yellow-rumped Tinkerbird	<i>Pogoniulus bilineatus</i>			2	3	3	3	1	0	0	1	0	13	0.7
Yellow-spotted Barbet	<i>Buccanodon duchaillui</i>			2	4	1	0	3	0	0	0	0	10	0.5
Yellow-throated Tinkerbird	<i>Pogoniulus subsulphureus</i>			0	0	2	0	0	0	3	0	0	5	0.3
MEROPIDAE														
Little Bee-eater	<i>Merops pusillus</i>			3	3	4	2	1	0	0	1	0	14	0.7
Blue-moustached Bee-eater	<i>Merops mentalis</i>	NT		0	0	2	0	2	0	0	0	3	7	0.4
CORACIIDAE														
Blue-throated Roller	<i>Eurystomus gularis</i>			1	3	2	2	2	0	1	0	0	11	0.6
Broad-billed Roller	<i>Eurystomus glaucurus</i>			1	0	1	0	0	0	0	0	0	2	0.1
ALCEDINIDAE														
African Pygmy Kingfisher	<i>Ispidina picta</i>		TN	1	1	2	2	0	3	0	0	4	13	0.7
African Malachite Kingfisher	<i>Corythornis cristatus</i>		TN	1	1	0	0	1	2	0	1	2	8	0.4
Giant Kingfisher	<i>Megaceryle maxima</i>		TN	0	0	0	1	0	1	0	2	3	7	0.4
Blue-breasted Kingfisher	<i>Halcyon malimbica</i>		TN	1	3	1	1	1	0	0	0	2	9	0.5
Woodland Kingfisher	<i>Halcyon senegalensis</i>		TN	3	1	2	0	2	0	3	1	2	14	0.7

FALCONIDAE														
African Hobby	<i>Falco cuvierii</i>		TN	1	0	1	1	2	0	0	0	0	5	0.3
Lanner Falcon	<i>Falco biarmicus</i>		TN	1	0	1	1	0	0	0	0	0	3	0.2
PSITTACIDAE														
Grey Parrot	<i>Psittacus erithacus</i>	EN		2	3	0	3	0	0	0	0	6	14	0.7
Red-fronted Parrot	<i>Poicephalus gulielmi</i>			0	0	1	1	0	0	2	0	2	6	0.3
Senegal Parrot	<i>Poicephalus senegalus</i>			0	0	1	1	0	0	0	2	2	6	0.3
ORIOLIDAE														
Western Black-headed Oriole	<i>Oriolus brachyrynchus</i>			2	5	1	0	3	0	0	0	0	11	0.6
Black-winged Oriole	<i>Oriolus nigripennis</i>			0	2	1	0	2	0	0	0	0	5	0.3
PLATYSEIRIDAE														
Chestnut Wattle-eye	<i>Dyaphorophya castanea</i>			0	2	0	0	0	0	0	0	0	2	0.1
Brown-throated Wattle-eye	<i>Platysteira cyanea</i>			3	2	0	1	1	0	0	0	0	7	0.4
MALACONOTIDAE														
Sabine's Puffback	<i>Dryoscopus sabini</i>			4	3	2	2	3	0	0	0	0	14	0.7
Black-crowned Tchagra	<i>Tchagra senegalus</i>			2	0	3	0	0	0	0	1	0	6	0.3
Orange-breasted Bush-shrike	<i>Chlorophoneus sulfureopectus</i>			1	0	1	0	0	0	0	0	1	3	0.2
Tropical Boubou	<i>Laniarius aethiopicus</i>			1	1	0	0	0	0	0	0	0	2	0.1
DICRURIDAE														
Shining Drongo	<i>Dicrurus atripennis</i>			0	2	0	0	1	0	0	0	2	5	0.3
Velvet-mantled Drongo	<i>Dicrurus modestus</i>			2	1	0	0	2	0	0	1	2	8	0.4
CORVIDAE														

Pied Crow	<i>Corvus albus</i>			0	3	2	0	0	0	0	3	0	8	0.4
MONARCHIDAE														
Blue-headed Paradise-flycatcher	<i>Trochocercus nitens</i>			1	2	0	0	0	0	0	0	0	3	0.2
Red-bellied Paradise-flycatcher	<i>Terpsiphone rufiventer</i>			0	0	3	0	3	0	0	0	2	8	0.4
NECTARINIIDAE														
Blue-throated Brown Sunbird	<i>Cyanomitra cyanolaema</i>			0	4	0	4	3	0	0	0	0	11	0.6
Buff-throated Sunbird	<i>Chalcomitra adelberti</i>			0	2	0	2	3	0	0	0	0	7	0.4
Collared Sunbird	<i>Hedydipna collaris</i>			4	5	4	3	2	0	0	0	0	18	0.9
Copper Sunbird	<i>Cinnyris cupreus</i>			3	0	4	1	0	0	0	0	1	9	0.5
Fraser's Sunbird	<i>Deleornis fraseri</i>			1	1	0	0	0	0	0	0	0	2	0.1
Grey-chinned Sunbird	<i>Anthreptes rectirostris</i>			0	2	0	0	1	0	0	0	0	3	0.2
Johanna's Sunbird	<i>Cinnyris johannae</i>			0	2	0	0	2	0	1	0	2	7	0.4
Little Green Sunbird	<i>Anthreptes seimundi</i>			2	3	0	2	1	0	0	0	0	8	0.4
Olive Sunbird	<i>Cyanomitra olivacea</i>			2	6	2	3	2	0	0	0	0	15	0.8
Olive-bellied Sunbird	<i>Cinnyris chloropygius</i>			3	2	4	2	3	0	1	0	0	15	0.8
Superb Sunbird	<i>Cinnyris superbus</i>			1	3	3	3	2	0	0	0	2	14	0.7
Variable Sunbird	<i>Cinnyris venustus</i>			3	4	0	3	2	0	0	0	3	15	0.8
PLOCEIDAE														
Black-necked Weaver	<i>Ploceus nigricollis</i>			2	3	6	4	5	0	0	0	0	20	1.0
Blue-billed Malimbe	<i>Malimbus nitens</i>			0	3	2	0	2	0	0	0	0	7	0.4
Crested Malimbe	<i>Malimbus malimbicus</i>			3	2	0	0	2	0	0	0	0	7	0.4
Grosbeak Weaver	<i>Amblyospiza albifrons</i>			0	0	4	0	0	0	0	0	0	4	0.2

Maxwell's Weaver	<i>Ploceus albinucha</i>			0	8	0	0	0	0	0	0	1	9	0.5
Red-headed Malimbe	<i>Malimbus rubricollis</i>			3	2	0	0	3	0	0	1	0	9	0.5
Red-headed Quelea	<i>Quelea erythrops</i>			0	0	0	0	6	0	0	0	0	6	0.3
Red-vented Malimbe	<i>Malimbus scutatus</i>			0	2	0	3	0	0	0	0	0	5	0.3
Spectacled Weaver	<i>Ploceus ocularis</i>			3	0	2	0	0	0	0	0	2	7	0.4
Vieillot's Weaver	<i>Ploceus nigerrimus</i>			12	0	20	0	0	0	0	0	0	32	1.7
Village Weaver	<i>Ploceus cucullatus</i>			0	6	30	0	12	12	15	10	16	101	5.2
Yellow-mantled Weaver	<i>Ploceus tricolor</i>			0	4	0	0	0	0	0	0	0	4	0.2
Yellow-mantled Widowbird	<i>Euplectes macroura</i>			12	2	4	0	2	0	0	0	0	20	1.0
ESTRILDIDAE														
Black-and-white Mannikin	<i>Spermestes bicolor</i>			7	0	0	0	6	0	0	0	0	13	0.7
Chestnut-breasted Negrofinch	<i>Nigrita bicolor</i>			2	5	4	4	5	0	0	0	0	20	1.0
Grey-headed Negrofinch	<i>Nigrita canicapillus</i>			0	2	3	3	3	0	1	0	0	12	0.6
Orange-cheeked Waxbill	<i>Estrilda melpoda</i>			5	6	0	0	0	0	0	0	3	14	0.7
Pale-fronted Negrofinch	<i>Nigrita luteifrons</i>			0	3	1	2	1	0	0	0	0	7	0.4
Red-billed Firefinch	<i>Lagonosticta senegala</i>			4	0	0	0	2	0	0	0	0	6	0.3
White-breasted Negrofinch	<i>Nigrita fusconotus</i>			0	2	0	1	2	0	0	1	0	6	0.3
VIDUIDAE														
Pin-tailed Whydah	<i>Vidua macroura</i>			6	2	4	5	3	4	1	1	2	28	1.5
Fonio Indigobird	<i>Vidua camerunensis</i>			3	0	0	2	0	0	0	0	0	5	0.3
Village Indigobird	<i>Vidua chalybeata</i>			2	0	2	0	0	0	0	0	0	4	0.2
NICATORIDAE														

Western Nicator	<i>Nicator chloris</i>			1	5	6	0	0	0	0	0	0	12	0.6
MACROSPHENIDAE														
Green Crombec	<i>Sylvietta virens</i>			0	0	0	2	0	0	0	1	0	3	0.2
Moustached Grass Warbler	<i>Melocichla mentalis</i>			2	0	0	0	0	0	0	0	2	4	0.2
Grey Longbill	<i>Macrosphenus concolor</i>			1	2	0	2	0	0	0	0	0	5	0.3
CISTICOLIDAE														
Buff-throated Apalis	<i>Apalis rufogularis</i>			0	2	0	0	2	0	0	0	0	4	0.2
Grey-backed Camaroptera	<i>Camaroptera brachyura</i>			3	4	5	3	3	0	0	0	0	18	0.9
Olive-green Camaroptera	<i>Camaroptera chloronota</i>			2	4	1	2	1	0	3	0	0	13	0.7
Short-winged Cisticola	<i>Cisticola brachypterus</i>			3	1	1	0	0	0	0	2	0	7	0.4
Tawny-flanked Prinia	<i>Prinia subflava</i>			2	2	3	1	0	0	0	0	1	9	0.5
Whistling Cisticola	<i>Cisticola lateralis</i>			4	3	4	1	1	3	0	0	0	16	0.8
Winding Cisticola	<i>Cisticola galactotes</i>			5	0	2	0	0	0	0	0	0	7	0.4
Yellow-browed Camaroptera	<i>Camaroptera superciliaris</i>			0	0	0	0	3	0	0	0	2	5	0.3
HIRUNDINIDAE														
Black Saw-wing	<i>Psalidoprocne pristoptera</i>			0	0	0	3	3	0	0	0	0	6	0.3
Fanti Saw-wing	<i>Psalidoprocne obscura</i>			6	10	10	3	3	0	0	0	0	32	1.7
Forest Swallow	<i>Petrochelidon fuliginosa</i>			0	2	0	0	2	0	0	0	0	4	0.2
Preuss's Swallow	<i>Petrochelidon preussi</i>			9	6	5	0	0	0	0	0	0	20	1.0
Rufous-chested Swallow	<i>Cecropis semirufa</i>			4	2	2	0	4	0	0	0	1	13	0.7
Square-tailed Saw-wing	<i>Psalidoprocne nitens</i>			0	3	0	2	0	0	0	0	0	5	0.3
White-bibbed Swallow	<i>Hirundo nigrita</i>			0	1	0	0	1	0	0	0	0	2	0.1

PYCNONOTIDAE														
Ansorge's Greenbul	<i>Eurillas ansorgei</i>			0	3	0	0	2	2	0	1	1	9	0.5
Baumann's Greenbul	<i>Phyllastrephus baumanni</i>			2	1	2	0	0	2	0	3	0	10	0.5
Common Bulbul	<i>Pycnonotus barbatus</i>			6	4	8	6	4	2	0	0	0	30	1.6
Grey Greenbul	<i>Eurillas gracilis</i>			2	5	0	1	2	4	0	0	3	17	0.9
Grey-headed Bristlebill	<i>Bleda canicapillus</i>			0	2	2	0	0	2	3	2	0	11	0.6
Honeyguide Greenbul	<i>Baeopogon indicator</i>			3	2	3	3	3	3	0	0	3	20	1.0
Little Greenbul	<i>Eurillas virens</i>			0	4	6	2	4	2	0	0	2	20	1.0
Plain Greenbul	<i>Eurillas curvirostris</i>			2	3	1	2	3	1	2	4	0	18	0.9
Red-tailed Bristlebill	<i>Bleda syndactylus</i>			0	3	0	0	0	0	0	2	0	5	0.3
Red-tailed Greenbul	<i>Criniger calurus</i>			2	4	0	0	3	0	0	0	1	10	0.5
Simple Greenbul	<i>Chlorocichla simplex</i>			7	5	6	2	7	0	1	0	2	30	1.6
Slender-billed Greenbul	<i>Stelgidillas gracilirostris</i>			2	6	2	3	4	2	0	0	2	21	1.1
Spotted Greenbul	<i>Ixonotus guttatus</i>			0	5	0	0	4	0	0	0	0	9	0.5
Swamp Palm Bulbul	<i>Thescelocichla leucopleura</i>			0	2	0	0	3	1	2	0	3	11	0.6
Western Bearded Greenbul	<i>Criniger barbatus</i>			0	5	0	0	4	0	0	4	0	13	0.7
Yellow-whiskered Greenbul	<i>Eurillas latirostris</i>			10	12	5	2	5	0	0	0	0	34	1.8
SCOTOCERCIDAE														
Chestnut-capped Flycatcher	<i>Erythrocercus mccallii</i>			2	3	2	0	4	0	0	0	0	11	0.6
Green Hylia	<i>Hylia prasina</i>			0	2	2	2	3	0	2	0	1	12	0.6
Tit Hylia	<i>Pholidornis rushiae</i>			3	3	3	0	2	0	0	1	0	12	0.6
ZOSTEROPIDAE														

African Yellow White-eye	<i>Zosterops senegalensis</i>			2	0	0	0	2	0	0	0	0	4	0.2
PELLORNEIDAE														
Puvel's Thrush Babbler	<i>Illadopsis puveli</i>			1	1	0	0	0	0	0	0	0	2	0.1
STURNIDAE														
Splendid Glossy Starling	<i>Lamprotornis splendidus</i>			0	0	0	3	0	0	0	2	0	5	0.3
MUSCICAPIDAE														
Cassin's Flycatcher	<i>Muscicapa cassini</i>			1	1	0	0	1	0	0	0	0	3	0.2
Dusky-blue Flycatcher	<i>Muscicapa comitata</i>			1	1	1	0	0	0	0	0	1	4	0.2
Fire-crested Alethe	<i>Alethe castanea</i>			0	3	0	0	0	0	0	0	0	3	0.2
Fraser's Forest Flycatcher	<i>Fraseria ocreata</i>			1	1	0	0	0	0	0	0	1	3	0.2
Grey Tit Flycatcher	<i>Myioparus plumbeus</i>			1	0	1	0	0	0	0	0	0	2	0.1
TURDIDAE														
White-tailed Ant Thrush	<i>Neocossyphus poensis</i>			0	2	0	0	0	0	0	0	2	4	0.2
Rufous Flycatcher Thrush	<i>Stizorhina fraseri</i>			0	3	0	0	0	0	0	0	0	3	0.2
African Thrush	<i>Turdus pelios</i>			1	2	3	1	1	0	0	1	0	9	0.5
THRESKIORNITHIDAE														
Hadada Ibis	<i>Bostrychia hagedash</i>		EN	0	0	0	0	0	0	0	0	2	2	0.1
ARDEIDAE														
Green-backed Heron	<i>Butorides striata</i>			0	0	0	0	0	0	2	1	3	6	0.3
ANHINGIDAE														
African Darter	<i>Anhinga rufa</i>			0	0	0	0	0	0	0	1	2	3	0.2

Number of signs				29 1	35 5	32 6	19 5	28 8	84	98	113	174	1924	100.0
Number of species				96	12 0	98	79	10 4	32	38	51	72	170	





