

## Report on High Conservation Value Assessment for GREL's Asikasu and Okurase Rubber Project

Subtitle

April 2016



## About Proforest

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

Proforest works to transform commodity 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 Ghana leads on delivery of Proforest activities in West and Central Africa including direct support to companies implementing responsible production, sourcing and investment for agricultural and forest commodities together with long-term programmes to support capacity building and multi-stakeholder initiatives in the region. Proforest also has offices in Brazil, Malaysia and the UK.

Our team comprises specialists in forest management, agricultural commodities such as palm oil, conservation and sustainability initiatives and certification. We have extensive experience in Africa and internationally and can work in English, French and Portuguese.

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## ALS Cover Page

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**Organisation commissioning work:** Ghana Rubber Estate Limited (GREL)

**Address:** Ghana Rubber Estates Limited,  
P. O. Box TD 228,  
Takoradi, Ghana

**Assessment location:** Eastern Region, Ghana

**Size of assessment area:** 850 ha

**Planned land use:** Commercial rubber plantation

**ALS Tier Rating:** Tier 1

**Certification scheme:** N/A

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# 1 Introduction

Ghana Rubber Estate Limited is a leading rubber producer in Ghana. The company is engaged in natural rubber production at both the primary and manufacturing levels. GREL currently has rubber estates in the Western Region of Ghana as well as an outgrower programme which feeds the processing factory at Apemenim. As part of its expansion programme, the company has acquired new concessions in the Eastern Region of Ghana. The first two sites acquired are located at Okurase and Asikasu in the Upper West Akyem Districts. Work is currently ongoing to acquire several additional new sites in the region and the company plans to acquire no less than 5,000 ha in the coming years. GREL however intends to commence land preparation and plant on those areas it acquires in a staggered manner, as and when the acquisitions are made. Detailed social and environmental assessments of risks and potential impacts of proposed projects have to be conducted before land preparation commences in any case.

As a member of the SIFCA Group, GREL is committed to demonstrating sound environmental management in all its operations and meeting the SIFCA Environmental and Social Charters as well as meeting the requirements from its investor partners, PROPARCO. This requires that the company should identify all areas necessary for the protection of biodiversity and minimise the impacts of their operations on the environment and on society. As part of this commitment, GREL asked Proforest to conduct a detailed and independent High Conservation Value assessment of its new acquisitions in the Eastern Region of Ghana. This independent assessment would help the company demonstrate their efforts towards protecting HCVs in line with SIFCA's Environmental and Social Charter as well as meeting the performance standards of the International Finance Company (IFC) which has been adopted by PROPARCO.

## Proposed sites

Site	Total size (ha)
Okurase	250 ha
Asikasu	600 ha
<b>Total</b>	<b>850 ha</b>

Given the phased acquisition of plots, GREL intends to carry out detailed assessments of each individual plot of land it acquires before it commences land preparation. In March, 2016, GREL asked Proforest to carry out a full independent High Conservation Value Assessment of its first two sites at Okurase and Asikasu and also investigate the possibility of conducting a phased HCV assessment for subsequent acquisitions made by the company within the broader landscape in the coming months.

This report describes the methodology adopted, team composition, HCV findings and management and monitoring recommendations for the Okurase and Asikasu sites. The main objectives of the assessment were to:

- Identify all the HCVs that are present or potentially present within the management area as well as those within the larger landscape that can be affected by the proposed plantation development programme
- Identify the threats to the management of the HCVs
- Provide management and monitoring recommendations for ensuring the continuous existence of the identified HCVs within the management area and also within the broader landscape

All these objectives are aimed at collectively demonstrating GREL's commitment to meeting its own Environmental and Social Charter as well as demonstrating compliance with international best practice.

The two sites consist primarily of farmlands and bush fallows with a few patches of advanced regeneration and heavily degraded secondary forests. At the time of the assessment, there were no large scale or industrial plantations on the site. That notwithstanding, the predominant land use of the area is subsistent agriculture and cash crop agriculture predominantly, oil palm cacao and citrus.

### About the HCV Concept

*High Conservation Values (HCVs) refer to biological, ecological, social or cultural values considered to be of outstanding significance at the national, regional or global scale and which require special protection for their maintenance and/or enhancement. The HCV concept aims at identifying areas with these values and developing appropriate management strategies to maintain and/or enhance the values they contain. The concept was originally developed in 1999 by the Forest Stewardship Council (FSC) and has since been widely used in the context of FSC certification for sustainable forestry. The HCV concept has gained global recognition resulting in its adoption and wide use outside of forest certification. It is currently being used in land-use planning, investment and in conservation advocacy. The increasing use of the concept outside of forest certification has been possible due to its adaptability and the availability of toolkits and guidance for potential users. Appropriate use of the concept aids forest managers, land use planners and producers of agricultural commodities to safeguard important conservation values during operations and deliver sustainable and responsible management of natural resources.*

### 1.1 Scope

The scope of this assessment was limited to the two sites that have been acquired by the company at:

- Okurase 250 ha
- Asikasu 600 ha

### 1.2 Reference document

The key reference document for this HCV assessment has been the Ghana National Interpretation of the Global HCV Toolkit (2006). All the definitions used in this report are based on those in the national interpretation. Given that this National Interpretation of the toolkit has not been updated since 2006, the assessment team has also extensively consulted and referred to the guidance in the HCV Common Guidance for identification, management and monitoring (2014). This is to ensure that the basis of HCV decision making are consistent with current definitions and guidelines of the HCV Resource Network.

### Summary of the 6 HCV categories

**HCV 1:** Concentrations of biological diversity including endemic species, and rare, threatened or endangered (RTE) species that are significant at global, regional or national levels.

**HCV 2:** 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.

**HCV 3:** Rare, threatened, or endangered ecosystems, habitats or refugia. **HCV 4:** Basic ecosystem services in critical situations including protection of water catchments and control of erosion of vulnerable soils and slopes.

**HCV 4:** Basic ecosystem services in critical situations including protection of water catchments and control of erosion of vulnerable soils and slopes.

**HCV 5:** Sites and resources fundamental for satisfying the basic necessities of local communities or indigenous peoples (for example for livelihoods, health, nutrition, water), identified through engagement with these communities or indigenous peoples.

**HCV 6:** 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.

## 2 Description of the assessment area

### 2.1 Site description

The two sites cover a total of 850 ha with 600 ha at Asikasu and 250 ha at Okurase. The project sites are named after the respective villages, Asikasu and Okurase in the Upper West Akyem District of the Eastern Region of Ghana. The two villages lie on the main Adeiso-Asamankese Highway, with the Asikasu site terminating just near the highway, whilst the Okurase site is only some 0.73 km away from this highway.

The two proposed sites are located within the Moist Semi Deciduous Forest Zone of Ghana. The area is characterised by moderate rainfall with two marked dry seasons during the year. Annual rainfall for this zone reaches up to 1,800 mm with the characteristic long dry season between December and February whilst the minor dry season occurs in August. The timings for these seasons however vary from year to year. Natural vegetation in this zone will typically consist of upper canopy trees reaching up to 40 m and emergent trees growing up to 60 m in height. Most of the species here are deciduous shedding their leaves mostly in the dry season or at the onset of the rainy season.

At the project site, the natural vegetation has been heavily and thoroughly modified with hardly any tree cover present at the site. The area is still under intensive use as agricultural lands with cacao, oil palm and citrus being the major cash crops. Plantain and cassava were the other predominant crops in the area. Areas that are not currently under cultivation are dominated by various grass species and weeds such as *Chromolaena odorata*. There are hardly any well-developed secondary forests in the areas visited and it appears that tree regeneration on the plots has been comprehensively suppressed by the current agricultural practices in the area which typically involve slash and burn and at times the use of agrochemicals that target woody growths. Hence, even typical pioneer light demanding species such as *Musanga cecropioides*, *Macaranga barteri* and *Ceiba pentandra* are rare occurrence on both of the two sites. That notwithstanding the all the dominant species that were identified at the site were light demanders such as *Morinda lucida*, *Albizia zygia*, *Senna siamea* with diameter at breast heights not exceeding 40 cm.

Our general conclusion is that for parts of these plot to regain its natural forest ecosystem, some significant management effort would need to be put in to aid regeneration. However, these management areas are generally well known to be agricultural lands with a long history of management as farmlands. The few trees that are still present at the site have been left either as shade trees or are part of the regenerating cover in fallow areas. Additionally, the proximity of these sites to the main Nsawam-Asamankese highway provides easy access to loggers who have in the past extracted most of the available timber species in the area, whilst farmers have subsequently followed up with slash and burn agriculture to convert the remaining forest patches to cacao, citrus or oil palm farms.



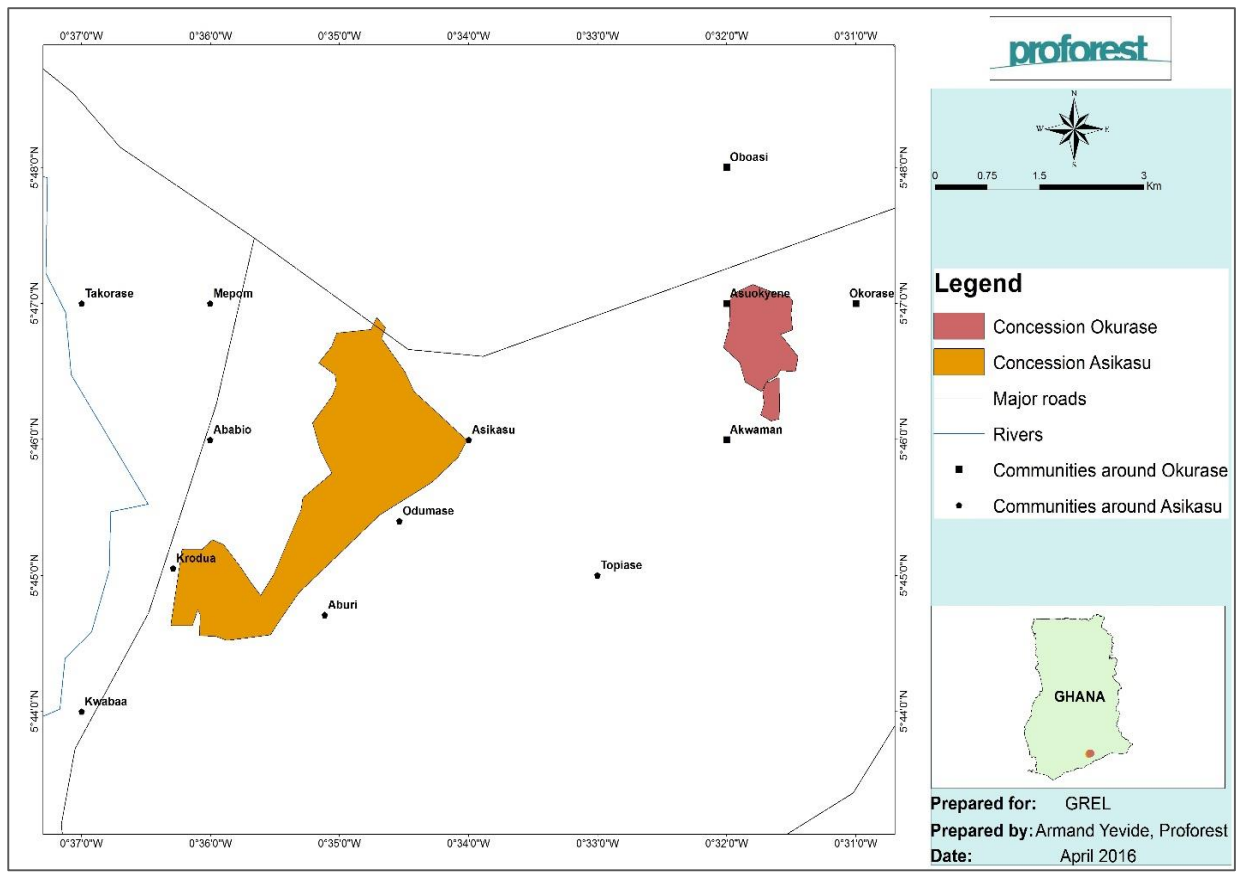


Figure 1: Locations of two concessions

## 2.2 Wider landscape context

The Eastern Region of Ghana where the management areas are located is one of the major cacao growing areas in the country. The natural forest types that occur in the area include the Moist Semi-Deciduous, Dry Semi-Deciduous and Upland Evergreen Forest Types. Most of these natural forests have been converted to agricultural lands and settlements. Outside of the designated protected areas, there are hardly any forests in good condition. The region lies between latitudes 6 and 7 degrees North and longitude 1.30 West 0.30 degrees East. The topography of the region is quite diverse with low lying areas around the valley of the Volta River and Lake and one of the highest reliefs, the Akwapim-Togo- Ranges. The region is well drained with the Volta Lake covering large stretches of the land. By it, transportation is made possible between the southern and northern parts of the country.

As with most other parts of the country, settlements tend to be denser closer to major roads, and the Adeiso-Asmankese road is the most important road that links the nation's capital, Accra to key towns in the Eastern Region such as Asamankese and Kade. Typically, the forest cover closer to the major roads tend to be degraded due to the easy transport links for loggers, the rather high populations along or close to the roads and the fact that farmers would strategically want their farms to be closer to the roads to be able to transport their produce to market centres.

The Upper West Akyem District, where the project site falls, is one of the 26 administrative districts in the Eastern Region. Adeiso which is on the Nsawam-Kade highway is located in the south western part of the region and serves as the capital of the district. It shares boundaries to the east with Ayensuano district, to the north with west Akim municipality, to the south eastern part with Nsawam-Adoagyiri municipality, to the south with Ga south municipality and to the south with Awutu-Afutu Senya district in the Central Region. The district has a total land size of about 342.3 km<sup>2</sup>.

The district has an appreciable undulating high and low lands with the highest point being at Adeiso which rises to about 500m above sea level. It has River Ayensu as the main river that drains through from the Ayensuano district in the eastern part of the district to join the central region in the west. The natural vegetation of the district would typically include high forests that are rich in timber and other forest products. The district is also endowed with rich soils which makes it suitable for farming activities.

The main economic activity in the district is mainly agriculture. It is estimated that the agricultural sector employs about 65 percent of the total population in the district. The major crops that are produced in the district include cassava, plantain, pawpaw, oil palm, pineapple among others. Adeiso, the district's capital is noted for processing cassava into high quality gari which attracts a lot of traders from all over the country to the district for trading purposes. The district also has a large market located at Adeiso that attracts traders from Accra the capital of Ghana. There are also groups who engage in the processing of palm fruits into oil that also attracts traders from far and near to come and buy the oil for sale in other markets.

### Tenure

The predominant land tenure system practiced is the *Abusua*<sup>1</sup>. Most of the lands in the jurisdiction are stool-vested lands and are leased out to farmers. The farmers pay an amount for an acre of land every year at Asamankese office of the administrator for Stool Lands. Traditionally, such lands are not given out for outright purchase, but may be leased for a period or given to tenants under various sharecropping arrangements. Prior to GREL's acquisition, the two plots had been given out to tenant farmers for the cultivation of food and cash-crops with annual rent paid by these farmers to the Stool (chief). Though these tenants do not technically own the land, they have some use rights over these lands having occupied them for several decades and deriving their main livelihood source from the land.

## 2.3 National context

Ghana covers a total area of 239,500 km<sup>2</sup> with a population of about 24 million, according to the 2010 Population Census. Fifty-four percent (54%) of Ghanaians live in rural areas. Agriculture, both subsistence and cash crop, is the major economic activity in the country. There are two predominant ecological zones in

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<sup>1</sup> *Abusua* is the Twi word for family. Lands are owned by various families and their administration are normally vested in the head of the family or chief

Ghana: the high forest zone mainly in the south-western third of the country (covering about 35% of the country) and the savannah zone.

The biological diversity of the high forest ecological zone is high and accounts for most of the biological diversity of the country. For example, out of 3,725 higher plants known to be in Ghana, about 2,300 are found in the high forest zone, including 730 tree species. Similarly, 185 of the 222 mammals of Ghana and about 200 of the 494 resident birds in Ghana are present in the high forest zone. Amphibians, reptiles and fishes have not yet been systematically surveyed in the forest zone but it is assumed that this zone harbours most of the diversity of these groups. As far as plants are concerned, the Wet Evergreen Forest Zone has the highest species richness and there is an overall decreasing gradient in plant diversity from south to north even in the same forest ecological zone.

Hawthorne and Abu-Juam (1995) have developed the concept of Genetic Heat Index (GHI) to identify the most important areas for tree species conservation in Ghana.

### Genetic Heat Index (GHI)

The GHI is a measure of distinctiveness and conservation importance of an area of forest based on the taxonomy, ecology and distribution of its tree species. Forests with tree species not closely related to other taxa, which are sensitive to environmental change and are nationally or globally rare have a high GHI. Map of the forests with higher GHI shows that they are mainly located in the wet and moist evergreen forest types.

The usual classification of Forest in Ghana (Hall & Swaine, 1981) recognizes seven forest types within the High Forest Ecological Zone, each with distinct plant assemblage and corresponding rainfall and soil conditions.

Table 1: Areas of the different vegetation zones in Ghana

Vegetation type	Area (km <sup>2</sup> )	% land area of Ghana	% of total high forest	Annual rainfall (mm)
Wet evergreen	6570	2.77	8.1	1500-2100
Moist evergreen	17770	7.48	21.8	1500-1700
Moist semi-deciduous	32890	13.84	40.4	1200-1800
Dry semi-deciduous	21440	9.02	26.4	1250-1500
Upland evergreen	292	0.12	0.3	1500-2000
Southern marginal	2360	0.99	2.9	1000-1250
South-east outlier	20	0.01	0.02	750-1000

NB: The savannah zone, made up of the Coastal, Guinea and Sudan savannahs cover about 65.77% of the total land area.

First forest reserves were created in the 1920s and a network of forest reserves managed by the Forestry Commission has been gradually established all over the

country. Today, there are 282 forest reserves in Ghana covering a total area of 23,729 km<sup>2</sup>. 216 forest reserves are located in the high forest zone covering about 17,000 km<sup>2</sup>.

Forest reserves have played and still play a key role in the conservation of forests and it has been estimated that less than 1 per cent of the forest cover is found outside forest reserves, much of it in small scattered fragments. Forest reserves, however, have suffered huge human pressures and degradation.

### 2.3.1 Threats to forests and biodiversity

At the turn of the 20<sup>th</sup> century, it was estimated that Ghana had over 80,000 km<sup>2</sup> of high forest but by 1950 this had fallen to 42,000 km<sup>2</sup> and by 1980 only 19,000 km<sup>2</sup> was left. In 1990, the current area of intact high forest was estimated at about 15,000 km<sup>2</sup> and in 2000 it was estimated at about 12,900 km<sup>2</sup>. Annual rate of deforestation is estimated at 2%.

The main causes of deforestation are shifting agriculture, wildfires, demand for fuel wood and over-logging. Agriculture alone accounts for more than 70% of deforestation. Forest fires are more pronounced in the drier semi-deciduous vegetation zone and are becoming a growing threat to the long term survival of forests in some parts of the country. Heavily logged forests and previously burnt areas for agricultural purposes allow fires to spread deep into forest areas.

Another major threat to biodiversity is the bush-meat trade. With increasing urbanisation and associated demand for food, there is now a high bush-meat demand in towns and it is estimated that the bush-meat trade is worth 200-300 M US\$ per year in Ghana, (i.e. between 2.4% and 3.6% of Ghana's annual GDP). Rodents and ungulates accounted for 59% and 25% of the biomass traded respectively.

Due to the high level of human pressures on the forests of the high forest zone, several species are now threatened with extinction either at the national or global levels.

## 3 HCV Assessment Team

Name	ALS License	Institution	Role	Expertise
Isaac Abban-Mensah	Provisional ALS15007IM	Proforest	Team Leader	Forest Ecology, and social expert

Abraham Baffoe	Provisional ALS15006AB	Proforest	Assessment Oversight	Forest Ecology, Biodiversity, conservation and social expert
Emmanuel Danquah	-	KNUST	Fauna Survey lead	Fauna expert
Eric Ofori Agyekum	-	Independent	Vegetation Survey Lead	Botany/Ecology
Frank Kwesi	-	Resource Trust	Vegetation Survey	Botany
Jacqueline Sapoama	-	AROCHA Ghana	Ecosystems assessment	Ecology, social expert
Armand Yevide	-	Proforest	GIS/Mapping, Hydrology and drainage	Hydrology, ecology

The bios of team members are included in Annex 1

## 4 Methodology and timeline

The assessment process gathered data and information from multiple streams. These included desk reviews, consultations with relevant stakeholders, field assessments and community consultations.

### 4.1 Pre-assessment scoping

Prior to undertaking the full HCV field assessment, a scoping visit was conducted by Proforest to obtain an overview of the nature of the vegetation in the area, possible HCVs and the key areas that the field assessment had to focus on. This exercise was useful in helping to ascertain that the project sites do not contain primary forests. Though very brief, this process was also helpful in informing the design of the HCV assessment methodology. The scoping study involved brief visits to the concession areas, interaction with GREL staff and consultations with communities. Information gathered was verified during consultations with key stakeholders. Preliminary observations made during the pre-assessment showed that the concessions consisted predominantly of a mosaic of farmlands and bush fallows. This informed the design of the HCV assessment methodology, the team requirements for the assessment, the literature review and the expert consultation.

### 4.2 Desk-based literature review:

A desk review of relevant documents and reports was carried out prior to the field assessment. The objective of the desk review was to identify the key landscape level concerns that apply and the likely conservation values present in the area. Literature reviewed included surveys that had been conducted in the company's concessions and adjoining areas, academic papers, reports and files made available by GREL such as concession maps. Additionally, literature on the main landscape level conservation concerns was reviewed. This phase yielded useful information on land use trends, likely conservation values to be encountered in the concessions as well as empirical data on surveys that had been conducted within the broader landscape.

### 4.3 Consultation with government institutions

Key government institutions responsible for land administration, natural resource management and environmental protection were consulted during the assessment process. The aim was to establish the formally designated land use of the concession areas and also to understand the national approach towards protecting biodiversity and addressing tenure and use rights of local communities over natural resources in the area. This process was also useful in helping the assessment team obtain an understanding of the company's legal obligation in terms of sustainable natural resource management and obligations to local communities in the catchment area of the concessions. Institutions consulted included the Forestry Commission, the Ministry of Agriculture and the Local Government Authority.

## 4.4 Risk assessment

As part of the assessment process, Proforest conducted a risk assessment of this project using a tier system in line with the recommendations of the HCV Resource Network<sup>2</sup>. Results of the risk assessment are presented below:

	Indicators of potential Risk	Finding	Details
Scale	Will the operation cover or affect more than 50,000 ha?	NO	This is a low scale project intended to cover a maximum of 850 ha.
Intensity	Is conversion of more than 500 ha of natural ecosystem or habitat planned?	NO	The project plans to convert close to 850ha of <b>highly modified ecosystems</b> . The concession currently consists predominantly of farmlands, bush fallows and some very few patches of natural vegetation
Risk	Does the assessor hold a provisional HCV license	YES	The assessor holds a provisional HCV license and is among the first generation of provisional HCV assessors. The assessor has vast HCV assessment experience.
	Does the project area contain, border or overlap with any priority biodiversity areas?	NO	The concession does not contain, border or overlap with any priority biodiversity area
	Are there local or indigenous peoples living in/using the area who have claims to land, water and or natural resources in the project area?	YES	There are local communities living <b>close</b> to the concession. Some have farmlands in the area, and they collectively access goods and services found in the concession area. The company has negotiated compensations for affected families in the area
	Is the HCV assessment taking place outside of a recognised certification scheme?	YES	The assessment forms part of the company's own commitment to protecting biodiversity conservation values. However, the company is also being assessed using the IFC's PS, which also contains additional sustainability safeguards.

The HCV Resource Network Assessor Licence Scheme, requires that a Tier 1 HCV assessment project includes a scoping study prior to the full HCV assessment. It also requires the report of the assessment to be peer reviewed by a HCV Resource Network approved peer reviewer.

**Though the proposed project is a low-scale and low intensity operation, the assessment report would have to be peer reviewed as part of the HCV ALS programme requirement.**

<sup>2</sup> <https://www.hcvnetwork.org/als/tier-assessment>

## 4.5 Consultations with local communities

In addition to the consultation with stakeholders, the assessment team also visited all relevant *landlord communities* who hold some form of traditional tenure over the lands in the concessions area. These are referred to here as *host communities*. The aim was to get an understanding of:

- The level of local communities' dependence on natural resources in the concessions area.
- Socio-cultural and religious values that are present in or linked to the concessions areas
- General perception about the proposed plantation development and how it would alter the socio-economic and cultural landscape of the host population
- Traditional tenure systems and claims over the concession areas (if any)

Details of the communities consulted are listed in Table 3 below.

Table 2: List of host communities near the concessions

	Community	Date
1	Asikasu	23-02-2016
2	Okurase	24-02-2016
3	Odumase	24-02-2016
4	Aburi	25-02-2016
5	Breman	25-02-2016

## 4.6 Summary of itinerary

A brief outline of the timings of the various activities that took place during this assessment are presented in table 4 below. A detailed itinerary that lists dates and key persons consulted and the specific issues raised during the discussions is presented in Appendix 1.

Table 3: Timelines of key activities conducted

Start dates	End dates	Activity
Sept, 2015	Oct, 2015	Scoping visit
Oct, 2015	March, 2016	Stakeholder expert consultations
Feb, 2016	March, 2016	Biological surveys
Feb, 2016	March, 2016	Social surveys
April, 2015	May, 2015	Reporting

## 4.7 Field work

In order to obtain primary data to enhance understanding on what conservation values are in the concessions, the team carried out a number of field data collections. The various assessments and studies carried out were informed by the experts' opinion in the region, observations made during the scoping visit and information gathered from consultations



with stakeholders as well as data from the literature reviewed. Data collection commenced in February, 2016 and ended in March, 2016. Assessments conducted included a biological assessment of the flora, fauna and the general vegetation and relief of the area as well as a socio-economic survey. The assessment team relied on the GIS team of GREL for appropriate maps which were required for the field work. Details of the data collection process and tools are provided below.

### 4.7.1 Planimetrics

Base maps for the GIS were created using vector layer data for roads, perennial rivers, administrative boundaries from IUCN (International Union for Nature of Conservation) database and Digital Chart of the World (DCW). High resolution satellite imagery was not available for this assessment. Hence public-domain Google Earth imagery was used to aid in planning for the survey.

### 4.7.2 Sampling design

For the flora and fauna surveys, data was collected using predetermined sampling plots. In order to ensure a fair coverage of the entire area of the concessions an automated sampling design was generated for the two sites. This allowed for the placement of a grid of parallel lines to be superimposed on the concession area taking into consideration the size, shape and layout of the concession.

#### 4.7.2.1 Flora survey

Eleven one-hectare sample plots were laid on the concession areas (8 in Asikasu and 3 in Okurase) using grids in GIS software for the map of the concession. Each sample plot measured 20 meters by 500 meters (size of 1 ha) and oriented North-South in a systematic pattern. A central survey transect was cut and the outer boundary of the plots determined at 10m away from this middle transect. Each plot was divided into ten quadrats, each measuring 20 m x 50 m.

Using the central transect, spotters walked along the lines and recorded all trees and lianas above 10cm dbh, 10m from either side of the transect. Records of the tree species and their diameter at breast height (dbh) were taken. Additionally, any other features of conservation interest were recorded. Spotters looked out for and recorded fruiting trees, seed trees, hollow trees, etc. Additionally, records were taken of the vegetation sub-types, important habitat areas and other landmarks such as the presence of rocks, streams, swamps, etc. Evidence of human activities in the area such as logging tracks, signs of previous burnings, farms, stumps, snares and evidence of logging were also noted and recorded. Data gathered from the field was compared with satellite imagery to aid in a better interpretation of remotely sensed data. To get an idea of the regeneration taking place, sampling plots of 5 m x 5 m were laid in the last quadrat of each plot. All tree regeneration less than 2m in height was recorded. Additionally, descriptive information about the area was taken.

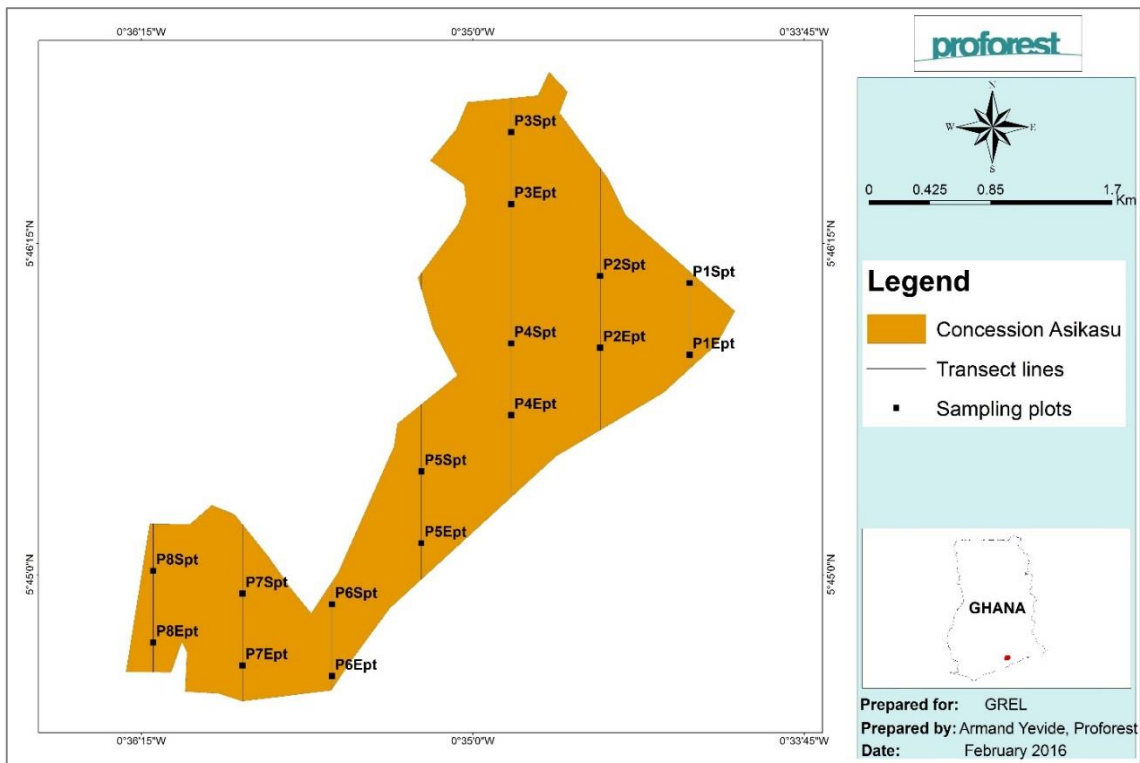


Figure 2: Starting points of transects laid for Asikasu

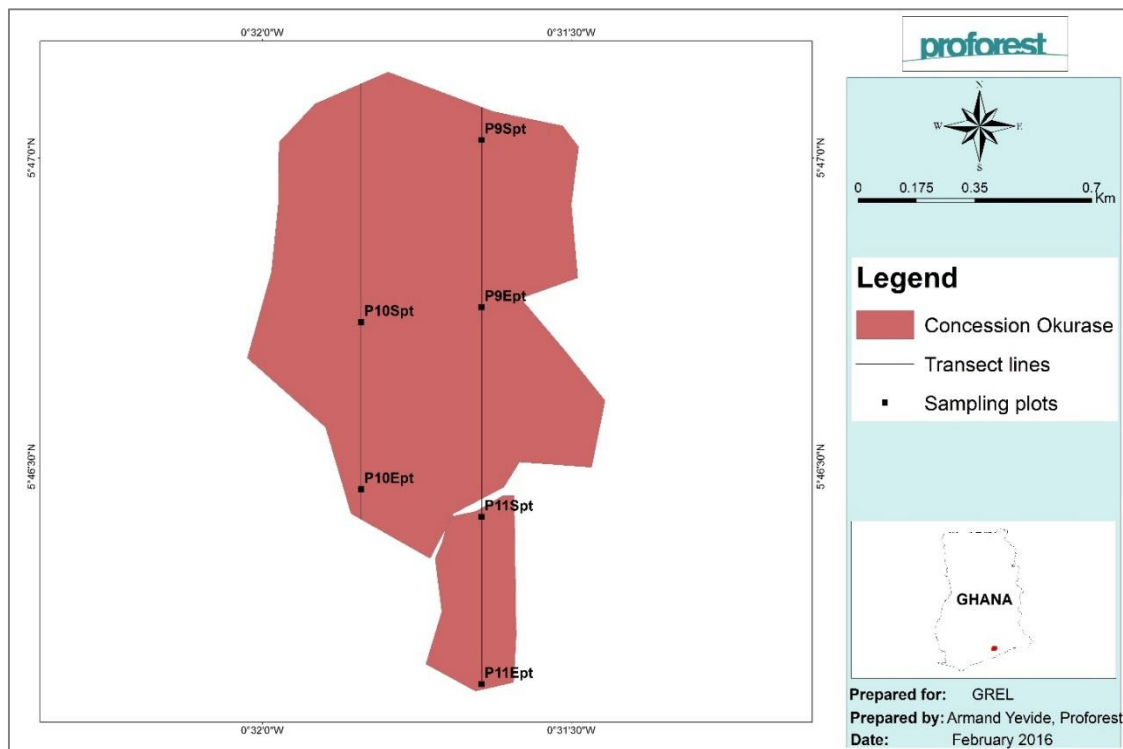


Figure 3: Starting points for transects at Okurase

### 4.7.2.2 Fauna survey

Sampling plots were systematically laid across the concession following a similar transect layout used by the botanic survey in Fig 8 and 9. Additionally, sampling was conducted along selected trails across the major land-use types.

#### **Mammals**

Information on large mammals was systematically obtained by direct observation and record of signs (vocalizations, droppings and footprints) along trails and foot paths within the selected sampling plots. Surveys were conducted during the early hours of the day and evenings. Additional information was obtained by interviewing local people, particularly hunters. Pictures in field guides (Stuart and Stuart, 2006 and Happold, 1990) were shown to the local people (hunters) to help in the identification of the mammals. It also gave the opportunity for others to corroborate or challenge the authenticity of information gathered from the field.

Small terrestrial mammal surveys involved direct observations of rodent signs including feeding signs and refuge examinations (searching in rodent burrows) along the line transects. All captured animals were identified using Happold (1990), sexed and released.

#### **Avifauna**

Bird surveys were also conducted systematically along the trails and foot paths within the sampling plots. Direct observations, including visual as well as vocal records were made to determine bird species occurrence. Additional information was also obtained from local people through interviews. Pictures in the field guide (Barrow and Demey, 2008) were shown to the local people to help in the identification. Particular attention was paid to species of special interest, notably rare or threatened species and key or unusual species

#### **Herpetofauna**

Reptiles and amphibian surveys involved direct observations and systematic refuge examinations (searching under rocks, logs, in rotten tree stumps, in leaf litter, old termite mounds and rodent burrows) within the sampling plots. Main reference for identifying herpetofauna was Hughes (1988).

#### **Conservation status**

The conservation status of the identified fauna was assessed using the Global (International Union for the Conservation of Nature (IUCN)) and National Ranking in Ghana (Wildlife Conservation Regulations, 1995).

#### **Global Criteria**

The International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species (2014) 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**

Ghana's wildlife laws (Ghana Wildlife Conservation Regulations, 1995) also categorize animal species into three main schedules based on the level of protection required for the particular species. The complete list is also provided in Appendix 1b.

### 4.7.3 Socio-economic/cultural surveys

As part of the assessment process, all relevant host communities were surveyed. The socio-economic and cultural surveys took place in February 2016. Data collection involved a series of interviews, focus group discussions and town hall meetings. The aim of these activities was to:

- To obtain some baseline information about the socio-economic dynamics of local communities, including information on livelihoods, household's dependency on resources in the natural environment and a general description of the local economy.
- To obtain some information on resource tenure in the community and how that influences resource management.
- To identify all areas of High Conservation Values in the concession together with the local communities and assess the threats posed to these HCVs as well as opportunities for their maintenance and possible enhancement

Discussions were held with different groups in the community to get their perspectives on the plantation establishment, likely impacts on conservation and socio-cultural values and means of mitigating these impacts.

### 4.7.4 Participatory mapping

Meetings were held with the host and surrounding communities. The various community groups (as per their communal governance structures) were represented at these meetings. During these meetings, a simplified map of the assessment area was presented to the various groups requesting them to indicate traditional and customary use areas.

### 4.7.5 Limitation

As at the time of the assessment, GREL's team had commenced land preparation at Asikasu. This implied that two of the planned sample plots had already been converted prior to the assessment. Even though our observations from the scoping study showed that these areas were already farmlands with hardly any trees, (and obviously the easiest to clear), the team missed the opportunity to assess potential regeneration in the area and the possible presence of small mammals prior to land preparation.

## 5 Identification of HCVs

This section presents an overview of the HCVs identified at the project sites. For each of the HCVs, information is provided about their identification, current status and potential threats to their continued existence. The definitions and explanations of the HCVs follow the Ghana national interpretation of the HCV toolkit, the requirements contained in the Global HCV Toolkit and also the Common Guidance for HCV identification.

Table 4: Tabular presentation of HCVs present in the concessions

HCV	Description	Present	Potentially present	Absent
HCV 1.1	Protected Areas			
HCV1.2	High concentration of species			
HCV 2	Large landscape-level ecosystems			
HCV 3	Rare, threatened or endangered ecosystems, habitats or refugia			
HCV 4.1	Areas that are important for watershed protection			
HCV 4.2	Areas critical for erosion control			
HCV 4.3	Areas serving as natural barriers against destructive wildfires			
HCV 4.4	Areas that play a critical role in climate regulation			
HCV 5	Areas providing basic needs of local communities			
HCV 6	Areas with critical socio-cultural or traditional/religious importance			

### 5.1 HCV 1: Globally, regionally or nationally significant concentrations of biodiversity values

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 High Conservation Value areas. However, these species must be present in global, regional or nationally significant concentrations. The Ghana HCV toolkit has two sub-categories under HCV 1. These are:

- Protected areas
- Threatened and endangered species (*and the habitats needed for their protection*)

## 5.1.1 HCV 1.1 Protected Areas

### 5.1.1.1 Definition

HCV 1.1 refers to areas that are set aside for protection and are equivalent to IUCNs protected area categories I-V<sup>3</sup>. These areas are usually gazetted as protected under national, state or regional laws. Protected Areas (PAs) are so designated to serve as biological reserves containing high levels of biodiversity and are usually the cornerstone for biodiversity conservation in many countries. Additionally, protected areas also perform critical ecological and environmental service functions such as water catchment protection, erosion prevention and micro-climate moderation.

HCV	Key question	Findings
1.1	Does the concession contain, form part of or adjoin a protected area?	ABSENT

### 5.1.1.2 Identification

Though there are different categories of Protected Areas in the country, the Ghana HCV toolkit considers only the following PA types as meeting the definition for HCV 1.1.

- National Parks
- Resource Reserves
- Global Protection Reserves
- Globally Significant Biodiversity Area
- Hill Sanctuaries
- Provenance Protection Areas and
- Wildlife Sanctuaries

### 5.1.1.3 Discussion

The Okurase and Asikasu projects are located in agricultural landscapes and hence do not contain any protected areas, neither do they form part of any of the protected area networks in the country. Though the broader landscape consists mainly of agricultural lands and settlements, there are still some areas with conservation interest that have been set-aside by the government as a permanent forest protection estate.

The closest forest reserve in the area is the Esuboni Forest Reserve. This is 19.95km east of Asikasu and 26.36km east of the Okurase project site. The management areas are separated from these protected areas mainly by farm lands, fallows and settlements. The team observed from satellite imagery that there are no contiguous forest cover or other intact ecosystems between the management area and the protected areas, as the broader landscape contains a lot of human settlements and highly modified ecosystems.

The assessment found that it is highly unlikely that the conversion of the two sites at Asikasu and Okurase to rubber plantations would have any direct adverse impact on the nearby protected areas, given the distance and the nature of the land-use between the concession and these protected areas. Hence HCV 1.1 is concluded to be **ABSENT**.

<sup>3</sup> [http://iucn.org/about/work/programmes/pa/pa\\_products/wcpa\\_categories/](http://iucn.org/about/work/programmes/pa/pa_products/wcpa_categories/)

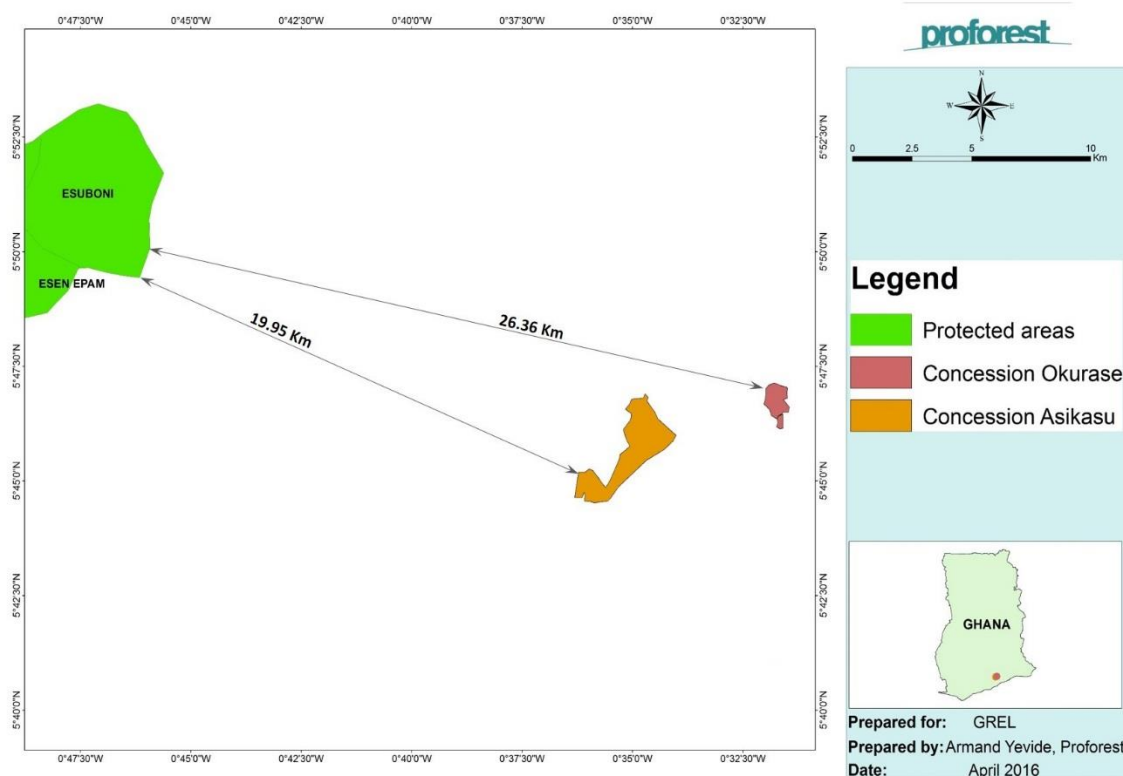


Figure 4: Location of the concession with respect to the nearest forest reserve

#### 5.1.1.4 Threats

Though HCV 1.1 is concluded to be absent, it is still essential to evaluate the potential indirect threats that plantation establishment may have on the closest protected areas in the broader landscape. For example, the potential for displaced farmers and hunters to shift their farming and hunting pressures to nearby protected areas; or the potential for an increased demand for food and other NTFPs to drive a rather unsustainable exploitation of natural resources in these protected areas. The assessment concluded that it is highly unlikely that any of these potential threats would be posed to the nearby protected areas given that:

- The nearby protected areas are a significant distance away from the concession, belonging to different communities and stools, and hence it is not expected that displaced farmers would be able to directly add on to the pressures on these protected areas
- There is a significant area of agricultural land and fallows between the concession and the protected areas, and it is expected that these areas would be able to accommodate any additional agricultural, hunting or logging pressures
- The concession is separated from these protected areas by urban and rapidly developing rural communities with well supplied markets and good road links to other urban areas.

#### 5.1.2 HCV 1.2 Rare, threatened and endangered species

##### 5.1.2.1 Definition

HCV 1.2 refers to high concentrations of species that are categorised as critically endangered (CR), Endangered (E), or vulnerable (VU) under the IUCN Red List, Appendix I

of CITES or those listed as protected under the country's legislations (either state or national).

HCV	Key question	Finding
1.2	Does the concession contain rare, threatened or endangered species in high concentrations?	<b>ABSENT</b>

### 5.1.2.2 Identification

Areas that contain significant populations or high concentrations of rare, threatened or endangered species are a priority for conservation. To be considered as HCV 1.2, these species should be present as a viable population or in high concentrations. The decision on whether the RTE's can be considered HCVs should be made with due consideration of the broader landscape level dynamics. The relative importance of the populations of the species found within the management area/concession are thus assessed together with the known abundance (or rarity) of the species within the wider landscape context, their ecology, mobility and ability to tolerate disturbances within their habitats and surrounding areas. According to the Ghana toolkit, an area will be considered as HCV if there is evidence of the:

- Presence of populations of at least 25% of the forest dependent, red-listed species that are naturally resident in Ghana.
- Presence of a population of at least one nationally protected species, whose survival in Ghana is critically dependent on the sustainable management of the population in question

Similarly, all species listed as nationally protected under the National Wildlife Conservation Regulation will be considered as HCV if they are a) dependent on a particular area and b) are so restricted that the population in the area could be regarded as critical to the survival of the species in Ghana.

**This** assessment considered all rare, threatened, endangered and nationally protected species as HCVs if:

- They were observed in significant and viable populations or
- If the survival of the species in the country was critically dependent on the sustainable management of those populations found in the concession

The decisions were also made in line with the precautionary principles. To help make appropriate decisions and recommendations, the team consulted widely with experts.

Most of the species identified during the assessment are species that are widespread and common in degraded forest vegetation and agricultural landscapes and are listed as *Least Concern* (LC) species on the IUCN's Red List. The results of the fauna survey indicate that both management areas support very low wildlife densities and species diversity. Most of the species recorded were either forest fringe species or species common on farmlands or degraded forests. The most commonly occurring species was the Stripped Ground Squirrel (*Xerus erythropus*, LC), whilst other common species included the Greater Cane Rat (*Thryonomys swinderianus*, LC) and the Gambian Pouched Rat (*Cricetomys gambianus*, LC).

For flora, the concession was dominated by species that are common on farmlands and recent fallows. That notwithstanding, there were some observations of individual trees



that are listed as Scarlet Star<sup>4</sup> species in Ghana and a few that are listed as vulnerable by the IUCN. Single observations of the following Scarlet Star species were made: *Albizia ferruginea*, *Daniellia ogea*, *Pterygota macrocarpa*, *Milicia excelsa*, *Triplochiton scleroxylon* and *Entandrophragma angolense*.

A total of 114 individuals of 32 plant species belonging to 18 families were identified in the whole area. The area is generally heavily impacted by agriculture which has severely limited the diversity of plant species in the concession. Dominance of light demanding species such as *Morinda lucida*, *Albizia zygia*, *Senna siamea* points to loss of non-pioneer plant species typical of less-disturbed forest. These three light demanders alone accounted for over 50% of all the three species identified in the study.

Given that all the species identified are also known to be well represented in the wider landscape and are well protected by conservation efforts in the nearby protected areas, they were not considered as HCV 1.2. There were no areas where any of those species of conservation interest existed in locally significant large viable populations.

HCV 1.2 is thus concluded as **ABSENT** in the concession.

### 5.1.2.3 Discussion

For both fauna and flora, the species found to be present in the concession are generally known to be common species in secondary forests and agricultural landscapes. No endangered or critically endangered species was identified in the concession. That notwithstanding, the assessment found a few species that are listed as vulnerable or Scarlet Star species in Ghana. These observations have not been considered as HCVs, because:

- The identified species are known to be present in good populations in nearby protected areas and also in wider landscape.
- For the fauna species registered as vulnerable on the IUCN list, their low densities in the concession and known mobility across the concession and nearby natural and agricultural areas limit the range of reasonable conservation approaches that may be implemented. For flora, the species of local conservation significance occurred in very low populations (single observations) and the priority species were not necessarily localised.

### 5.1.2.4 Threats

Hunting, illegal logging and habitat loss continue to threaten the remaining biodiversity in the landscape. The establishment of the plantation could pose a number of threats to the biodiversity in the area. Key concerns are listed below:

- Land clearance activities would invariably lead to the destruction of the habitat of some of the fauna of conservation interest in the region. To minimise the impact of these operations, recommendations have been made in section 6. Recommendations include a combination of set-aside areas and land preparation approaches that enable the wildlife in the area to move into set-aside refuge in the concession and also in the wider landscape
- The conversion of the natural landscape in the concession would also imply that communities would no longer be able to access some non-timber forest products that were previously available in the concession area. This demand would thus shift to nearby natural areas and other previously unexploited areas.

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<sup>4</sup> Black star species are globally rare and of high priorities for careful management, e.g. *Cola umbratilis*

- The increasing local demand for food could theoretically serve as a catalyst for local communities to clear new areas to establish farmlands. This situation is compounded by the fact that some existing farmlands are now part of the concession and hence would no longer be accessible for farmers. This would then shift the pressure to the nearby natural areas. Recommendations for ameliorating these impacts are listed in Section 6.

## 5.2 HCV 2 Globally, regionally or nationally significant large landscape level ecosystem of ecosystem mosaic

### 5.2.1 Definition

HCV 2 refers to globally, regionally or nationally significant large landscape forests contained within or containing the management unit where viable populations of most if not all naturally-occurring species occur 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 HCVs.

HCV	Key question	Finding
2	Does the concession contain or form part of a regionally or nationally significant large landscape forest or does it serve as a linkage joining two such forests?	ABSENT

### 5.2.2 Identification

HCV 2 refers mainly to large landscape level forests, ecosystems or ecosystem mosaics that are generally intact and where ecological processes and ecosystem functioning are largely unaffected by recent anthropogenic activities. The management areas for this project occur in agricultural landscapes with several active and current farms. There are hardly any areas that contain large landscape level forests or ecosystems that have not been fragmented by human activities. The nearest forest blocks in nearby protected areas have also undergone some level of logging (some of which has been unsustainable), and can hardly be counted as intact landscapes containing viable proportions of naturally occurring species in natural patterns and distribution. The national interpretation of the HCV Toolkit for Ghana concluded that this HCV category is not present at all in Ghana given the level of degradation of all the forests and natural ecosystems in the country. Based on the information above, the assessment concludes that HCV 2 is **ABSENT**. The figure below presents a satellite imagery of the wider landscape of which the concession falls part.

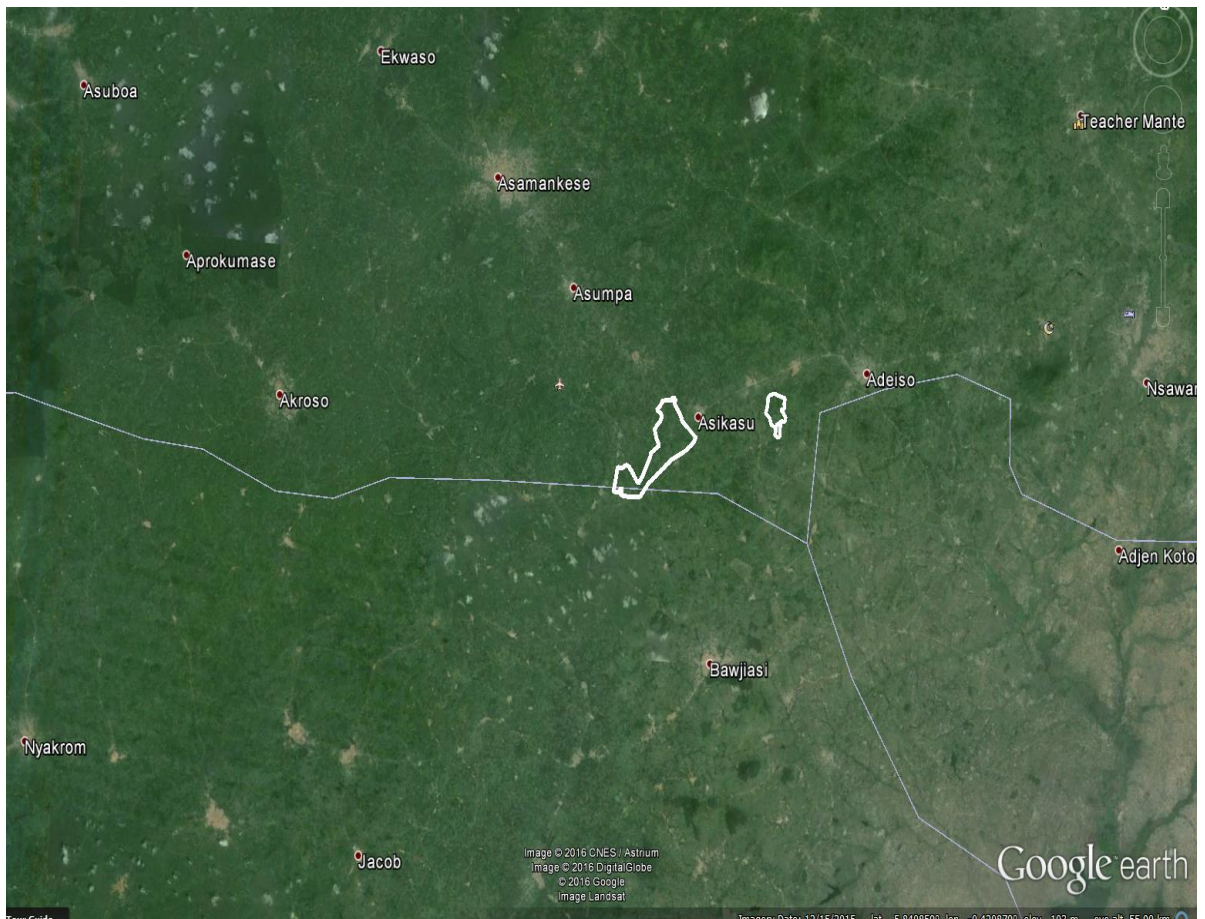


Figure 5: Google Earth Satellite imagery of concession area, outlined in white showing the closest forest cover to the north-west of concessions near Aprokumase

### 5.3 HCV 3: Areas that are in or contain rare, threatened and endangered ecosystems

#### 5.3.1 Definition

HCV 3 refers to areas that are in or contain rare threatened or endangered ecosystems.

HCV	Key Question	Finding
3	Does the concession fall in or contain an ecosystem that is considered rare, threatened or endangered?	<b>ABSENT</b>

#### 5.3.1.1 Identification

In identifying this HCV, a definition of ecosystems as broad forest types and smaller habitat types is considered. The Ghana HCV toolkit considers the following categories of areas listed below as HCV 3: Forest and habitat types that:

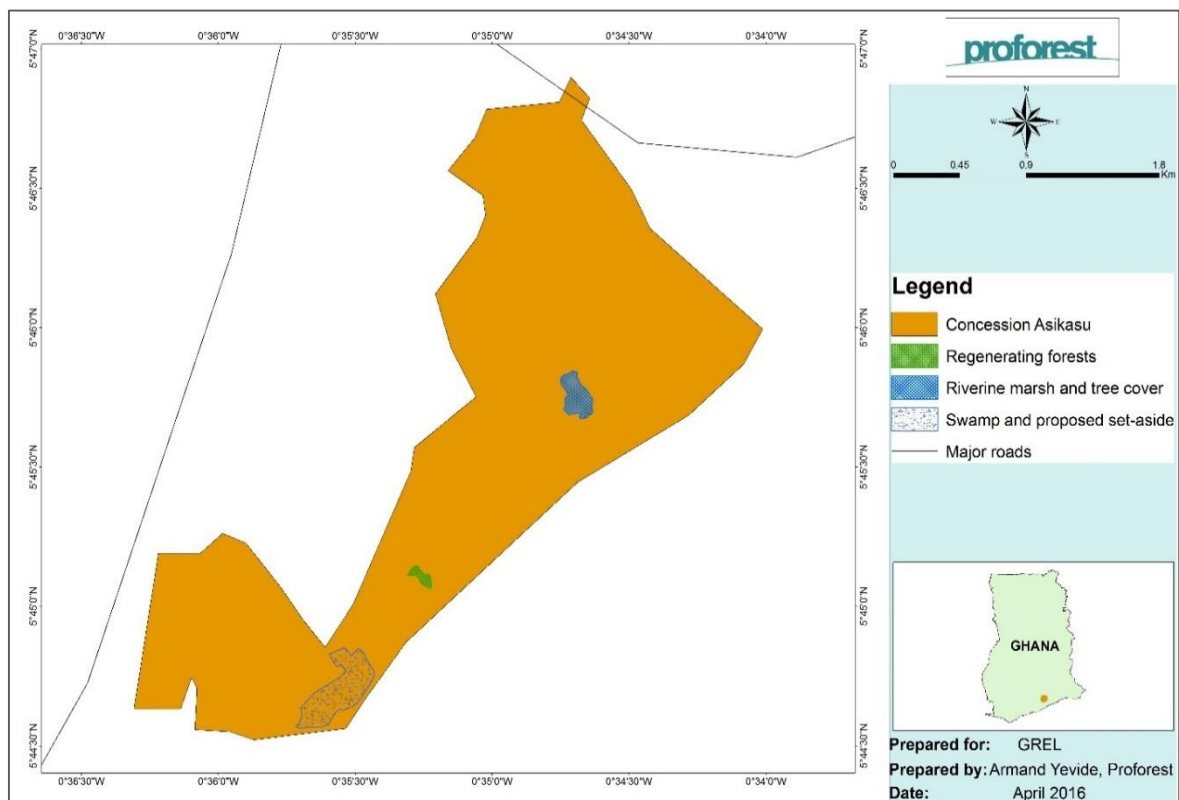
- Are naturally rare;
- Have been dramatically reduced from their original extent due to the activities of man;
- Are so threatened by existing and planned activities that they should be considered threatened/endangered.

Forest types in Ghana considered to fall under the above defined categories and deemed to be HCVs are the Wet Evergreen, Southern Marginal, Mangroves, and Dry Semi-deciduous and Moist Semi-deciduous Forest types. All habitat types of upland marshes and upland wetlands, savannah gallery forest, lowland swamps and coastal savannah are also considered HCV 3 areas.

The extent of the area under the scope of this assessment falls in the Moist Semi-Deciduous forest type, which is considered to be HCV 3 in Ghana. However, the concession areas do not currently contain any significant patches of this natural vegetation, as the current land cover has been modified by farming and settlements. Hence, it cannot be said that the management areas contain any of the threatened Moist Semi-Deciduous rainforests.

At the micro-scale level, the assessment team observed that the management areas consisted predominantly of flat and undulating farmlands on mineral soils. This land cover and substrate type is generally common in the broader landscape and in the country as a whole. In view of the above, HCV 3 is considered to be **ABSENT** from the management areas.

The assessment team however found some areas within the concession that had some vegetation cover of some conservation significance, and which should be set aside for protection. These include 1) some riverine marsh with some relatively good tree cover, considering what pertains in the bigger concession 2) a swampy area with some tree cover and 3) an area containing some regenerating forests in Asikasu. Though these areas are not necessarily HCV areas, GREL intends to set aside representative samples of the natural vegetation of the area for conservation purposes. Given the highly degraded nature of the concession, these proposed areas would be among the best areas to set aside for protection.



## 5.4 HCV 4: Areas that provide basic services of nature in critical situations

HCV 4 refers to areas that provide basic ecosystem services in critical situations.

### 5.4.1 HCV 4.1: Areas important for watershed protection

#### 5.4.1.1 Definition

An area is considered as HCV 4.1 if it is critical for the maintenance/regulation of the flow of rivers, preventing severe floods, or maintaining water quality, where these services are critical e.g. where the rivers provide communities with water for drinking, irrigation or fishing. Similarly, areas that help maintain fragile or rare aquatic ecosystems, or prevent damage to important infrastructure such as dams may be considered as HCV 4.1. This HCV also includes forest areas that cover the entire sub-catchment of a stream on which communities depend and provide a function in regulating the flow and quality of the water.

#### 5.4.1.2 Identification

HCV	Key Question	Finding
4.1	Does the concession contain areas that provide a function in regulating the flow of water within an entire catchment (on which a community depends)?	PRESENT

The Ghana Toolkit identifies forest reserves designated for protecting river headwaters as HCV 4.1 areas. An area may also be considered as HCV if it covers the entire sub-catchment of a stream on which a community (or communities) depend for drinking water, irrigation or fishing, and the area provides a function in regulating the quality and quantity of water on which these functions depend. This HCV is also likely to be present in some areas within the dry semi-deciduous forest zone and in hilly areas dominated by the upland evergreen forest type.

Usually, water bodies on which downstream communities critically depend should qualify as HCV 4.1.

The major towns and villages near the concession area have some access to potable water and do not depend directly on water-bodies from the nearby streams as their major sources of water for household use. For example, the people at Asikasu and Okurase have access to borehole water in the centre of their towns. That notwithstanding, several other smaller villages and settlements near the concession depend on waterbodies flowing through the concession as their main sources of water. During the assessment, the team found that even though the Odumase community has access to a pump fitted boreholes, several households also continued to rely on a nearby pond as an important additional source of water, particularly during times when the borehole was faulty. The village of Kroso located within the Okurase concession also continues to depend on a ground spring called *Ekosokofi* (or *Niabu*) as their main source of drinking water. It is expected that several downstream settlements would continue to depend on waterbodies that flow through the GREL concession as critical sources of water for household use. Additionally, the headwaters of a stream that farmers use mostly when on their farms was identified in the Asikasu concession.

Given the presence of the headwaters and waterbodies on which local communities depend for household consumption, HCV 4.1 is considered PRESENT.

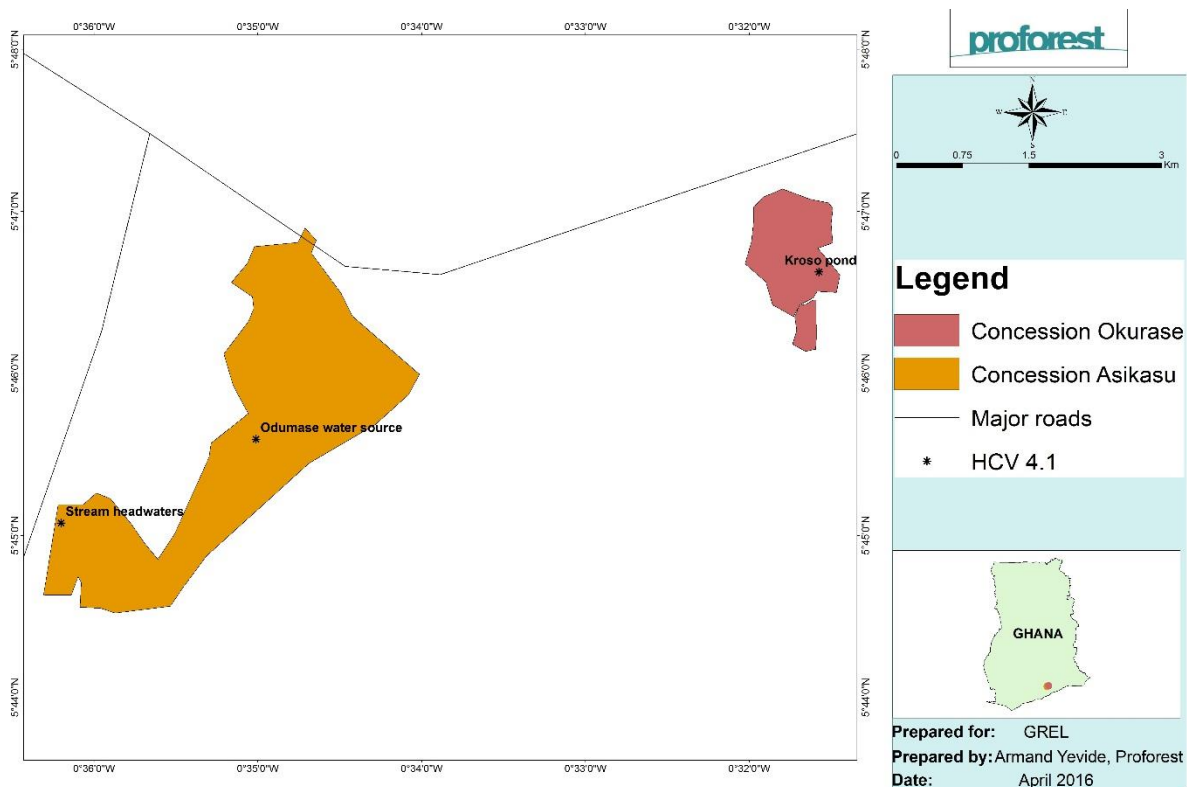


Figure 6: Key water sources of the communities engaged

### 5.4.1.3 Discussion

Healthy headwaters — tributary streams, intermittent streams, and spring seeps — are essential to the health of stream and river ecosystems. Protecting the streams with forested riparian buffer zones and protecting and restoring the watersheds in which they arise will provide benefits vital to the water resources. Healthy, headwaters supply organic matter that contributes to the growth and productivity of higher organisms, including insects and fish. Headwaters also help to keep sediment and pollutants out of the stream system’s lower reaches. In addition, they enhance biodiversity by supporting flora and fauna that are uniquely acclimated to this habitat. Maintenance of a riparian buffer with desirable vegetation is a key requirement in the protection and management of water bodies in Ghana. Usually, a 10m to 90m buffer is prescribed for all water bodies depending on the size of the water-body. Riparian vegetation protect 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. A reduction in the vegetation cover of riparian areas can lead to increased sedimentation and increased nutrient loading of streams which will result in a marked decrease in the quality of the water bodies.

An important first step is the mapping of all water courses indicating the extent of buffers and a rehabilitation strategy. Practical steps such as tree planting and halting the application of fertilizer and pesticides within the buffer should be explored with a view to maintaining the ecological integrity of such fragile ecosystems.

#### 5.4.1.4 Threats

Threats that the major water sources and riparian buffers in in the concessions face include:

- Conversion of riparian buffer zones to plantations
- Increased siltation and nutrient loadings from land preparation activities and the application of agrochemicals

### 5.4.2 HCV 4.2: Areas critical to erosion control

#### 5.4.2.1 Definition

All natural vegetation may be important for the purposes of erosion prevention, but when normal land management practices are sufficient for erosion protection, they will not be considered HCV. An area will be considered HCV if it is essential for the protection against severe erosion or terrain instability in areas where the consequences are severe.

#### 5.4.2.2 Identification

HCV	Key Question	Finding
4.2	Does the concession contain areas that are essential to the protection against severe erosion or terrain instability in areas where the consequences of these are severe?	ABSENT

Areas that play a role in erosion and landslide prevention or that are catchment area forests are considered as HCV. According to the Ghana HCV Toolkit, forest shelter belts that prevent serious wind erosion where this would drastically affect local agriculture will also be considered HCV. All forests adjacent to reservoirs, water works or hydro power systems will be considered potential HCV. Where commercial operations are considered, it the responsibility of the manager to demonstrate that operations in such areas will not increase the risk of severe erosion.

There are no Hill Sanctuaries within the concession, neither are there any shelterbelt reserves or areas adjacent reservoirs and hydropower systems. However, there are areas within the concession with very steep slopes, where the removal of the natural vegetation could lead to serious erosion and siltation of nearby water-bodies.

The terrain of the concessions area under the scope of this assessment is generally flat and undulating with hardly any steep slopes exceeding 30 degrees. Given the absence of steep slopes and areas that are particularly prone to erosions, the assessment concluded that HCV 4.2 is **ABSENT**.

The two concession areas are generally flat and undulating and there are no areas with steep slopes that are particularly prone to erosion.

### 5.4.3 HCV 4.3: Areas providing barriers to destructive fire

#### 5.4.3.1 Definition

This refers to areas which serve as a natural barrier to destructive wildfires especially in areas that are generally fire prone or areas that help to protect natural vegetation, particularly those with HCVs against wildfires.

### 5.4.3.2 Identification

HCV	Key Question	Finding
4.3	Does the concession contain area that play a role as a natural barrier against the spread of wildfires?	ABSENT

While several areas in Ghana are already designated as shelterbelt forest reserves, it is noted that due to changes in land use there may be areas within or outside these protected forest areas that could provide this function. In areas that have been subjected to increasing levels of anthropogenic fires in recent years, any forest area that helps prevent fire spreading into protected areas will be considered HCV 4.3.

HCV 4.3 refers to all vegetation that helps to prevent the spread of destructive wildfires particularly into areas containing high conservation values. It has been suggested that natural intact forests can serve as barriers to destructive wildfires given their low undergrowth and moist litter layers. Once kept protected and their canopies un-fragmented, natural forests could serve as breaks that prevent wildfires. Within the concession, no natural forests exist, and there is no history of recurrent wildfire. HCV 4.3 is thus concluded to be **ABSENT** from the concession.

## 5.4.4 HCV 4.4: Areas that play a critical role in local climate regulation

### 5.4.4.1 Definition

This refers to areas that play a critical role in regulating climate and where loss or severe degradation of that area would result in catastrophic changes to local climatic conditions, such as dramatically increased fire risk, or exposure to drying winds that would compromise productive agriculture.

### 5.4.4.2 Identification

HCV	Key Question	Finding
4.4	Does the concession contain areas where forest loss or severe degradation would result in catastrophic changes to local climatic conditions?	ABSENT

This HCV is said to be present where the natural vegetation plays a critical role in maintaining the local climate. Areas such as forest shelterbelts in Ghana are generally identified by the Ghana HCV toolkit as performing this function.

Within the concessions the natural vegetation is very much modified and there are no vegetation or ecosystems that can be said to be performing the function of critically maintaining or moderating the local climate. HCV 4.4 is thus considered to be **ABSENT** from the concession.

## 5.5 HCV 5: Areas fundamental to meeting basic needs of local communities

### 5.5.1 Definition

These are areas fundamental to meeting basic needs of local communities (e.g. subsistence, health).



### 5.5.2 Identification

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

An area is considered HCV 5 when it is the source of basic needs in a situation where the majority of the local people or the poorest population among the local people have no realistic alternative. Basic needs include food, NTFP harvesting, where this provides critical household income; medicinal materials, building materials or other basic household needs

Majority of the unconverted areas in the concession consist of farms and fallows. However, the communities also carry out the collection of various non-timber forest goods from the natural landscape. Typical products that are collected include mushrooms, snails, building materials and game. Our consultation with all the local communities indicated that all these products were diffused and available in several other areas in the natural landscape. They were hence not confined to the concession alone or to any particular area that could be set aside for protection. Additionally, though hunting and snail gathering takes place in the concession, there were no particular locations that served as key hunting grounds within the concession. Local communities also indicated that meat from hunting was not considered as an essential source of protein. Reared animals such as poultry and livestock as well as meat produce available on the well supplied local markets served as their main sources of protein.

The assessment team determined that HCV 5 is **ABSENT** from the concession following an analysis of the fringe communities and their level of dependence on the concession. That notwithstanding, steps should be taken to help safeguard some representative areas in the concession that can continue to provide some of these non-timber products to the local communities.

### 5.5.3 Discussion

The basic needs most likely to occur in rural areas in this district are food (including subsistence hunting grounds of bushmeat as a source of protein), harvesting of NTFP for medicinal purposes, building materials, fuel wood, bamboo, rattan, etc. However, the relative importance of these resources appear to diminish with increasing urbanisation of the communities and access to good transport links. Over time, communities shift their dependencies on wild gathered and hunted products to domesticated products and subsequently onto products that are readily available on the market. That notwithstanding, in most cases, the poorest in the community tend to continue to depend on goods in the natural environment as a critical source of their livelihood. Where such dependencies exist and there are clearly particular areas within the natural environment which provide these goods, such areas have to be set aside for protection. In the case of the two project sites, the team concluded that HCV 4 was absent due to:

- The limited dependence of local communities on products found in the concession as a critical source of their livelihoods
- The fact that those goods that the communities occasionally collect are not particularly confined to any particular areas that can be set aside for that purpose

- Those goods and services which are collected are also known to be widely available in other areas in the natural environment, and these areas are still accessible to the communities.
- That the communities are not very rural and have well developed markets where various items are readily available for purchase. The communities have good transport links to each other and to Accra, the capital of Ghana.

#### 5.5.4 Threats

Regardless of the fact that the collected NTFPs are known to be present in other areas, the establishment of the plantation could present at least two key risks:

- A reduction in the total area of land that is available for NTFP collection and
- Increased populations associated with the influx of workers would also increase the demand for these same NTFPs

Hence a combination of increased demand and reduced availability of NTFPs could have an impact on the poorest and the most vulnerable in the community. Steps should thus be taken to ensure that where possible, alternatives are provided for the communities.

### 5.6 HCV 6: Areas critical to the traditional cultural identity of local communities

#### 5.6.1 Definition

These are 'areas that are important for a local community's cultural, ecological or religious activities'. An area is considered as HCV if it defines the cultural identity of the local people such that its absence will lead to cultural erosion.

#### 5.6.2 Identification

HCV	Key Question	Finding
6	Does the concession contain areas or values which are of critical significance to the traditional cultural identity of local communities?	ABSENT

An area is considered to be HCV 6 if it contains any area, resource or value that is considered to play a critical socio-cultural or religious function. This may include areas that are set aside as sacred and serving as the home to deities or ancestors. These areas are also known as sacred groves. In Ghana, some patches of forest/natural vegetation may be considered as 'evil' 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 curses to himself and the community as a whole.

Additionally, a particular species of animal or plant may be considered as sacred or as a totem for the community. Such species are normally not killed or disturbed, as they are thought of as containing the soul of the community or serving as home for some benign or evil spirits. Hence during farming and land conversion, all such species are left untouched because of the traditional or religious significance. In some areas in the country, rivers, stones, or other features in the natural environment may also be considered as gods and revered as such. HCV 6 may also refer to intangible values 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 particular day within the year for religious

festivities or random days that are dictated by the oracles for the performance of traditional or religious rites.

Discussions with local communities indicated that though there are a number of traditional/religious symbolism associated with certain parts of the wider landscape, none was present in the area that had been allocated to GREL. The elders of the community had carefully selected the site to be given to GREL and had made conscious effort to ensure that any areas that had cultural or traditional significance had been excluded from the lands allocated to GREL.

Consultations with the various communities also pointed to the fact that there were indeed no such cultural or religious sites located within the proposed management areas. Based on the information obtained from the consultations with local communities, HCV 6 is concluded to be ABSENT. That notwithstanding, it is expected that GREL would take proactive steps to continually engage with local communities before the start of land preparations.

## 5.7 Summary of stakeholder comments

**Name:** Mr Fredrick Akitsi  
**Title:** District Coordinating Director  
**Organisation:** District Assembly, Adeiso

**Key concern:** There is currently a petition against the project by some aggrieved farmers and landowners. In some cases, the family heads/chiefs may have leased out the lands to the company without seeking the consent of farmers on the land (who may not necessarily be land-owners but who may have some use rights over the area. There are concerns about the farmer engagement process and some farmers may not have been adequately engaged in the compensation process. That notwithstanding, the arrival of investors such as GREL was good for the district since it comes along with jobs and development for the citizenry. Aside GREL, there is already a Citrus and Jute factory in the area which is providing jobs to community members and for that matter GREL coming in was in the right direction. GREL had already installed two bore holes for the communities.

**Assessor comment:** GREL is continuing with the process of engagement and has excluded all dispute areas from the project. The company would continue with negotiations with affected farmers, and land preparation would only commence after the consent has been obtained.

**Name:** Mr Frederick Ntow  
**Title:** MIS Officer  
**Organisation:** Ministry of Food and Agriculture, Adeiso

**Key concern:** *Food Security* – Major crops cultivated in the area were, cassava, plantain, pawpaw, pineapple and orange with some few cash crops as such as oil palm and cocoa. Releasing farmlands to GREL would mean the farmer will not be in the position to cultivate and supply their family the community with these crops any longer which mean food security in the area will be affected seriously. He however

explained resettling the farmers with a new farmland might curb the problem of food security.

GREL in consultation with the chiefs should re-engaged those affected farm owners who have petition the court and the assembly and come up with concrete solution to bring peace. Even before and after compensation payment, there should be some sort of management on the part of GREL to educate the affected farmers on how best to put their compensation package/payment into profitable venture that will equally provide and sustain them in the absence of their farmlands.

**Assessor comment:** Though all communities indicated that they had lands in other areas that could meet their food demands, it is still anticipated that dedicating 850ha to rubber would invariably have some impact on food security. GREL plans to engage with communities to identify ways that they can improve on the productivity of existing farms within the area.

**Name:** Mr Opoku  
**Title:** District Manager  
**Organisation:** Forest Services Division

**Key concern:** The nearest forest reserve to the concession are Atewa range FR which is about 21km north from Asikasu and Esuboni FR which is also about 19km from Asikasu. Though these reserves are far from the concessions it is still prudent to manage displaced farmers from any future invasion. It would be useful if GREL would collaborate with the FSD to collaborate on the management of any set-aside areas that would be in their concession. As a matter of urgency, GREL should write to the commission for impact assessment to be done before any clearing is carried out

**Assessor comment:** Though the concession areas are predominantly farmlands, the assessment has also identified trees within the area. GREL will share the data with the FSD and officially inform them of the project for the FSD to carry out their assessments prior to conversion

**Name:** Asikasu Community

**Comments:** *Land acquisition process-* GREL first approached the Okyehene, who gave a directive through the divisional chief of Asamankese to the village heads to make land available for the development of the rubber plantation. Appropriate lands were identified and farmers on those lands were notified of the project. Upon agreeing with the arrangements, a committee was formed by the farmers and land-owners to engage with the company on reasonable compensations. The team engaged experts and Cocobod to help them with the negotiation process. Majority of the farmers have since taken their compensations and left. However, there are a few affected farmers (covering about 60ha) who are not in agreement with the process and have taken the matter to court.

All the areas given out have a long history of farming and do not contain any forests. One of the key sources of the water for the community, called Mfata passes through GREL's concession and adequate steps should be implemented to protect the water course.

**Assessor comment:** Recommendations have been made for the protection of waterbodies within the concession, particularly those on which communities depend on for household use.

### Name: Odumase Community

**Comments:** Odumase is a Ga settlement on Akyem land. They are directly under the chief of Asikasu. The community was informed about the project by the leaders at Asikasu. Farmer meetings were held to discuss and agree on the compensation figures. The negotiation was done on behalf of the farmers by representatives selected by the farmers. Crop compensations were paid for each farmer based on the total area of land that had been cultivated. Community continues to depend on the Tetteh Kofi River as a key source of water for household use, given that the borehole built by GREL was faulty.

**Assessor comment:** Assessment has mapped out the points along the Tetteh Kofi River that the community uses. Additionally, recommendations have been made for the protection of all waterbodies in the concession.

### Name: Okurase Community

**Comments:** Engagement with the community started when the Okyehene gave a directive to the community to make land available for the project. The elders engaged with various families to identify suitable lands for the project. Farmers were engaged and they agreed on compensations to be paid. The company is still engaging with farmers to identify new areas to be given out to expand the project. There are no sacred areas in the concession area that has been given out to GREL. Additionally, the area consists mainly of farmlands and does not include natural areas that communities critically depend on for non-timber-forest products. There is a pond called *Niibu or Koso-Kofi* located within the Okurase site which serves as the main source of water for the Okoso settlement which is under Okurase.

**Assessor comment:** The location of the water source has been identified and mapped. Recommendations have been made for the protection of this area.

## 6 HCV management and monitoring

This section presents recommendations for managing the identified high conservation values in the concessions. The aim is to ensure the continued existence of these HCV and minimise all likely adverse impacts. Key areas that need management interventions are described generally, and reference is made to the High Conservation Values that specific management interventions apply.

### 6.1 General suitability of the concessions for plantation development

A key requirement for many sustainability standards is that plantations establishment is proscribed in areas that contain primary forests, high conservation values, or local people's lands (unless the Free Prior and Informed Consent, FPIC of the community is expressly given). Based on the field findings and the stakeholder engagement, the assessment team makes the following conclusions:

- That the allocated management areas generally **do not consist of primary or intact forests**. Sections 4 and 5 above have illustrated the nature of the vegetation to comprise mainly of farmlands, bush fallows and secondary regrowth.
- That **there are communities living close to the concessions who hold claims of traditional tenure over parts of the concession area**, and who need to be engaged with so as to ensure that the company's operations are carried out with their full consent and that plantation establishment does not impinge on these claims/rights without their free, prior and informed consent. It should be highlighted that at present there are outstanding disputes where some families who own lands in the proposed management areas are yet to give their full consent.
- Those HCVs within the concessions have been duly identified and mapped during the assessment process. HCV 4.1 in particular will have to be delineated in the field and mapped systematically as land preparation process progresses. The High Conservation Values observed in the concession do not preclude the establishment of a plantation and an associated processing plant. However, these HCVs will have to be managed to ensure the continued existence and maintenance of the integrity of the HCVs.

Given the above observations the concessions are considered to be generally suitable for rubber plantation establishment. That notwithstanding, all identified HCVs should be properly delineated on the ground and managed. Conversion of the non-HCV areas to plantations should demonstrate a net gain for the local economy and people.

### 6.2 Threat assessment

The table below analyses the various threats posed to the identified HCVs based on a) the likely intensity b) Urgency and c) Scale. The three indicators are analysed using three colour codes with **red** representing high priority, **orange** representing medium and **blue** representing low priority.

Table 5: Threats facing the identified HCVs

HCV Ref	Description of value	Main threats	Intensity <sup>5</sup>	Urgency <sup>6</sup>	Scale <sup>7</sup>
4.1	Stream headwaters and riparian buffer zones	Conversion of lowland swamps to plantations	Red	Red	Red
		Run-off of agro-chemicals into swamps, thereby deteriorating ecosystem quality	Yellow	Yellow	Red
		Loss of habitat for several swamp adapted plant and animal species	Red	Red	Red
		Conversion of stream headwater vegetation to plantations	Red	Red	Red
		Loss of potable water due to pollution from agrochemical run-off and siltation	Yellow	Yellow	Blue
		Flooding	Yellow	Yellow	Yellow
		Reduction in habitat quality for aquatic biota due to siltation and agrochemical run-off	Yellow	Yellow	Blue

Table 6: Management and monitoring recommendations for identified HCVs

HCV Ref	Main threats	Management recommendations	Monitoring recommendations
4.1	Conversion of riparian buffers to plantations	All riparian buffers in the concession should be set aside for conservation. All such areas should be clearly mapped and delimited on the ground to avoid accidental conversion. A buffer zone of at least 10m should be left around the headwaters and other water bodies in the concession. No agrochemicals use in buffer zones	Ensure that the boundaries of the set-aside buffers remain intact
	Run-off of agro-chemicals into swamps, thereby deteriorating ecosystem quality		Monitor the implementation of SOPs on use of agrochemicals close to swamps and riparian buffers
	Loss of habitat for several swamp adapted plant and animal species	Periodic (bi-annual) assessment of habitat quality and fauna presence	
	Conversion of stream headwater vegetation to plantations	The vegetation around the headwaters at Asikasu other stream headwaters that would be	Ensure that the boundaries of the set-aside buffers remain intact

<sup>5</sup> Degree of change or deterioration of the value

<sup>6</sup> How soon the threat is expected

<sup>7</sup> What proportion of the identified value would be affected?

	discovered during land preparation should be mapped and set aside from conversion.	Periodic bi-annual assessment of the integrity of riparian buffer zones
Loss of potable water due to pollution from agrochemical run-off and siltation	Adequate buffers should be left for all rivers/ streams in concession No use of agrochemicals in riparian buffer zones	Quarterly monitoring of water quality parameters in line with EPA and WRC guidelines
Flooding		Ensure that buffers remain intact
Reduction in habitat quality for aquatic biota due to siltation and agrochemical run-off		Quarterly monitoring of water quality parameters in line with EPA and WRC guidelines



## 7 Synthesis

The findings from the assessment show that the concession is generally suitable for rubber plantation development in line with GREL's internal Environmental and Social Charter as well as the IFC's Performance standards. The concession area does not contain any primary forests and consists predominantly of agricultural lands (farms and bush fallows). GREL has acquired these concessions with the prior consent of local communities duly represented by their family heads and *Stool* and the company has paid the **negotiated** compensations to some affected farmers. That notwithstanding, there are still some disputes that are yet to be resolved. This assessment has assessed all six HCV categories in the concession and has identified HCV categories present using the Ghana National Interpretation as the key reference document. The identified HCVs have also been appropriately mapped. It should be noted that the HCV areas mapped in this report only represent those HCVs identified during our fieldwork, consultation with key experts and stakeholder as well as our analysis of satellite imagery. These are in no way exhaustive. This report has provided the basis for arriving at the decisions for identifying HCVs and it is expected that the company would take steps to update this map with additional information, should new HCV areas be discovered during land preparation.

Our interactions with local communities and key stakeholders show that though communities continue to collect some NTFPs from the management area, they cannot be said to be critically dependent on the concession. Additionally, there are no areas within the concession that serve any critical socio-cultural, traditional or religious purposes.

### 7.1 Connectivity and layout

The map below outlines the minimum areas that have been proposed to be set aside by GREL during land preparations. These include the identified HCV 4 areas and the patches of natural areas in the concession that can form the basis of the company's conservation work in the concession. In addition to these, GREL is expected to map all riparian buffer zones in the concession and set them aside for protection in line with the country's requirements on buffer zones. This should be done for both permanent and seasonal streams.

To enhance the ecological functionalities of these small patches of land it is strongly recommended that they are interlinked. Based on the information available from the fauna surveys, it is expected that linking these set-aside areas via the riparian buffer zones would allow for adequate movement of fauna within the concession. The data currently available (shown in maps below) does not highlight the stream network in the concession as this data was not available at the time of the assessment. A detailed mapping of the stream and river network in the concession would be vital prior to land preparation. These can also be used as the basis for connecting the set aside areas to allow for easy movement of fauna within the concession.

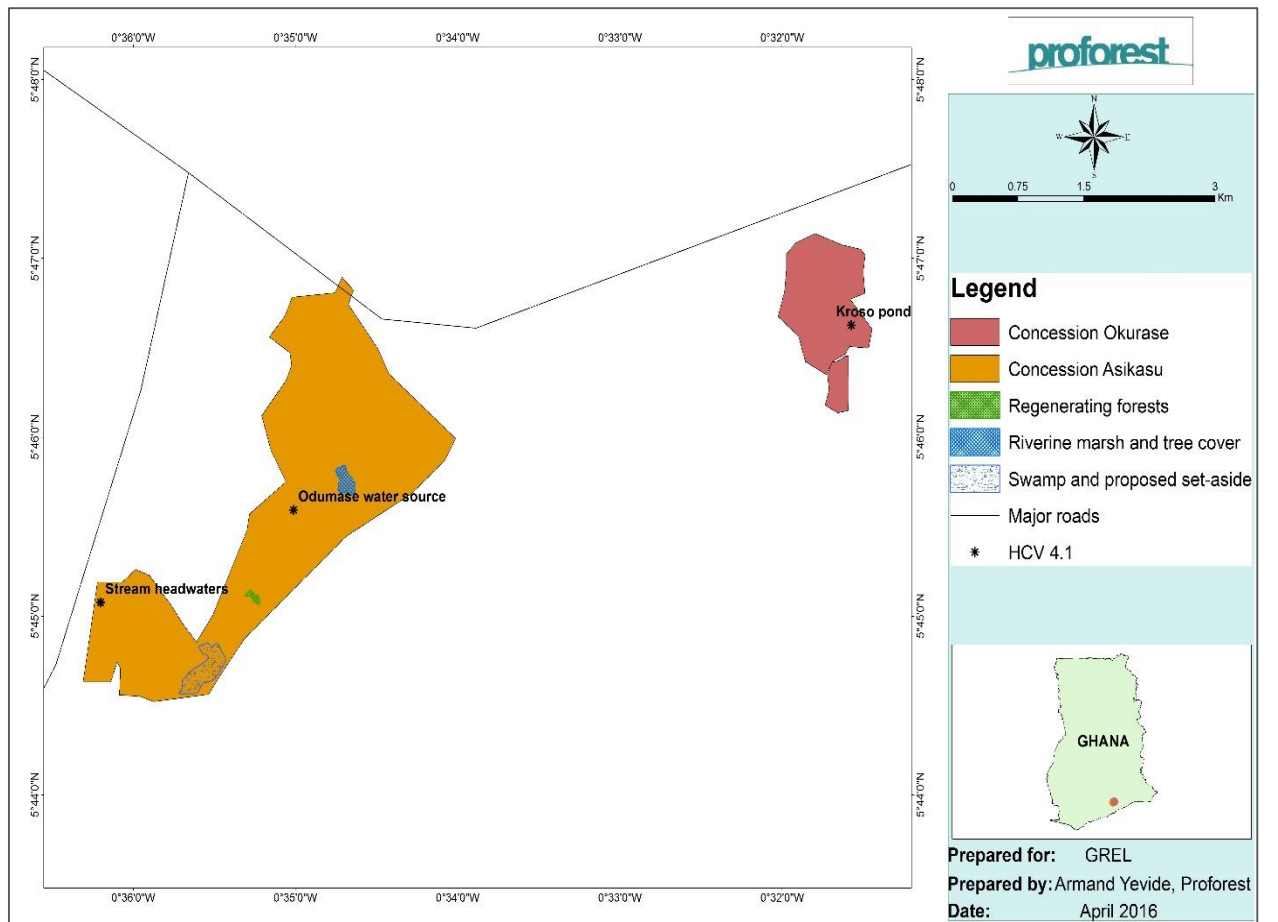


Figure 7: Map of all proposed set-aside areas in concession

## 7.2 Training and capacity building

It is expected that the company trains all its workers and nearby communities on the HCVs identified and on measures to ensure the continued existence of those HCVs.

## 7.3 Mapping and delineation on the ground

All HCV areas should be properly mapped and also delineated on the ground to prevent accidental clearance or encroachment

## 7.4 Incorporation of findings into SOPs

It is strongly recommended that the company incorporates all the findings of this assessment into its standard operating procedures. Recommended guidelines for best practice that would ensure the continued protection of the HCVs and other conservation priorities in the concession have been outlined in the annex 2 of this document.

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## Annex 1: CVs of assessment team members

### Isaac Abban-Mensah

Isaac has a background in sustainable agricultural development and socio-economics of tropical forestry. He has diverse work and research experience in natural resource governance, commodity certification, smallholder development and High Conservation Values within forestry and agricultural landscapes. Isaac is a Senior Project Manager at Proforest, where he works directly with commodity producers to meet international sustainability standards. Isaac has conducted several HCV assessments in Africa, South East Asia and elsewhere for several different commodities including oil palm, rubber, coffee and forestry products. He has led HCV assessments in line with the RSPO's New Plantings Procedure, as well as HCV assessments for existing plantations. Isaac has run several HCV training courses, ranging from advanced HCV training and mentoring for practitioners to introductory HCV training courses in different countries and ecological zones. He has also facilitated the development of HCV national interpretations and the development of guidance for smallholders.

### Abraham Baffoe

Abraham has MSc in Forestry and Environmental Policy and over 19 years of experience working on natural resource management, specializing in the development and implementation of sustainability standards in forestry and agricultural commodities production and natural resources policy. His experience involves managing community forestry projects, developing and implementing forest certification programmes and providing support to sustainability standard setting and policy implementation. As the Forest Programme Leader at the WWF West Africa Forest Office, he coordinated several forestry projects including providing technical support to the FLEGT/VPA process. He has also provided training and technical support to companies on forest certification for the Global Forest and Trade Network. Abraham is an Associate Director at Proforest where his work includes leading on FLEGT projects and carrying out sustainability compliance and High Conservation Value assessment, planning and management for both forestry and oil palm development companies. Abraham has led many High Conservation Value assessments for forest operations and oil palm plantation development in several countries in Africa including Ghana, Nigeria, Cameroon, Gabon, Tanzania, Ethiopia, Liberia, Zambia and Cote d'Ivoire

### Emmanuel Danquah

Dr. Emmanuel Danquah is the Head of the Department of Wildlife and Range Management and a Senior Lecturer at the Kwame Nkrumah University of Science and Technology (KNUST) in Ghana. Having worked for several years in the NGO sector, Emmanuel's academic background is interdisciplinary, with a combination of rich academic and research experience in the biodiversity sector. He has over 20 papers and technical reports to his credit. Emmanuel's recent areas of research include HCV assessments, biodiversity monitoring and impact assessments of natural resource-based projects, green economies in biosphere reserves, endangered species management; protected areas governance, indigenous people and conservation, and traditional knowledge in natural resource management.

### **Eric Ofori Agyekum**

Eric has a bachelor's degree in Natural Resources Management and a master's degree in Environmental Sciences. Essentially, Eric's work has been on improving the sustainability of forest and agricultural ecosystem services provision and biomass energy production in Ghana since 2006. He is a forest management and chain of custody lead auditor and has participated in several FSC audits in Ghana.

### **Mohammed Armani**

Mohammed holds a BSc. In Natural Resources Management and an MSc in Forest and Nature Conservation. Has over 9 years' experience in natural resource management. Previously worked as forest certification auditor and manager in Ghana. Armani has advanced expertise in GIS and allied technologies.

### **Jacqueline Sapoama Kumadoh**

Jacqueline has experience in the areas of ecological surveys, community entry and engagement protocols, environmental sustainability assessment, community conservation-based development, habitat restoration, climate change adaptation mechanisms, policy development, proposal development, and tropical research working with diverse levels of corporate, research and rural environments. She has been involved in training farmers in conservation-based agriculture, conducting environmental conservation education, ecosystem service analysis, data collection and analysis protocols and dealing with multiple stakeholder processes.



Annex 2a: Mean mammal sign densities (per km) and relative abundance (%) for Asikasu and Okurase concessions

Common Name	Scientific Name	Transects									Total	Density per km	Relative Density (%)	IUCN Status	Ghana Wildlife Preservation Schedule
		Asikasu					Okurase								
		4	5	6	7	8	9	10	11						
<b>RODENTS</b>	<b>RODENTIA</b>														
<b>Squirrels</b>	<b>Sciuridae</b>														
Ground Squirrel	<i>Xerus erythropus</i>	4	2	6	3	3	4	2	1	25	6.3	33.8	DD	Schedule 3	
Forest Squirrel	<i>Heliosciurus gambianus</i>	0	3	1	0	0	0	0	0	4	1.0	5.4	LR/nt	Schedule 3	
<b>Porcupines</b>	<b>Hystriidae</b>														
Brush-tail Porcupine	<i>Atherurus africanus</i>	0	3	0	1	0	0	0	0	4	1.0	5.4	LR/nt	Schedule 2	
<b>Cane Rats</b>	<b>Thryonomyidae</b>														
Marsh Cane Rat	<i>Thryonomys swinderianus</i>	5	3	4	0	0	0	0	0	12	3.0	16.2	LR/nt	Schedule 3	
<b>Pouched Rats</b>	<b>Cricetomyinae</b>														
Giant Gambian Rat	<i>Cricetomys gambianus</i>	2	2	4	2	0	1	0	0	11	2.8	14.9	LR/nt	Schedule 3	
<b>Murid Rats</b>	<b>Muridae</b>														
Striped Grass Mouse	<i>Lemniscomys striatus</i>	0	0	0	0	0	3	2	1	6	1.5	8.1	LR/nt	Schedule 3	



Annex 2b: Mean mammal sign densities (per km) and relative abundance (%) for Asikasu and Okurase concessions

Common Name	Scientific Name	Transects									Total	Density per km	Relative Density (%)	IUCN Status	Ghana Wildlife Preservation Schedule
		Asikasu					Okurase								
		4	5	6	7	8	9	10	11						
<b><u>CARNIVORES</u></b>	<b><u>CARNIVORA</u></b>														
<b>Mongoose</b>	<b><i>Herpestidae</i></b>														
Cusimanse	<i>Crossarchus platycephalus</i>	0	3	0	1	0	0	0	0	4	1.0	5.4	LR/nt	Schedule 2	
<b>Genets and Civets</b>	<b><i>Viverridae</i></b>														
Blotched Genet	<i>Genetta servalina</i>	0	4	0	2	0	0	0	0	6	1.5	8.1	LR/nt	Schedule 2	
<b><u>UNGULATES</u></b>	<b><u>UNGULATA</u></b>														
<b>Antelopes</b>	<b><i>Antelopinae</i></b>														
Maxwell's Duiker	<i>Cephalophus maxwellii</i>	0	2	0	0	0	0	0	0	2	0.5	2.7	LR/nt	Schedule 2	
<b>Number of signs</b>		<b>11</b>	<b>22</b>	<b>15</b>	<b>9</b>	<b>3</b>	<b>8</b>	<b>4</b>	<b>2</b>	<b>74</b>	<b>18.5</b>				
<b>Number of species</b>		<b>3</b>	<b>8</b>	<b>4</b>	<b>5</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>2</b>						

Appendix 2c: Mean bird sign densities (per km) and relative abundance (%) for Asikasu and Okurase concessions

Common Name	Scientific Name	Transects									Total	Density per km	Relative Density (%)	IUCN Status	Ghana Wildlife Preservation Schedule
		Asikasu					Okurase								
		4	5	6	7	8	9	10	11						
<b>Egrets</b>	<b>Ardeidae</b>														
Cattle Egret	<i>Bubulcus ibis</i>	5	0	0	0	0	0	0	0	5	1.3	4.0	DD	Schedule 1	
<b>Birds of Prey</b>	<b>Accipitridae</b>														
Black Kite	<i>Milvus migrans</i>	3	0	0	0	0	2	0	0	5	1.3	4.0	LR/nt	Schedule 1	
African Goshawk	<i>Accipiter tachiro</i>	0	1	0	0	0	0	0	0	1	0.3	0.8	LR/nt	Schedule 1	
<b>Francolins</b>	<b>Phasianidae</b>														
Ahanta Francolin	<i>Francolinus achantensis</i>	0	1	0	2	0	0	0	0	3	0.8	2.4	LR/nt	Schedule 3	
<b>Pigeons and Doves</b>	<b>Columbidae</b>														
Bronze-naped Pigeon	<i>Columba iriditorques</i>	0	1	2		1	0	1	0	5	1.3	4.0	LR/nt	Schedule 2	
Afep Pigeon	<i>Columba uncinata</i>	0	2	0	1	0	2	0	0	5	1.3	4.0	LR/nt	Schedule 2	
Red-eyed Dove	<i>Streptopelia decipens</i>	2	1	1	0	2	0	0	0	6	1.5	4.8	LR/nt	Schedule 2	
<b>Cuckoos and Coucals</b>	<b>Cuculidae</b>														
Senegal Coucal	<i>Centropus senegalensis</i>	3	4	3	6	3	2	3	2	26	6.5	20.6	LR/nt	Schedule 3	

## Annex 2d: Mean bird sign densities (per km) and relative abundance (%) for Asikasu and Okurase concessions

Common Name	Scientific Name	Transects									Total	Density per km	Relative Density (%)	IUCN Status	Ghana Wildlife Preservation Schedule
		Asikasu					Okurase								
		4	5	6	7	8	9	10	11						
<b>Swifts</b>	<b><i>Apodidae</i></b>														
Little African Swift	<i>Apus affinis</i>	0	0	0	2	0	0	0	0	2	0.5	1.6	LR/nt	Schedule 3	
<b>Bee-eaters</b>	<b><i>Meropidae</i></b>														
Blue-headed Bee-eater	<i>Merops muelleri</i>	0	1	0	0	0	0	0	0	1	0.3	0.8	LR/nt	Schedule 3	
<b>Hornbills</b>	<b><i>Bucerotidae</i></b>														
Piping Hornbill	<i>Bycanistes fistulator</i>	1	2	0	2	0	1	0	0	6	1.5	4.8	LR/nt	Schedule 2	
<b>Barbets</b>	<b><i>Capitonidae</i></b>														
Naked-faced Barbet	<i>Gymnobucco calvus</i>	0	3	0	0	0	0	0	0	3	0.8	2.4	LR/nt	Schedule 3	
<b>Wagtails and Pipits</b>	<b><i>Motacillidae</i></b>														
African Pied Wagtail	<i>Motacilla aguimp</i>	0	1	0	2	0	0	0	0	3	0.8	2.4	LR/nt	Schedule 3	
<b>Bulbuls and Greenbuls</b>	<b><i>Pycnonotidae</i></b>														
Common Bulbul	<i>Pycnonotus barbatus</i>	1	3	3	0	0	1	2	0	10	2.5	7.9	LR/nt	Schedule 3	

Appendix 2ec: Mean bird sign densities (per km) and relative abundance (%) for Asikasu and Okurase concessions

Common Name	Scientific Name	Transects									Total	Density per km	Relative Density (%)	IUCN Status	Ghana Wildlife Preservation Schedule
		Asikasu					Okurase								
		4	5	6	7	8	9	10	11						
<b>Weavers</b>	<b><i>Ploceidae</i></b>														
Village Weaver	<i>Ploceus cucullatus</i>	2	7	5	2	0	0	0	0	16	4.0	12.7	LR/nt	Schedule 3	
Grey-headed Sparrow	<i>Passer griseus</i>	1	3	4	3	1	0	0	0	12	3.0	9.5	LR/nt	Schedule 3	
<b>Drongos</b>	<b><i>Dicruridae</i></b>														
Pied Crow	<i>Corvus albus</i>	2	2	1	4	5	3	0	0	17	4.3	13.5	LR/nt	Schedule 3	
<b>Number of signs</b>		<b>20</b>	<b>32</b>	<b>19</b>	<b>24</b>	<b>12</b>	<b>11</b>	<b>6</b>	<b>2</b>	<b>126</b>	<b>31.5</b>				
<b>Number of species</b>		<b>9</b>	<b>14</b>	<b>7</b>	<b>9</b>	<b>5</b>	<b>6</b>	<b>3</b>	<b>1</b>						





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