



Project CIPREL 5 combined cycle thermal power plant

Atinkou

In accordance with PS 6

Biodiversity Action Plan



Habitat Assessment
Reviews
and Action Plan
for
biodiversity

Expertise for biodiversity recovery
standard SP6 studies of CIPREL 5
project (Taboth, Ivory Coast)

December 18, 2019



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1 Summary

In response to the growing electricity needs of Côte d'Ivoire, the company ERANOVE, operator of the CIPREL power plant in the industrial zone of Vridi, plans to extend its electricity production capacity by means of a new plant named Atinkou. It will be located 30 km west of Abidjan, near the village of Taboth in the prefecture of Jacqueline, 800 m south of the Ebrié lagoon and 3500 m north of the Atlantic Ocean. Fifteen kilometers of high-voltage line will also be built in an easterly direction to connect the Azitio - Akoupé high-voltage line currently under construction.

The project is located in an area marked by agricultural activities - extensive plantations of coconut and rubber trees, as well as food crops - in which there are many shallow swamps and temporarily flooded forests remain in relatively good state of conservation. The site of the plant is located almost halfway between the Azagny (50 km west) and Banco (30 km east) national parks. The boundaries of the Audouin classified forest were redefined in 2018, for the needs of the Ivorian army (training camp), and today exclude a portion comprising part of the route of the high-voltage line.

The financial institutions involved in financing the project require, among other things, that it respect international good practices in terms of taking biodiversity into account, and in particular performance standard No. 6 (PS6) of the International Finance Corporation (IFC).

An Environmental and Social Impact Assessment (ESIA) was carried out in 2018 by the ERM and ENVAL firms. This Biodiversity Action Plan takes over from the biodiversity component of this ESIA. It incorporates a complementary analysis of the issues in compliance with performance standard No. 6 of the IFC. It then outlines in a concrete and practical way a series of measures making it possible to resolve the biodiversity challenges identified.

The Atinkou power station with water and gas pipes will have a 35 ha right-of-way and the high-voltage line which will export the produced electricity of around 75 ha. This project will impact a total area of 13.4 ha of natural habitats - of which 7.9 ha (under the high-voltage line) will only be "lowered" to a height of 3 m - and 96.8 ha of habitats modified (forest plantations, crops and cleared areas). The natural habitats impacted include 6.5 ha of well-preserved forest areas divided between raffia trees (5.2 ha), swamp forest (1.2 ha) and temporarily flooded forest (0.1 ha) to which add 2.7 ha of grassland on sandy soil, 3.6 ha of degraded forest and 0.6 ha of lagoon aquatic environment.

The natural habitats impacted by the project host a still relatively high biodiversity, and constitute critical habitats for:

- *Phrynobatrachus* sp. (n/a): a new amphibian species to science, known only to the Banco forest and the project site, considered within the science to have restricted distribution
- *Morerella cyanophthalma* (VU): an amphibian with very restricted distribution, known to only three locations on the Ivory Coast coastline. The species has not been observed but the habitat is typical of this frog known from the Banco and Azagny national parks, as well as from wetlands on the border with Ghana.

The area still hosts a population of *Cercopithecus lowei* (VU), an endemic primate of the Ivory Coast and Ghana and *Trichechus senegalensis* (VU), the African manatee, present in aquatic habitats and the Ivorian lagoons which host a major populations.

Note there is also the special case of the West African crocodile (*Crocodylus suchus*) whose IUCN status, still under evaluation, should be at least VU in the near future (according to the group of crocodile specialists of the IUCN / SSC). The data collected does not indicate that the forests in the study area constitute a critical habitat for the species, but it is nevertheless the subject of particular attention due to the high hunting pressure to which it is submitted, including on the project area. Other species of interest include the dwarf crocodile (*Osteolemus tetraspis* - VU) and the red-breasted owl (*Scotopelia ussheri* - VU) whose presence has been reported by fishermen and villagers from Taboth but who have not been observed directly.

A total of 20 species of flora and fauna were the subject of a detailed analysis in this study, in addition to the analysis relating to natural habitats. These species were the subject of additional surveys (May 2019), and an in-depth assessment of the project's impacts on their habitats.

Certain species and habitats also contribute, materially or spiritually, to the well-being of the populations affected by the project. The assessment of "ecosystem services" carried out within the framework of the ESIA and the Resettlement Action Plan (RAP) is repeated here in broad outline here in order to better understand certain ecosystem services of supply, regulation and culture that have been prioritized.

The project presents negligible residual impacts on the habitat of the African manatee (an aquatic mammal) and low residual impacts on 2 species of amphibians for which swamp forests, temporarily flooded and raphia constitute a critical habitat. The project will impact 6.5 ha of this critical natural habitat, with its procession of forest species. Measures to mitigate and compensate for these impacts so that the project contributes to the conservation of these habitats have been integrated into a Biodiversity Action Plan (BAP), in accordance with performance standard 6 of the IFCs requesting a "net gain" for critical habitats.

The main proposed compensatory measures are:

- Financial support for the National Park Azagny for the conservation of coastal rainforest environments ¹. Like many protected areas, the park currently suffers from a lack of resources to fully carry out its missions.
- Support for the improvement of knowledge about the distribution and ecology of amphibians on the Ivorian coast, especially *Morerella cyanophthalma* and *Phrynobatrachus* sp, which will be described further

The ambitious project avoidance strategy, coupled with this compensation strategy makes Atinkou project an exemplary project in the consideration of biodiversity, despite a challenging environment in terms of sensitivities.

¹ This is a compensation for "avoided losses."

2 Presentation of the Project

2.1 Project background and this study

As part of the Ivorian government's policy on access to electricity and in response to the growing electricity needs of Côte d'Ivoire, the company ERANOVE, operator of the CIPREL gas-fired power station in the area industrial plant in Vridi, plans to extend its electricity production capacity by means of a new power plant called Atinkou. This will be located near the village of Taboth, in the prefecture of Jacqueline, less than 1 km south of the Ebrié lagoon, and approximately 30 km west of Abidjan (Figure 1)

This Project, named CIPREL 5, includes the installation of a gas turbine, a heat recovery boiler, a steam turbine and forced-draft cooling towers in closed cycle, as well as auxiliary equipment associated. The additional installed capacity will be 390 MW. ERANOVE's production capacity will therefore go from a current total installed power of 543 MW (CIPREL) to more than 940 MW (CIPREL and Atinkou).

The associated infrastructure includes in particular a water intake and discharge pipe in the lagoon for cooling the turbines, a gas supply pipe and a power station for connection to the network. The evacuation and transport of energy will be ensured by a High Voltage transformer station and a 400 kV power line of approximately 15 kilometers connecting pylon 55 of the line under construction (by the state of Ivory Coast) between the Azito power station and the Akoupé Zeudji substation. The construction and operation of this power line was the subject of an environmental and social impact study (ESIA) separate from that of the Atinkou power station.

The ESIA's have shown the coexistence of two areas of potential impact of the Project: a direct area of influence (where the Project and the immediate surroundings will be located) and an indirect (likely to be exposed to direct and indirect impacts on the natural and human environments), as shown in Figure 1. Some effects will be combined with those of other projects, in particular that of the Azito - Akoupé Zeudji high-voltage line, and that of Greater Abidjan.

The financial institutions involved in financing the project require, among other things, that it respect international good practices in terms of taking biodiversity into account, and in particular performance standard No. 6 (PS6) of the International Finance Corporation (IFC).

[The biodiversity action plan to enable CIPREL / ERANOVE managing biodiversity as part of the construction and operation of thermal combined cycle plant Atinkou.](#)



Figure 1: Project Location Map with its zones of influence. North Ebré lagoon, south the Gulf of Guinea
 Source: ESIA CIPREL 5 project (Ivory Coast), by ERM (2019).

In this context, BIOTOPE was commissioned to:

- Analyze gaps in the ESIA vis-à-vis the PS6
- Update the mapping of natural, modified and critical habitats concerned by the project's areas of influence
- Update the critical habitat assessment based on the information presented in the ESIA's and the targeted additional study on chimpanzees and confirm if the related requirements apply to the project.
- Develop a Biodiversity Action Plan (BAP), and a biodiversity monitoring and evaluation plan if critical habitat is confirmed
- Prepare a Biodiversity Management Plan based on the ESIA and the results of this assessment, which will be integrated into the Environmental and Social Management Plan (ESMP).

This work was carried out on the basis of data already available in the already existing versions of these documents (ESIA, ESMP and associated studies), on additional bibliographic research, a field mission (May 2019) and consultations with local communities.

This document is a draft of the assessment of critical habitat and Actions Plan for Biodiversity. It includes an analysis of the issues and impacts, and measures proposed, as a BAP.

2.2 The CIPREL Project 5

2.2.1 Context of the energy sector in Ivory Coast

In 1990, the Ivorian government undertook an important phase of restructuring of the electricity sector by granting a private company the management of the production, transport, distribution, export and import of the electric energy. This restructuring aimed to ensure self-financing and financial stability in the sector, as well as to optimize the functioning of the electricity network.

The discovery, in 1993 and 1994 at sea of the associated oil and gas deposit "Lion", and of the dry gas deposit "Panthère", gave the government the opportunity to consider thermal energy in order to install installations larger production. With this in mind, the government signed in 1994 an agreement with a private company, the Ivorian Electricity Production Company (CIPREL) for the construction, operation and transfer of ownership of a thermal power plant with a capacity of " about 210 MW (Vridi II, in the Abidjan area). The public-private partnership agreement with CIPREL, the first of its kind in Côte d'Ivoire and sub-Saharan Africa, demonstrates the government's intention to expand the electricity generation sector through private actors.

And indeed, the available production capacity in 2015 was around 1,770 MW, coming from the Azito (430 MW), CIPREL (540 MW) and Aggrekko (100 MW) power plants, all located near Abidjan, plus the contribution of hydroelectric power stations located a few hundred kilometers from consumption centers. No energy reserves are available and existing plants must operate in continuous mode at almost maximum power to meet consumer demand.

In this context, several power plant projects are under development or evaluation, notably the thermal power stations of Azito (extension of 250 MW) and Songon (372 MW), as well as the hydroelectric dams of Singrobo (44MW), Louga (283 MW), Boutoubré (156 MW), Tiboto (220 MW) and de Tayaboui (100 MW).

To these projects will be added in the short term the development of the CIPREL 5 power station which will result in an increase in the installed capacity of 390 MW, ie a 16% increase in the country's electricity production capacity. This new increase in capacity will thus significantly contribute to securing the electricity supply of the Republic of Côte d'Ivoire. This project was the subject of a memorandum of understanding with the State of Côte d'Ivoire in September 2016, and the agreement was signed on December 19, 2018.

2.2.2 Project Description - CIPREL 5

The first 4 phases of the CIPREL Project which began in 1995 consisted of the installation of different types of turbines on the site of the Industrial Zone of Vridi. All of these machines, capable of running on gas and using back-up fuel, bring the total power of the CIPREL power plant to 543 MW today.

ERANOVE is planning a new extension of the CIPREL power plant, called CIPREL 5. This extension will be installed on a new site 1 km southeast of the village of Taboth, and about 12 km east of Jacquelineville. The 30 ha land allocated to the project is located in a rural area, currently occupied by coconut plantations and subsistence farming areas (mainly cassava and maize), bordered by forest islands. The site is located approximately 800m south of the Ebrié lagoon. The areas closest to the project activities are located approximately 700 m from the northwest boundary of the land. The Power Plant Project includes the installation of a new gas turbine (TAG), a heat recovery boiler, a steam turbine (TAV), and forced draft cooling towers connected to a pipeline water, as well as the associated auxiliary equipment.

The evacuation and the transport of energy will be ensured by a 400 kV electric line made of double circuit overhead conductors, to be built between a post on the site of the power station and the future line connecting the Azito power station to the power station Akoupé Zeudji (whose construction is in progress). The line will be supported by pylons 50 to 60 m high located at more or less regular intervals (approximately 400 m), over a distance of 15.6 km until it connects to pylon 55 of the Azito Akoupé Zeudji line. Three route options were studied; Option 1 passing through the north of the Project area is the one currently favored by Atinkou, because it allows the best balance between avoiding environmental impacts, limiting the need for land acquisition and displacement of local communities, and construction costs (see Figure 2). This option crosses the northern part of the Audoin classified forest, in a highly anthropized area which was recently subdivided. The construction and operation of this power line was the subject of an environmental and social impact study treated independently of that of the power plant.

The CIPREL 5 power station will be operated by a company from the ERANOVE group called Atinkou. The installed capacity at the new plant will be approximately 390 MW. Increasing CIPREL's production capacity to around 940 MW. The plant will be put into operation gradually. The commissioning of the TAG in open cycle is planned for the third quarter of 2020, the commissioning of the combined TAG-TAV cycle is planned for the second quarter of 2021. The entire project has been the subject of a protocol agreement with the State of Côte d'Ivoire in September 2016. The agreement was signed on December 19, 2018.



Situation du Projet et zones d'influences

ERANOVE - CIPREL
Analyse d'habitats critiques

-  CENTRALE CIPREL
-  Ligne électrique HT
-  Prise de gaz
-  Pipe prise d'eau
-  Zone tampon 1 km
-  Zone d'influence indirecte



Source : CBRIG AERI (L), 2016 Cartographie : Biotope 2019-05-24T09:23:50

Figure 2: Map of the present situation of the project, currently with plot retained power line before crossing the lagoon Ebrié. Source Biotope 2019

3 Scope of the Biodiversity Action Plan (BAP)

3.1 Objectives BAP

The Biodiversity Action Plan aims to provide the necessary supplements to the biodiversity component of the Environmental and Social Impact Study, by breaking down in a concrete and practical manner (description, calendar, budget, distribution of tasks between actors) the measures outlined there, possibly by supplementing them with other measures enabling the biodiversity challenges identified to be resolved.

In the present case, biodiversity issues additional to those mentioned in the ESIA were identified and confirmed when the ESIA was brought up to standard PS6.

This work was carried out on the basis of data already available in the ESIA and related studies, based on further research, consultation, and the results of field missions conducted in May 2019 by Biotope. All these factors helped:

- Refine the assessment of biodiversity issues in the areas of influence of the Project;
- Carry out a critical habitat assessment;
- Update the habitat mapping in the study area;
- Reclassify the impacts;
- Propose appropriate and proportionate mitigation and compensation measures.

The scope of this action plan includes the lagoon aquatic area affected by the Project, as well as all of the terrestrial environments impacted directly or indirectly (permanent hold of the Project or of the associated transmission line, places of temporary occupation and their areas of influence).

According to PS6, are several objectives:

- Protect and conserve terrestrial and aquatic biodiversity (fauna, flora, natural habitats);
- Respect the mitigation hierarchy (avoid - reduce - compensate) by targeting the absence of net loss of biodiversity for natural habitats, and the net gain for critical habitats;
- Cover the construction and operating phases of the power plant and the high-voltage line.

3.2 Study Areas

According to the PS6 performance standard, it is necessary to take into account the impacts linked to the project on the entire terrestrial or aquatic landscape, potentially affected, and on natural and critical habitats.

The "terrestrial landscape" is used in the broad sense and can correspond to an ecoregion, a biome or any other unit of ecological space significant at regional level (that is to say, which is not site-specific). The purpose of this requirement is to encourage the identification of impacts on a larger scale than that of the project's direct right-of-way, in particular the impacts on the connectivity of habitats and / or on ecosystems outside the immediate vicinity of the Project but which could be modified by its development. This allows the impact analysis to be properly contextualized.

It is also a fundamental step in identifying environmentally appropriate mitigation and compensation options that are consistent with the wider conservation efforts in the region. It can support the mitigation and compensation strategy, which may be implemented at the regional level and not only in the immediate vicinity of the project. This type of analysis is also particularly important to prevent the degradation and fragmentation of natural habitats, and in particular the cumulative impacts, linked in particular to the development of the so-called "Greater Abidjan" project.

In accordance with PS6, the analysis focused on several areas of interconnected areas of study

The 'study landscape' under PS6 for this project of thermal power covers:

- The immediate study area - or area of direct influence where the project infrastructure and immediate surroundings will be located - which corresponds to the areas analyzed in the ESIA's of the power plant and the high-voltage line, as well as in the additional studies (in particular the Ebrié lagoon study). The immediate study area therefore includes the 30 hectare site for the plant, a 50 m wide corridor centered on the route of the high voltage line, the unloading quay in the lagoon near the Jacquerville bridge, access roads to the site, work areas, as well as all other constructions relating to the project (in particular the workers' city if finally validated).
- The close-up study area - or area of indirect influence, which corresponds to a more or less extensive area around the various project components likely to be the object of direct and indirect impacts (see Figure 2).
- For terrestrial environments, bibliographic research was done on species frequenting the same natural habitats as those present in the project area, and species with conservation issues were analyzed at national level to determine their probability of presence in this area.
- For data extraction from databases: a right-of-way has been defined by applying buffer zones around the immediate study area. These buffer zones are
 - o 30 km buffer zone for the extraction and analysis of bird data extended to the Important Bird Areas (IBA or ZICO) present nearby.
 - o 15km buffer zone to the other groups.
- For aquatic environments, the Ebrié lagoon was the subject of additional bibliographic research. This concerned more particularly the area located to the right of the village of Taboth, but research was extended to consult the data and the context relating to the entire lagoon in order to complete the distribution maps of the species.

To facilitate the reading of the report we will retain the following terms:

Table 1 - Definition of the study areas	
Study zone	Characteristics
distant	This is the location of the power plant and the high-voltage line. The functionality of the site is analyzed, the position of the project within the land corridor - the terrestrial landscape (see definition below) - located between 2 aquatic ecosystems - lagoon and oceanic -, the location in relation to the villages and human communities, depending on the uses made of them, etc. For certain species at stake, presence data concerning neighboring areas were also analyzed (such as the Banco forest or the Azagny National Park) . It is also the study area that was the subject of the ecological continuity analysis.
Indirect or Close	This is the area potentially affected by the project. The initial state is analyzed in a more targeted manner, based both on information from the bibliography and on field observations.
Direct or Immediate	These are the project implementation area and also the ESIA study areas. It includes settlement areas, construction areas and their direct surroundings. The initial state was analyzed there in a more complete way. field surveys were indeed centered on this area.
Discreet Management Unit	For the study of critical species and habitats within the framework of PS6, the project had to determine a reasonable limit (ecological or political) defining the area of habitat to be taken into consideration. This is called "discrete management unit": an area with a definable limit within which biological communities and /or management issues have much more in common than with those in adjacent areas. A discrete management unit may or may not have an actual management limit (for example a protected area) but can also be defined by another ecologically relevant limit (watersheds, interfluvial zone, patch of intact forest within a modified habitat , seagrass beds, coral reefs, upwelling zone, etc.). The demarcation of the management unit depends on the species (and, sometimes, subspecies) which are of concern.

The distant study area was used to compile data on the potential presence of species as part of the ESIA gap analysis. It is sufficient to take into account the impacts linked to the project on the entire terrestrial or aquatic landscape potentially affected: accidental pollution linked to the site or diffuse linked to the aerial discharges from the power plant, destruction and modification of natural habitats, modification of properties physico-chemical of the lagoon ecosystem (temperature, salinity).

The field surveys were focused on the immediate study area.

In accordance with the PS6 performance standard, the characterization and evaluation of critical habitats involves the delimitation of discrete management units² (DMU). The delimitation of DMU depends on the species and / or habitats that are sources of concern in the project area.

3.3 Consultations with stakeholders and experts

Several actors and experts were mobilized during the development of the ESIA. In addition, during the preparation of this document were also consulted:

- Several naturalists and doctoral students concerning the batrachological data relating to the following frogs : *Phrynobatrachus ghanensis*, *P. villiersi*, *Hyperolius viridigulosus*, *Morerella cyanophthalma* and *Kassina arboricola*

² Sometimes better known in English: Discrete Management Unit (DMU)

- Academic herpetologists to check for possible data on the presence of crocodiles and more specifically of the African False Gharial, *Mecistops cataphractus*, Dwarf crocodile *Osteolaemus tetraspis* and West African crocodile *Crocodylus suchus*.
- Ornithologists concerning possible data on the presence of the parrot Timneh *Psittacus timneh*, the bulbul yellow beard *Criniger olivaceus*, and rufous fishing owl *Scotopelia ussheri*
- SODEFOR (Forest Development Corporation) regarding the status of the classified forest Audoin and potential data on the presence of species with conservation issues.
- The SICOR (Ivorian Grated Coconut Company) concerning the status and future of extensive coconut plantations in the project area.
- The villagers, farmers and fishermen in the vicinity of the power plant project to verify whether the presence of all of the above conservation species was known to the immediate study area.

3.4 complementary field mission: methodological approach

3.4.1 Protocol and species sought

A field mission was carried out by Biotope at the start of the rainy season, from 09 to 14 May 2019, in order to describe and specify the interest of the terrestrial and aquatic habitats present in the immediate study area, in particular for species that may potentially trigger a critical habitat designation within the meaning of PS6. This period is particularly favorable for batrachological inventories of which the bibliography showed the interest.

The field mission carried out from 09 to 14 May 2019 supplemented other inventories already carried out as part of the impact study and a mission dedicated to primates. It was designed on the basis of a preliminary analysis of the species likely to trigger a designation of critical habitat. This preliminary work, carried out on the basis of a bibliographic study and a cartographic analysis of the arrangement of habitats and accesses, made it possible to orient the field reconnaissance towards particular micro-habitats and to develop prospecting techniques adapted to the ecology of the target species. Given the relatively short time allotted for this mission, the field research was focused on the surroundings of the power plant site, mainly the expanse of swamp forest which is east of the village of Taboth, and the forest of 'Audoin. The areas were explored by car, on foot and by boat from the lagoon as shown in Figures 3 and 4..

Nine terrestrial species had been identified in the bibliography as likely to trigger a critical habitat designation due to their IUCN status (EN or CR) and / or their restricted distribution, among many threatened species:

- two plants (*Macropodiella heteromorpha* (VU) and *Aneilema mertonii* DD) among several species listed "vulnerable" by the IUCN which have a restricted distribution (*Nauclea diderrichii*, *Milicia regia*, *Turraeanthus africanus* ...)
- three threatened reptiles (*Mecistops cataphractus* - CR, *Kinixys erosa* - CR and *Kinixys homeana* - EN) among several vulnerable or almost threatened species including a soft-shelled turtle (*Cyclanorbis senegalensis* - VU) and two other crocodile species: *Osteolaemus tetraspis* (VU), *Crocodylus suchus* (IUCN status under revision).

- two vulnerable amphibians (*Morerella cyanophthalma* and *Kassina arboricola*, VU) and a species classified as near threatened (*Phrynobatrachus ghanensis*, NT) which is found on the fringes of its known distribution area. These three species have restricted ranges likely to trigger critical habitat
- a bird: the gray parrot (*Psittacus timneh* - EN), as well as two species classified as "vulnerable": the red-breasted owl (*Scotopelia ussheri*) and a bulbul forest (*Criniger olivaceus*).

The habitats of these species have been identified and prospected in the site of the plant and in the Audouin forest. No survey has been carried out on the Ebrié lagoon concerning the presence of the African manatee (*Trichechus senegalensis* - VU)

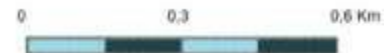
The research was carried out by three research managers specializing in each of the taxa concerned (amphibians, reptiles and flora), accompanied by a project manager conducting ornithological surveys. The movements were made on foot inside the targeted habitats, and a small boat was used to conduct nocturnal reconnaissance in the lagoon concerning crocodiles. In addition, reconnaissance was carried out by vehicle between the various study areas as well as in the Audouin forest concerning the route chosen for the high-voltage line



Trace parcourue autour du village de Taboth

ERANOVE - CIPREL
Analyse d'habitats critiques

- CENTRALE CIPREL
- Ligne électrique HT
- Pipe prise d'eau
- Trace parcourue
- Zone tampon 1 km
- Zone d'influence indirecte



Sources : BIRD AERIAL, 2010 Cartographie : Biotope 2016-05-14T09:23:56

Figure 3: Trace traveled on land and in the lagoon in the central area





Trace parcourue dans la forêt d'Audouin

ERANOVE - CIPREL
Analyse d'habitats critiques

— Ligne électrique HT
— Trace parcourue



Source : ©BIBIS AERIAL 2015 Cartographie : Biotope 2015-05-04T08:23:06

Figure 4: Trace traveled by car in the forest Audouin.



3.4.2 Surveys for wildlife and terrestrial habitats

The species likely to trigger critical habitat depend closely on the remaining forest areas in the region. The methodology therefore consisted in identifying the potentially most favorable sectors for these species (undergrowth in the swampy and temporarily flooded forest areas, which constitute the best preserved forest areas in the project area) and to seek their presence or presence indicators: mainly visual and auditory observations for some species of amphibians and birds. In addition, consultations were held with local populations (in particular farmers, hunters and fishermen) in order to collect information on these species, their distributions and abundance. Visual aids were used and 'trick' questions were systematically asked to ensure the validity of the comments collected from these people.

The analysis and description of terrestrial habitats was carried out using conventional methods, noting the characteristics of the important parameters influencing the species: type of habitat, structure and main species composition of the vegetation, level of closure of the canopy, nature of the soil (macroscopic analysis) and character flooded, temporarily flooded or dry, possible degradations and traces of human activity. Other elements were also noted in order to enrich the analysis, such as the presence of flood / wetlands, connectivity of habitats and ecological continuity

All the days (from 09 to 14 May 2019) were devoted to finding the target species for the different taxa (see Figures 3 and 4 for the traces traveled in the recognized areas), and inventories were conducted at night for nocturnal species (crocodilians and certain species of amphibians).

Table 1.1 - Species with conservation issues observed during field inventories				
Kingdom	Class	Species	Distribution	IUCN status
Animalia	amphibia	<i>Arthroleptis poecilnotus</i> - complex	forest Upper Guinea Block	LC
		<i>leptopelis spiritusnoctis</i>	West Africa	LC
		<i>Sclerophrys regularis</i>	Sub-Saharan Africa	LC
		<i>Hoplobatrachus occipitalis</i>	Sub-Saharan Africa	LC
		<i>Afrixalus dorsalis</i>	Sub-Saharan Africa	LC
		<i>hyperolius fusciventris</i>	Sub-Saharan Africa	LC
		<i>hyperolius picturatus</i>	forest Upper Guinea Block	LC
		<i>Phrynobatrachus latifrons</i>	Sub-Saharan Africa	LC
		<i>Phrynobatrachus</i> sp.	N / A	NE
		<i>ptychadena bibrani</i>	Sub-Saharan Africa	LC
		<u>Mascarene Grass Frog - complex</u>	Sub-Saharan Africa	LC
		<i>aubria subsigillata</i>	Sub-Saharan Africa	LC
		<i>Amirana albolabris</i>	Sub-Saharan Africa	LC
	mammals	<i>Cercopithecus lowei</i>	Ivory Coast and Ghana	VU
	reptiles	<i>Crocodylus suchus</i>	West and Central Africa	NE
<i>Pelomedusa</i> sp		N / A	N / A	
Plantae	noliopsida	<i>Milicia excelsa</i>	tropical Africa	NT
		<i>Milicia regia</i>	West Africa	VU
		<i>Nauclea diderrichi</i>	tropical Africa	VU
		<i>Tetracera alnifolia alnifolia</i>	forest Upper Guinea Block	NE
	Liliopsida	<i>Raffia palma-pinus</i>	West Africa	NT

Schedule of Conservation challenge to species observed during field surveys with their distribution and status IUCN

The list of species observed during field surveys (Table 1.1) is detailed below :

- For **the flora**, the surveys were conducted along targeted daytime reconnaissance walks towards the potential habitat types of the two species likely to trigger critical habitat. For each survey, the species have been identified and the corresponding habitat described. A total of 87 plant species have been inventoried, but none of the species likely to trigger critical habitat, the presence of which seems to be excluded for the following reasons. In fact, *Macropodiella heteromorpha* is subservient to the rocky zones of rapids and waterfalls of permanent rivers. It could potentially be present on the Bandama River which borders Azagny National Park, but there is no suitable habitat in the Project area. *Aneilema mortonii* is a hydrophyte inhabiting the wet and marshy areas of savannah and forest. The species is known from several stations in Ghana, Côte d'Ivoire and Nigeria. Its non-observation can be explained either by its absence in the Project area, or by its disappearance due to the dwindling of its habitat by drying up the areas of marshes and swamps for agriculture. In addition, young and small individuals belonging to sensitive species such as *Nauclea diderrichii* (VU) and *Milicia regia* (VU) have been seen many times throughout the study area. Expertise was also conducted on the diversity, distribution and status of terrestrial invasive alien species. The species *Chromolaena odorata* and *Lantana camara* are present throughout the area, scattered in diffuse stands colonizing crops, fallows and forest edges;
- For **the reptiles**, the inventories were conducted day and night in search of the three species likely to trigger critical habitat presented in § 3.4.1. The other three sensitive species (2 crocodylians and a turtle) have also been the subject of targeted research. Daytime searches were conducted on foot mainly in swamp forests, shallow s and flooded meadows in the project area, while nighttime searches were conducted from a boat on the lagoon along the coast and visiting all entrances to water in the land. At very low speed (less than one knot), two observers used powerful lighting to continuously scan the edge. Based on targeted interviews of local communities and observation of habitats, the presence of the false African gharial (CR) seems to be excluded from the project area. Indeed, this species does not much affect large and open aquatic environments. In addition, the rivers are essentially bordered by grassy vegetation which does not offer a favorable nesting site.



Figure 5: Nest *Crocodylus suchus* observed near the Village Taboth

Finally intentional or accidental fishing (sight, with nets and traps) represents a very significant risk of disappearance for the three species of crocodylians. A former West African crocodile (*Crocodylus suchus*) nest was seen near the village of Taboth. According to interviewees, the dwarf crocodile (*Osteolaemus tetraspis*) is present in the project area, although inventories have not confirmed this information. Only one turtle has been observed, it belongs to the genus *Pelomedusa*, and does not present any particular conservation issue.

- For **amphibians**, investigations were also carried out day and night in search of the species at stake. The inventory was conducted systematically, collecting all the species encountered, with a sampling effort directed more specifically towards the forest and marshy habitats to which the desired taxa are subservient.

Individuals were preferentially captured for visual identification, but when they were difficult to approach the identification was auditory. In flooded areas, capture is done using a dip net, and for tree species (or in dry areas) directly by hand. Fourteen amphibian species have been collected, only one of which is likely to trigger critical habitat: *Phrynobatrachus* sp. This species, very similar to *Phrynobatrachus ghanensis*, has only been observed in the Banco forest and has not yet been described to date. In the current state of knowledge, this species has a very restricted distribution area. Finally, the habitats of *Phrynobatrachus* sp. correspond to those of *Morerella cyanophthalma* (VU), a threatened amphibian species known only from three places in the world including the Banco and Azagny national parks;

For amphibians and reptiles, surveys were carried out in day and night to optimize contacts and catches (diurnal species / night).

- For the **birds**, research was mainly focused on the Timneh parrot, *Psittacus timneh* (EN) likely to trigger critical habitat, but attention was also drawn to the two other species potentially present and classified as "vulnerable" on the IUCN Red List: *Criniger olivaceus* and *Scotopelia ussheri*. The reconnaissance was carried out mainly during the day, by visual and auditory observations. Two night trips were made from dusk until 10 p.m. to identify nocturnal species (fishing owl). The inventories were conducted by combining techniques of pedestrian recognition and from a boat on the lagoon; the ironing technique having been developed for research from the lagoon. Although none of the 3 species sought has been observed, all of the fishermen and villagers interviewed agree to report the red owl (*Scotopelia ussheri* - VU) as present on the project site, but confusion with the Pel owl (*Scotopelia peli* - LC) is possible.



Figure 6: Inventory amphibians collection technique for visual identification

The characterization of the habitats and the inventories were carried out according to a targeted sampling on representative environments. Coupled with the preparatory work (bibliographic and cartographic), and the consultations carried out (local populations and researchers), a relevant analysis of ecological issues can be made.

These surveys also made it possible to refine the mapping of land use based on the elements of typology proposed within the flora part of the impact study. Given the short time available for this field prospecting, the entire area could not be prospected. Only verification points were carried out, and crossed with an analysis of aerial images.

4 Description of habitats within the study area

4.1 forest habitats

The indirect area of influence of the Atinkou project is dominated by coconut groves under which food crops are often found. Terrestrial habitats are presented in detail in the ESIA. Among the six habitat categories identified, 3 consist of forest formations: raffia, swamp forests and temporarily flooded forests. Complements to the ESIA on these only forest habitats are presented below because they concentrate the biodiversity issues in the project area (see EIES Chapter 6_Initial state).



Figure 11: Coconut grove image in the project area

4.1.1 State of conservation of forest environments

Historically, the expansion of export crops was the main driver of deforestation in Ivory Coast. In the project area in particular, the implementation of SICOR (Ivorian Grated Coconut Company) in the 1970s caused a profound change in natural forest ecosystems.

The Ivorian forests have lost 60% of the 37 300 km² which constituted their area in 1975. In 2013, tropical rainforests only covered 14 500 km².

The project is located in the Guinean rain forest area of West Africa. Located on a codon of land approximately 5 kilometers wide between the Gulf of Guinea (Atlantic Ocean) and the Ebrié lagoon, the soil is mainly composed of sand. This sand is covered with topsoil where forests remain, and peat in raffia and swamp forest areas. In the region, swampy and temporarily flooded forests constitute the habitats that concentrate the majority of biodiversity issues.

The May 2019 field mission verified the state of conservation of these forest areas. In a region where natural habitats have been greatly modified by human activities - mainly the extensive cultivation of coconut palms and subsistence farming - these forest relics are today reduced to a few low land areas and at the edge of the lagoon which could not be exploited. However, they are still in a relatively good state of conservation due to the flooded nature of their soil which makes them difficult to access and exploit.

The largest forest block in the project area consists of a swamp forest bordering the Ebrié Lagoon east of the village of Taboth and the site of the plant. Covering an area of approximately 2 km², it consists of the three forest types described in the ESIA: swamp and raffia forests, and the higher areas with more drained soil are covered with temporarily flooded forests.

The greatest threats identified for these habitat types are:

- the gradual conversion of the driest areas to intensive agricultural uses (coconut and rubber plantations) or traditional uses of fire;
- Local exploitation of timber as *Nauclea diderrichii* (VU) or *Milicia regia* (VU), and raffia for the production of palm wine;
- Hunting

Figure 8 shows the losses of forest cover between 2001 and 2018 in the CIPREL 5 project area, as well as primary forests in 2001. It appears that deforestation was more marked on the outskirts of agglomerations than in the rest of the territory consisting essentially of coconut groves, the creation of which dates back to the 1970s. In 2001, only 2 blocks of "primary" forest remained in the project area: one located in the classified forest of Audouin, and another bordering the Ebrié lagoon east of the plant area (mentioned above). The latter still exists today, but the northern part of the Audouin forest, located east of NDjem, was the subject of severe clearing which increased from 2010 onwards. There is no longer any natural forest in this area, which has been entirely cut down to be subdivided in its western part, and planted (rubber, teak, coconut trees and subsistence farming). The Ivorian government has also recently redefined the boundaries of this classified forest to exclude a strip of approximately 1km wide from the ocean to the lagoon on which a military camp will be built (Order No. 2018-592 redefining the boundaries of the Audouin classified forest, published in the Official Journal of the Republic of Côte d'Ivoire, No. 65 of Monday August 13, 2018). The project was also forced to modify the final part of the route of the high-voltage line so as to bypass the future military zone (see Figures 1 and 2)

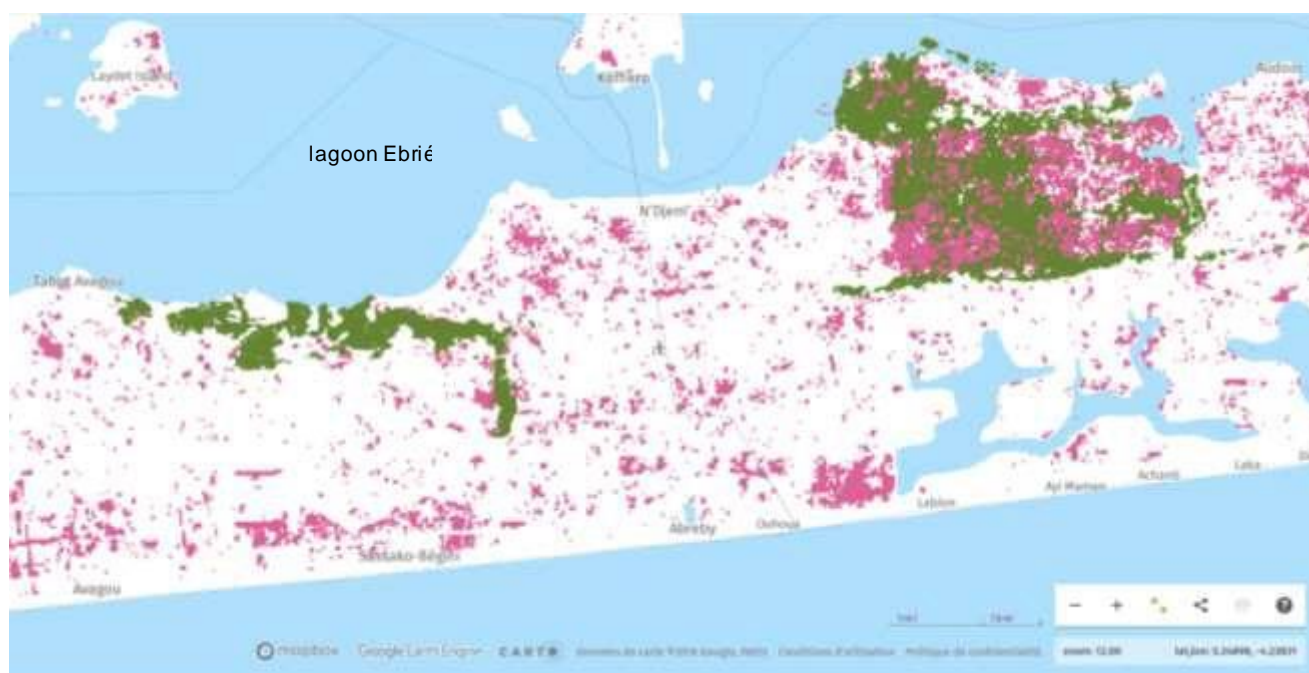


Figure 8: Loss of forest cover between 2001 and 2018 (in pink). In green are the primary forests in 2001.
source: *Global Forest Watch* (2019)

4.1.2 Characterization of forest habitats impacted by the project

The 30 ha constituting the site of the plant are located in an aging coconut grove where rare scattered small patches of secondary forest (not flooded) have started to recolonize the area. The route of the water line for cooling the turbines crosses 2 small thickets of temporarily flooded forest in order to avoid the large forest block located to the north and east of the power station (see Figure 10 below)

The route currently considered for the gas pipeline travels through coconut groves and then into the medium-voltage line that supplies the village of Taboth: it has no impact on the forests of the area. Finally, the route chosen for the high-voltage line is mainly located in coconut groves, but it crosses a few areas of swampy and temporarily flooded forests. Although the installation of the pylons is not yet final, the planned interval of 400 m between each of them should make it possible to avoid all the forest areas crossed. In addition, the cables will be laid by helicopter, which should make it possible to avoid clearing the 50 m right-of-way of this power line. On the other hand, the height of vegetation admitted under the high-voltage line is 3 m, so all trees exceeding this height will be selectively cut by loggers using chainsaws (no intrusion of machines in swampy forests)

The forest areas directly impacted by the Atinkou project are found exclusively along the three networks created: the water and gas pipes and the electricity export line. The forest areas to be crossed represent 0.7% of the forests present in the area of indirect influence of the project, which represents less than 0.1% of the swamp forest area present in the neighboring Azagny National Park (area of the 19,000 ha park, including more than 8,000 ha of forest), and therefore a very small part of the Guinean forests of West Africa. Nevertheless, and given the significant state of degradation of the Ivorian forests, it should be noted the particular character of these low land forests which constitute refuge zones for a whole procession of flora and fauna species which are there, specifically adapted. A significant part of this singular biodiversity subservient to such wetlands has restricted distributions and / or is threatened with extinction. In the case of this project, the sensitive species identified belong to the groups of amphibians, reptiles and plants.



Figure 9: temporarily flooded forest dominated by raffia. To the east of the village of Taboth.

However, other more widely distributed forest species (but some of which are also threatened) also find conditions favorable to their maintenance. This is particularly the case of the Lowe's Mone (*Cercopithecus lowei*, classified "vulnerable" by the IUCN) which was observed in the present study and in the complementary study on chimpanzees, and of otters (*Aonyx capensis* and / or *Hydrictis maculicollis*, both classified as "near threatened" by the IUCN), the presence of which has also been reported in the study on chimpanzees and in the present fieldwork.



Impact des installations sur les habitats terrestres

ERANOVE - CIPREL
Analyse d'habitats critiques

- CENTRALE CIPREL
- Ligne électrique HT
- Pipe prise d'eau
- Pipe gaz



Figure 10: The plots of the 3 networks (water, gas and electricity) will impact relatively small areas of forest habitats in the vicinity of the plant.

Table 2 – State of conservation of swampy and temporarily flooded forests in the area of indirect project influence				
Forest type	well conserved forests		degraded forests	
	Area	Proportion of all forests	Area	Proportion of all forests
swamp forests	270.72 ha	17.98%	82.98 ha	5.51%
temporarily flooded forests	85.12 ha	5.65%	172.64 ha	11.47%
Raffie	866.85 ha	57.58%	27,15 ha	1.80%
Total	1222.69 ha	81.22%	282.77 ha	18.78%

Of the 1505 hectares of swamp forests, seasonally flooded and raffia present in the area of indirect influence of the project, just under a fifth are degraded in nature (18.8%). These forest patches that have been degraded mainly by agricultural activities are spread throughout the area of indirect influence.

4.1.3 additional mapping of terrestrial habitats

The ESIA presents a description of the various categories of natural terrestrial habitats present in the study area, but it does not present a map or areas of these habitats from a more detailed analysis of high resolution images and / or field data.

The maps presented in the ESIA are extracts from land use maps automatically performed on large areas from low resolution satellite images (remote sensing). These maps do not have the level of precision necessary for the proper assessment of the project's impacts on natural habitats and therefore on the vital areas of the species at stake present on the site.

To make up for this lack, a mapping of terrestrial habitats was produced on the basis of high-resolution satellite image analysis (© Bing Aerial 2019) and on the basis of the exploitation of the contour lines of the LIDAR survey carried out in The area. A field confirmation was implemented to assess the state of conservation of natural environments during the May 2019 mission.

This cartographic analysis of terrestrial habitats made it possible to calculate the areas of natural habitats present in the immediate study area, the values obtained are presented in Table 3 below. This analysis confirms that coconut groves very largely dominate the area (almost three quarters of the terrestrial landscape).

Natural and semi-natural habitats cover almost a quarter of the area of direct influence (24.1%, or almost 1033 ha; see Figures 11a and 11b, and Table 8). The rest are modified habitats. Forest habitats (raffia, well-preserved and degraded swamp and temporarily flooded forests and flooded meadows) therefore represent 18.1% of the immediate study area, or more than 776 ha

Table 3 - Areas of habitat in the immediate study area		
Type of terrestrial habitat	Extent of immediate study area	Percentage
Coconut plantation and agricultural areas	3173.87 ha	74.1%
Raffia	484.33 ha	11.3%
grassland on sandy soil	172.03 ha	4.0%
swamp forest	158.67 ha	3.7%
temporarily flooded forest	133.66 ha	3.1%
populated villages and areas	52.96 ha	1.3%
flooded Prairie	52.21 ha	1.2%
Body of water	32.04 ha	0.8%
Right of way	22.86 ha	0.5%
Total	4282.63 ha	100%

The analysis presented in Table 3 was performed on the immediate study area, then extended to the immediately adjacent well-preserved natural areas. This extended analysis made it possible to define a Discrete Management Unit (DMU) for forest species, based on the contiguous forest areas still present in the sector, and on the results of the ESIA. Thus, the areas of natural areas impacted by the project could be characterized (see following chapters). Extending the analysis in this way also makes it possible to feed the identification of the sectors that can accommodate the mitigation and compensation measures planned under the BAP.

s The term discrete management unit has been replaced by the area of environmentally relevant analysis (Appropriate ecologically area of analysis) in new IFC guidance notes (2019).



Figure 11a: Plant formations on the right area of the central Atinkou

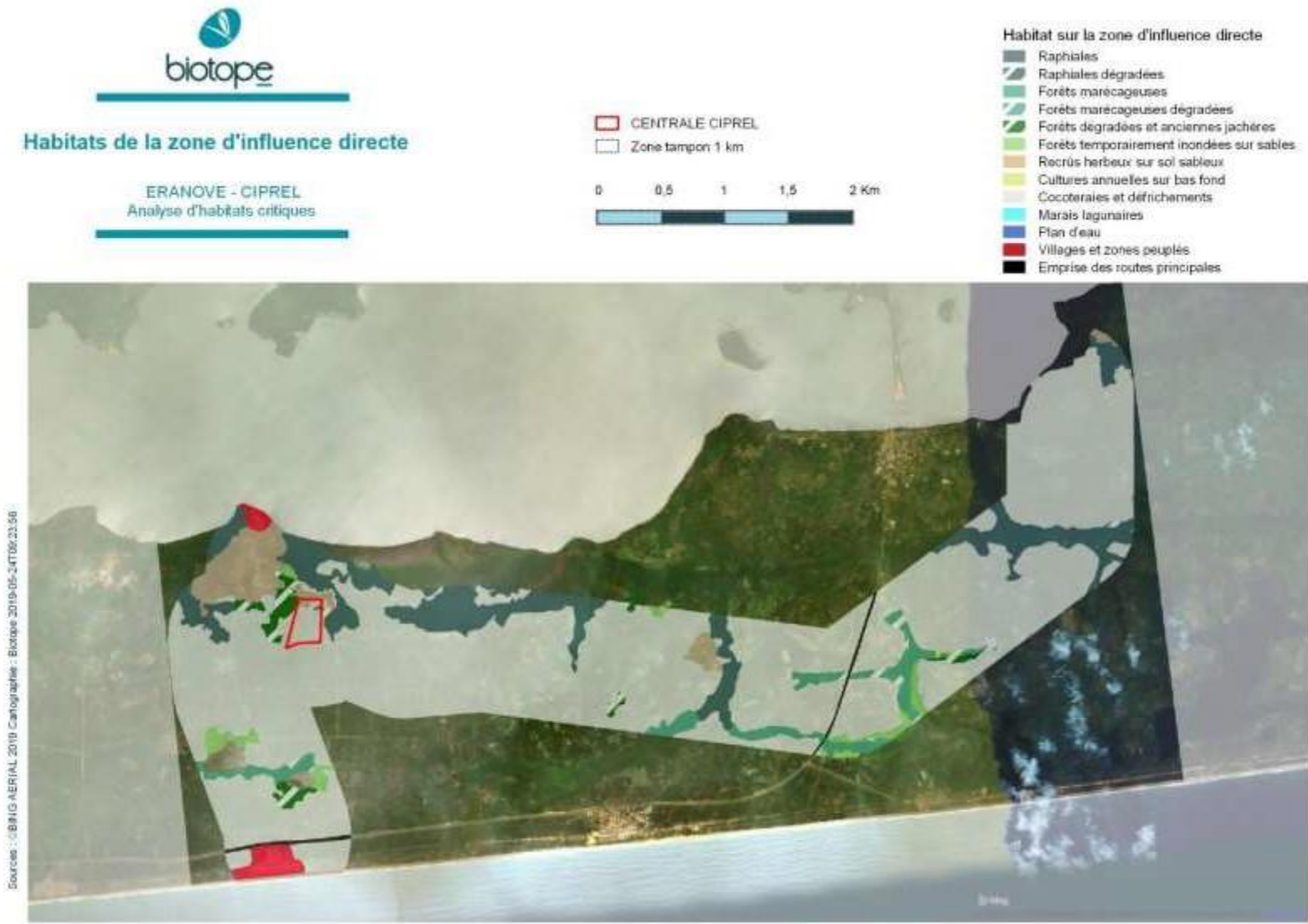


Figure 11b: Location and characterization of natural habitats in the area of direct influence. The classified forest Audouin is located in the extreme northeast of the direct influence.

4.2 aquatic habitats

The ESIA described terrestrial habitats in detail, but gaps were identified in the description of aquatic habitats. This description is however important to have a good understanding of the issues relating to these habitats, and to the species they harbor. The field mission coupled with the analysis of aerial images of the sector made it possible to propose elements of analysis on the aquatic habitats present within the immediate study area.

Aquatic habitats are "natural" habitats within the meaning of PS6.

The site of the plant is located less than 1 km from the Ebrié lagoon. This lagoon is one of the largest in West Africa, about 140 km long, 4 km wide and 4.8 km deep. Its total surface covers just over 560 km² and its perimeter covers 644 km (see Figure 12). It communicates with the Atlantic Ocean via the Vridi Canal.

However, due to its connection with the ocean, there is a flow entering marine waters into the lagoon which depends on the relative hydraulic levels of the lagoon ecosystem. The inflow varies according to the seasons and the tides (it is at its maximum during high tides and in the dry season when the water level in the lagoon is low). With the exception of the Abidjan port area, the depth of the lagoon does not exceed 8 m.



Figure 12: Location of the project in relation to the Ebrié lagoon in Ivory Coast.

Source: dispersion study lagoon. Tractebel 2019

The Ebrié lagoon complex experiences annual precipitation ranging from 1,400 to 2,800 mm with an average of 1,800 mm.year⁻¹. Evaporation is estimated between 1237 and 1405 mm with an average established at 1356 mm. The water temperature remains between 25 and 32 °C with an average of 27 °C. The Ebrié lagoon is characterized by four climatic seasons (Kouadio, 2011). The long dry season covers the months from December to February with low rainfall (55 ± 33 mm of rain on average). The long rainy season extends from March to July with very abundant and almost continuous

precipitation, reaching its peak in June (270 ± 133 mm of rain on average). The short dry season which extends from August to September is characterized by rare rains and low densities (44 ± 42 mm of rain). The short rainy season, which is between October and November, is marked by high rainfall (160 ± 30 mm of rain on average).

The transparency of the water varies between 0.2 and 3.0 m depending on the location and the season. The salinity in the Ébrié lagoon depends on the season and the distance from the Vridi canal. It varies from 1.15 to 19.4 g / L at the surface (9.8 g / L on average) and from 1.15 to 32.4 g / L at the bottom (28.5 g / L on average).

In the case of the Ébrié lagoon, which is both the most modified by man and the most heterogeneous lagoon, two essential characteristics are at the origin of the established zonation

- The Vridi canal: it sits directly above Abidjan and, unlike the Bassam pass, it corresponds to a long-lasting and vast opening which allows the tide to influence at least its mechanical effects, with delay and amortization to the eastern and western ends of the Ébrié system. Note that the Vridi canal is twice as distant from the Assagny canal (which corresponds to the western end of the Ébrié lagoon) as from the old Bassam pass (which coincides with the eastern end), thus creating a certain asymmetry between the east and west branches of the lagoon;
- Two-thirds of continental water supplies come from Comoé. This river opens at the eastern end of the lagoon, thus reinforcing the spatial asymmetry already noted. In addition, very large fluctuations in the volume of the flood contribute to high interannual variability.

Its hydraulic regime depends on land and sea exchanges, as well as their hydraulic, morphological and bathymetric parameters. Depending on the season, its parameters vary as follows:

- temperature⁴: it experiences a minimum around 24.5° C at the end of the rainy season (August), a maximum around 29° C in April and an annual average of around 28° C
- salinity and pH: the salinity of the lagoon decreases from May to November due to the supply of fresh water from the rivers and consequently implies variations in pH during the year;
- turbidity: turbidity depending on location and marine exchanges. It can occasionally reach high levels; and
- dissolved oxygen content: finally, in certain places of the lagoon the dissolved oxygen can reach more than 80% of saturation. To the east of the lagoon, in the relatively deep waters of the Abidjan basin, the rates are much lower. Anaerobic conditions can be encountered, for example in the Bietri basin.

Overall, literature indicates that the Ébrié lagoon contains 154 species of fish divided into 70 families (Fishbase 2019; Daget and Itis 1965; Daget and Durand 1968; Albaret and Ecoutin 1990; Konan, 2011; Froese and Pauly, 2017). The ichthyofauna of the Ébrié lagoon breaks down as follows: 47.6% of demersal species, 21.8% of benthopelagic species, 14.3% of species associated with reefs, 11.6% of pelagic species-neritic, 4.1% of pelagic species and 0.7% of pelagic-oceanic species. This relatively high specific richness is favored by the diversity of habitats. Indeed, according to Hugueny (1990), the specific richness of an environment increases with the heterogeneity of habitats and the depth.

⁴ Pre-study CIPREL V Tractebel.

African manatees live in the Ebrié lagoon, which is recognized as an important settlement site for the species. The presence of this sirenian is known to fishermen, some of whom still practice hunting using specific traps. The brackish waters of Azagny National Park and the lower part of the Bandama River are areas where the chances of observing the species are greatest.



Figure 13: The Ebrié lagoon from the village of Taboth

For several years the lagoon has suffered a significant level of pollution by receiving industrial discharges and the discharge of urban wastewater from Abidjan and to a lesser extent in Dabou and Songon. The lagoon has high bacteriological contamination rates, with coliform rates exceeding the standards recommended by the World Health Organization. Despite everything, the lagoon remains a territory used for fishing and navigation.

5 Identification and assessment of critical habitats

5.1 Review of PS6 criteria

The habitats and species present in the project area have been described in part in the ESIA. An additional analysis was conducted to:

- Define the distribution of natural habitats and assess their state of conservation,
- Identify a number of high-stakes species not mentioned in the ESIA.

On the basis of these elements, the objective of this chapter is to identify whether there are critical habitats on the CIPREL 5 project site within the meaning of IFC PS6.

The IFC defines habitats as "land, freshwater or marine geographic units, or even air corridors that support a variety of living organisms, and their interactions with the non-living environment." For the purposes of implementing PS6, "habitats are classified as modified, natural and critical habitats. Critical habitats being a subset of modified or natural habitats".

Critical habitats are defined as "areas of high biodiversity value, including (i) habitats of critical importance to critically endangered and / or endangered species; (ii) areas of great importance for endemic species and / or limited distribution; (iii) areas of great importance hosting significant international concentrations of migratory species and / or unique species; (iv) seriously threatened and / or unique ecosystems; and (v) areas that are associated with key evolutionary processes".

- Criterion 1: Species Critically Endangered (CR) and / or endangered (EN) worldwide
- Criterion 2: Endemic species and / or limited distribution
- Criterion 3: Migratory Species and / or species subject to significant concentrations
- Criterion 4: severely threatened and/or unique ecosystems
- Criterion 5: Areas associated with key evolutionary processes

The first three criteria are related to the species and the last two ecosystems.

5.2 Analysis of species likely to trigger critical habitat classification

In addition to the work carried out for the development of the ESIA, there was a bibliographic analysis and the extraction of data from various sources. The objective of this screening process was to consolidate the lists of species for groups that could trigger the criticality of a habitat and which had not been studied enough in the ESIA. These sources are:

- Analysis of field data from the 2018 ESIA

- Extraction and analysis of data related to species on the study area within the following databases:
 - o Red List of IUCN: www.iucnredlist.org
 - o Fishbase: www.fishbase.org
 - o Global Biodiversity Information Facility (GBIF) <http://www.gbif.org>
 - o Database on KBA (Key Biodiversity Area):
www.keybiodiversityareas.org/home
 - o Analysis of data on *FreshWater KBA* (Ecosystem Profile)
 - o eBird: <https://ebird.org> (Bird watching) and iNaturalist: <https://www.inaturalist.org>
(Naturalistic observations)
- Analysis of the available literature on the sector and the classified forest Audouin

A database of almost 1800 present or potential species was formed by BIOTOPE and analyzed to prioritize and gradually focus attention on the most important ones.

All of the 1,800 species identified during this screening phase were screened against PS6 criteria. This work made it possible to identify 49 species (39 species of fauna and 10 of flora; see Table 4 below) potentially falling under one or more of the three threshold criteria. These 49 species have therefore been the subject of more detailed attention and have been evaluated in more detail, particularly in terms of their range and their requirements in terms of habitats. Among these 49 species, 33 were prioritized because present according to the ESIA (n = 27) (except *Albizia africana* and *Phrynobatrachus villiersi*) or very probably present within the immediate study area and its surroundings according to our knowledge / understanding from the field (n = 6). These 33 species appear in black in Table 4 below. Among them, 8 species which were not reported in the ESIA required further field investigations before an in-depth analysis of the potential criticality of their habitats

Among the listed species, it should be noted that all the species with an IUCN threat status (CR, EN, VU and NT) were initially considered as having a high potential stake. Thereafter, the choice was made according to the quantitative thresholds relating to critical habitats (see below).

The detailed analysis and contextualized species (regulatory status, conservation status, distribution and occurrence, potential criticality and proven habitat, etc.) is appended.

Among the listed species, it should be noted that all the species with an IUCN threat status (CR, EN, VU and NT) were initially considered as having a high potential stake. Thereafter, the choice was made according to the quantitative thresholds relating to critical habitats (see below).

These are the following species (see also Table 4):

- *Nauclea diderrichii* (VU): A Rubiaceae growing in rainforests and swamps
- *Milicia regia* (VU): moraceae endemic to West Africa
- *Cercopithecus lowei* (VU): a primate that prefers to live in forests and humid savannah. It is endemic to the Ivory Coast and Ghana, the IUCN status has been reassessed in January 2019 to go straight from "least concern" to "vulnerable".
- *Phrynobatrachus* sp. : a species of frog that has not yet been described, currently known only from the Banco forest. Phenologically very similar to *Phrynobatrachus ghanensis*. Evidence available to date suggests that this species has a reduced range and is likely to pose significant conservation challenges.

- *Morerella cyanophthalma* (VU): A recently described, very restricted distribution frog that is known in only 3 areas: the national parks of Banco, Azagny, and swamp forests Tanoé - Ehy (on the Ghana border).
- *Trichechus senegalensis* (VU): African manatee, a sirenian living in neritic aquatic areas and freshwater ecosystems of West Africa from Mauritania to Angola. Despite a general lack of knowledge about its range, the species is present in lagoon Ebrié and evidence of its decline are growing (catch and hunting).

Of the 33 selected species, impact analysis focused on 20 species: 13 species that could potentially trigger a critical habitat designation were dismissed for various reasons outlined below:

- *Mecistops cataphractus* (CR): The African gharial is absent from the project area.
- *Hippopotamus amphibius* (VU): Absence of the species.
- *Scotopelia ussheri* (VU): a fishing owl from the wetlands and forests of West Africa whose presence could not be confirmed. Given the suitability of the habitat for the species, and the information from the villagers on its presence, it should be monitored in the event that it is discovered during the construction of the power plant and the high voltage line.
- *Kinixys erosa* (EN) and *Kinixys homeana* (CR): 2 species of tortoise which are very likely absent, but should be the subject of a watch in case they are discovered during the construction works of the power plant and the high voltage line.
- *Kassina arboricola* (VU), *Phrynobatrachus ghanensis* (NT), *Hyperolius viridigulosus* (NT): none of these 3 species of amphibians were observed during reconnaissance, and are probably absent from the project area. However, they should be watched in case they are discovered during construction work.

The recommended watch concerning the species with conservation stakes potentially present on the project site must be carried out by experts from each group (birds and reptiles + amphibians) during the preparation of the site (markup) and before the clearing (especially concerning the electric line). If these species are discovered during the construction phase, avoidance or scaring off measures must be put in place for *Scotopelia ussheri*, and removal / relocation for the 5 species of amphibians and reptiles.

Among the 20 species selected for the impact analysis, the criticality of habitats could not be assessed for 3 species: Pelican, a rodent (*Anomalurus pelii* spp. *Peralbus*), a frog (*Hyperolius viridigulosus*) and a plant (*Baphia bancoensis*). The lack of data on their biology or their presence (very old historical data) makes any evaluation very hypothetical.

The detailed analysis and contextualized species (regulatory status, conservation status, distribution and occurrence, potential criticality and proven habitat, etc.) is appended.

Kingdom	Class	Species	Common name	proven presence	potential presence	restricted distribution	IUCN status	ESIA ERM	IUCN
Animalia	Amphibia	<i>Hyperolius viridigulosus</i>	(Stream Reed Frog)		X		Near Threatened	X	X
Animalia	Amphibia	<i>phrynobatrachus ghanensis</i>	frog Ghana		X	X	Near Threatened	X	X
Animalia	Amphibia	<i>Morella cynophthalma</i>	N / A		X	X	Vulnerable	X	X
Animalia	Amphibia	<i>Kassina arboricola</i>	(Ivory Coast Running Frog)		X		Vulnerable	X	X
Animalia	Aves	<i>Necrosyrtes monachus</i>	brown Egyptian vulture		X		Critically Endangered		X
Animalia	Aves	<i>Pterodroma madeira</i>	Zino's Petrel		X		Endangered		X
Animalia	Aves	<i>Psittacus timneh</i>	Parrot Timneh		X		Endangered		X
Animalia	Aves	<i>Bycanistes cylindricus</i>	White-thighed hornbill		X		Vulnerable		X
Animalia	Aves	<i>Lobotos lobatus</i>	Shrike barbed		X		Vulnerable		X
Animalia	Aves	<i>Hydrobates leucorhous</i>	Petrel Storm-Petrel		X		Vulnerable		X
Animalia	Aves	<i>Sternula balaenarum</i>	Damara Tern		X		Vulnerable		X
Animalia	Aves	<i>Picathartes gymnocephalus</i>	Picathartes of Guinea		X		Vulnerable		X
Animalia	Aves	<i>Criniger olivaceus</i>	Bulbul yellow beard		X		Vulnerable		X
Animalia	Aves	<i>Scotopelia ussheri</i>	Rufous fishing owl		X		Vulnerable		X
Animalia	Mammalia	<i>Caracal aurata</i>	Chat gold		X		Vulnerable		X
Animalia	Mammalia	<i>Cercopithecus lowei</i>	Cercopithecus Lowe	X	X		Vulnerable	X	X
Animalia	Mammalia	<i>Cercopithecus roloway</i>	cercopithecus Rolloway		X		Critically Endangered		X
Animalia	Mammalia	<i>Cercopithecus roloway</i>	pygmy hippopotamus		X		Endangered		X
Animalia	Mammalia	<i>Anomalurus peli</i>	Anomalure Pell		X	X	Insufficient Data	X	
Animalia	Mammalia	<i>Colobus vellerosus</i>	Colobus Geoffroy		X		Vulnerable	X	X
Animalia	Mammalia	<i>Genetta johnstoni</i>	Genette Johnston		X	X	Vulnerable	X	
Animalia	Mammalia	<i>Hippopotamus amphibius</i>	common hippopotamus		X		Vulnerable	X	
Animalia	Mammalia	<i>Hylomyscus baeri</i>	Hylomyscus Baer		X		Endangered		X

Kingdom	Class	Species	Common Name	Proven Presence	Potential Presence	Restricted distribution	IUCN Status	ESIA ERM	IUCN
Animalia	Mammalia	<i>Pan troglodytes verus</i>			x		Critically Endangered	x	x
Animalia	Mammalia	<i>Panthera pardus</i>			x		Vulnerable		x
Animalia	Mammalia	<i>Phataginus tetradactyla</i>			x		Vulnerable	x	x
Animalia	Mammalia	<i>Phataginus tricuspis</i>			x		Vulnerable	x	x
Animalia	Mammalia	<i>Piliocolobus waldroni</i> ou <i>Piliocolobus badius badius</i>			x		Critically Endangered Endangered	x	x
Animalia	Mammalia	<i>Procolobus verus</i>			x		Vulnerable	x	x
Animalia	Mammalia	<i>Smutsia gigantea</i>			x		Vulnerable	x	x
Animalia	Mammalia	<i>Trichechus senegalensis</i>			x		Vulnerable	x	x
Animalia	Reptilia	<i>Mecistops cataphractus</i>					Critically Endangered		x
Animalia	Reptilia	<i>Lepidochelys olivacea</i>			x		Vulnerable		x
Animalia	Reptilia	<i>Osteolaemus tetraspis</i>			x		Vulnerable	x	x
Animalia	Reptilia	<i>Kinixys erosa</i>			x		Insufficient Data	x	
Animalia	Reptilia	<i>Kinixys homeana</i>			x		Vulnerable	x	
Animalia	Reptilia	<i>Dermochelys coriacea</i>			x		Vulnerable		x
Animalia	Reptilia	<i>Trionyx triunguis</i>			x		Vulnerable		x
Animalia	Reptilia	<i>Cyclanorbis senegalensis</i>			x		Vulnerable		
Animalia	Arecaceae	<i>Raphia palma-pinus</i>		x		x	Near Threatened	x	x
Animalia	Arecaceae	<i>Raphia sudanica</i>		x		x	Near Threatened	x	x
Animalia	Caesalpinia	<i>Albizia africana</i>			x	x	Vulnerable	x	
Animalia	Commelin	<i>Aneilema mortonii</i>			x	x	Insufficient Data		x

Animalia	Fabaceae	<i>Baphia bancoensis</i>			X	X	Least Concern	X	

Reign	Class	Species	Common name	proven presence	potential presence	restricted distribution	IUCN status	ESIA E	M IUCN
Plantae	Fabaceae	<i>Leptoderris miegei</i>			X	X		X	
Plantae	Meliaceae	<i>Turraeanthus africanus</i>	av odiré		X	X	Vulnerable	X	
Plantae	Moraceae	<i>Milicia regia</i>	Iroko	X	X		Vulnerable	X	
Plantae	Podostema	<i>Macropodiella heteromorpha</i>			X		Vulnerable		X
Plantae	Rubiaceae	<i>Nauclea diderrichii</i>	Bahia	X	X	X	Vulnerable	X	

Although not triggering the criticality of habitats, a lot of species (birds, amphibians, reptiles and mammals) linked to the Guinean forests of West Africa deserves special attention. This will be the case by taking into account natural habitats, in accordance with PS6. Note the special case of the West African crocodile, *Crocodylus suchus*, whose conservation status has not been assessed by IUCN (NE) because it was previously assimilated to the Nile crocodile, *Crocodylus niloticus* (LC). However, it has been found that the species presents conservation challenges and its status under evaluation by the IUCN is likely to present challenges due to a very fragmented regional distribution and strong hunting pressures.

5.3 Determination of discrete management units (DMUs)

For Criteria 1 to 3, the project must determine a reasonable limit (ecological or political) defining the area of habitat to be taken into account in the context of the critical habitat assessment. This is called the “discrete management unit” (DMU) or an “ecologically relevant assessment area”: an area with a definable limit within which the biological communities and / or management issues have much more in common than those of adjacent areas.

A discrete management unit may or may not have an actual management limit (for example, legally protected areas, World Heritage sites, community reserves, etc.), but may also be defined by another ecologically relevant limit such as, for example, a watershed, an interfluvial zone, a patch of intact forest within a modified habitat, seagrass beds, coral reefs, or zone of upwelling of water, etc.

The delimitation of DMUs will depend on the species (and, sometimes, subspecies) that are of concern. Two DMUs were selected: one for terrestrial species of raffia, swampy and temporarily flooded forest, and one for species of aquatic habitats.

5.3.1 Discrete Management Unit 1 - the raffia, swamp forests and seasonally flooded

Given the forest character of the species that could potentially trigger the criticality of the habitat, the DMU n° 1 includes the complex of swampy and temporarily flooded forests that cover all the shallows of the coastal cordon between the village of Adjacouti (to the west) and the village of Audouin (and Lac Dadié, to the east). This DMU, shown in Figure 14, covers 37,000 ha. It was chosen for two types of species:

- The species of amphibians frequenting swampy and temporarily flooded forests that cover the shallows of the project area. These habitats are very localized and fragmented in the areas of influence of the project. The species with the most challenges in this category is *Phrynobatrachus* sp., A species recently discovered in the Banco forest, but not yet described. Other forest species that were not observed on the project site are *Morerella cyanophthalma* (VU, endemic to the Ivorian coast and known from 3 sites⁶; the UGD corresponding to ~ 5% of its area of occurrence of 7,692 Km²) and *Kassina arboricola* (VU, known from 5 sites with an area of occupation of less than ~ 194,000 Km²), as well as the Ghanaian frog *Phrynobatrachus ghanensis* (NT) and *Hyperolius viridigulosus* (NT). This type of habitat also exists in the neighboring national parks of Banco and Azagny, but given the limited movement capacities of these species, it is assumed that the exchanges between the populations of the UGD and the neighboring populations are negligible

⁵ It has been suggested that it could be classified EN or VU (Shirley, pers. Com).

⁶ See Konan et al. (2016): New data from *Morerella cyanophthalma* (Anura: Hyperoliidae) in Azagny National Park, southern-central Ivory Coast. *Herpetology Notes* 9. 59-65.

- Among the primate species frequenting these same swampy and temporarily flooded forests in the project area, the Low e's cercopithecus (*Cercopithecus lowei*) classified VU on the IUCN red list also occupies this DMU. This cercopithecus has been observed in a wide variety of forest habitats, including modified habitats. With groups occupying territories with an estimated area ranging from 3 to 30 km², it is reasonable to think that there can be exchanges between different patches of forests. **The DMU corresponds to less than 1% of the range of this species, and cannot be considered critical for its conservation within the meaning of IFC performance standard No. 6**


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Analyse d'habitats critiques

Légende

-  CENTRALE CIPREL
-  Zone UGD terrestre
-  Forêts marécageuses, temporairement inondées et raphiales



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Figure 14: Discrete Management Unit for the terrestrial environment

5.3.2 Discreet Management Unit 2 - Complex Ebrié lagoon

In addition to the ecosystem services linked to the subsistence fishery practiced by a growing human population around the edges of the Ebrié lagoon, the species of major concern is the African manatee *Trichechus senegalensis* (VU). The abundance and distribution of the populations of this sirenian are still very little known due to the lack of research and conservation activities devoted to it, but all the experts and local populations agree to recognize the decrease in populations due to habitat loss and degradation, hunting and accidental capture. The lagoon complexes of the Ivorian coastline are home to one of the world's largest populations of the vulnerable species.

This potential DMU covers a total area of 56,600 ha (see Figure 15 on the next page).



Figure 15: discrete management unit for the aquatic environment - the lagoon Ebré

5.4 Analysis of criteria related to ecosystems (criteria 4 & 5)

5.4.1 threatened and / or unique ecosystems (criterion 4)

PS 6 indicates the need to use the IUCN Red List of Ecosystems where formal assessments have been conducted. If no evaluation exists, the client is then required to use evaluations developed with systematic methods at national / regional level by recognized institutions (government, academic or other qualified organization ...).

The threshold used to trigger critical habitat according to criterion 4 of PS 6 is to have 5% or more of the global range of an ecosystem contained in the area considered. Contrary to what is said in the ESIA, the terrestrial DMU - which corresponds to less than 0.1% of the sub-regional distribution area of the shallow s covered with raphials, swamp forests and / or temporarily flooded d 'West Africa - cannot be considered critical in relation to PS 6.

5.4.2 key evolutionary processes (Criterion 5) - analysis of ecological corridors

As an illustration, the IFC PS6 guidance note presents some possible examples of spatial characteristics associated with evolutionary processes. None is applicable to the project with the exception of connectivity between habitats (for example, biological corridors) which ensures the migration of species and gene flow, and which are particularly important both in fragmented habitats and for conservation metapopulations.

The immediate study area, located at the southern edge of the Guinean forest estate, extends into a region that was still largely dominated by dense forest a few decades ago. Today, in this sector as in the whole of the southern part of Côte d'Ivoire, the forest areas are greatly degraded and are often reduced to small plots that are more isolated. In order to preserve the exceptional biological diversity that is developing within the Ivorian forests, it is important not only to conserve the forest areas that still exist today, but also to maintain and develop ecological connections between these areas in order to allow circulation. plant and animal species.

In the absence of a pre-existing mapping of the main components of the ecological network around the project, whether at the national, regional or local scale, a specific summary analysis of the main forest ecological continuities was carried out at the scale from Ivory Coast. This analysis allows us to locate the main ecological continuities highlighted around the immediate study area in a wider ecological context.

This analysis was based on the land cover layer produced by the United State Geological Survey 7 over the whole of West Africa in 2013⁷. It consisted in highlighting the axes of the main forest ecological continuities from a visual interpretation of land use. The main forest areas still present in 2013 were thus linked to each other via the areas with the highest density of natural forest plots.

⁷ <https://eros.usgs.gov/westafrika>

Given the low concentration of forest areas in the vicinity of the project, the immediate study area is located at a distance of forest ecological continuity of national and international interest. The immediate study area plays a minor role in the functionality of these ecological continuity.

This analysis was completed and refined around the thermal power plant project using more precise data on the current land use in this sector: within a radius of 30 km around the power plant and the route of the high-voltage line. , the ecological forest continuity was clarified thanks to a visual interpretation of Landsat and DigitalGlobe satellite images from 2016 (accessible via the Google satellite service).

The main limitation of the method used to highlight ecological forest continuity on a national scale and around the immediate study area is the differentiation of the most natural forest areas within the mosaics of wooded areas including spaces more or less degraded forest, tree plantations, shrub crops, fallows, etc... If this differentiation appears relatively easy when the images are exploited at very high resolution on small areas, it becomes the other hand, many more difficult when working with large territories and remote sensing techniques have been used to map land cover.

More locally, the more or less degraded forest remains that remain around the immediate study area help maintain ecological continuity of regional interest. These ecological continuities reinforce the functionality of the ecological network on a larger scale, and allow exchanges between the afforestation of the study area and the larger afforestation located on the periphery (Azagny National Park). Figure 16 shows these terrestrial ecological continuities, and their almost uniform spatial distribution throughout the terrestrial DMU.

The increasing exploitation of the few forest areas of the study area, the clearing and intensification of agricultural practices - note in particular the increasing use of pesticides (aerial spraying) - nevertheless contribute to gradually reducing the functionality of ecological continuity highlighted. Consequently, the landscape structure is less and less permeable to the movement of forest species between the remaining patches of forest.



The connections between the marshy and flooded forests were temporarily taken into account in the definition of understated land management unit for forest species.

The Ebrié lagoon and the natural environments associated with it constitute another particularly typical, rich and threatened ecosystem in Côte d'Ivoire. Despite the fact that the project's impacts on this ecosystem will be relatively low at the local and a fortiori regional level, the analysis focused on ecological continuity formed by the lagoon, considered to be of regional interest. Ebrié lagoon is a diverse and fragile ecosystem that stretches from east to west over approximately 140 km long and has an area of approximately 560 km². It collects the waters of the Agnéby, Comoé and Mé rivers, as well as several smaller rivers. Its average depth is less than 5 m, and has values between 1 and 4 m in the project area.


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Continuités écologiques

ERANOVE - CIPREL
Analyse d'habitats critiques

Légende

-  CENTRALE CIPREL
-  Continuités écologiques terrestres

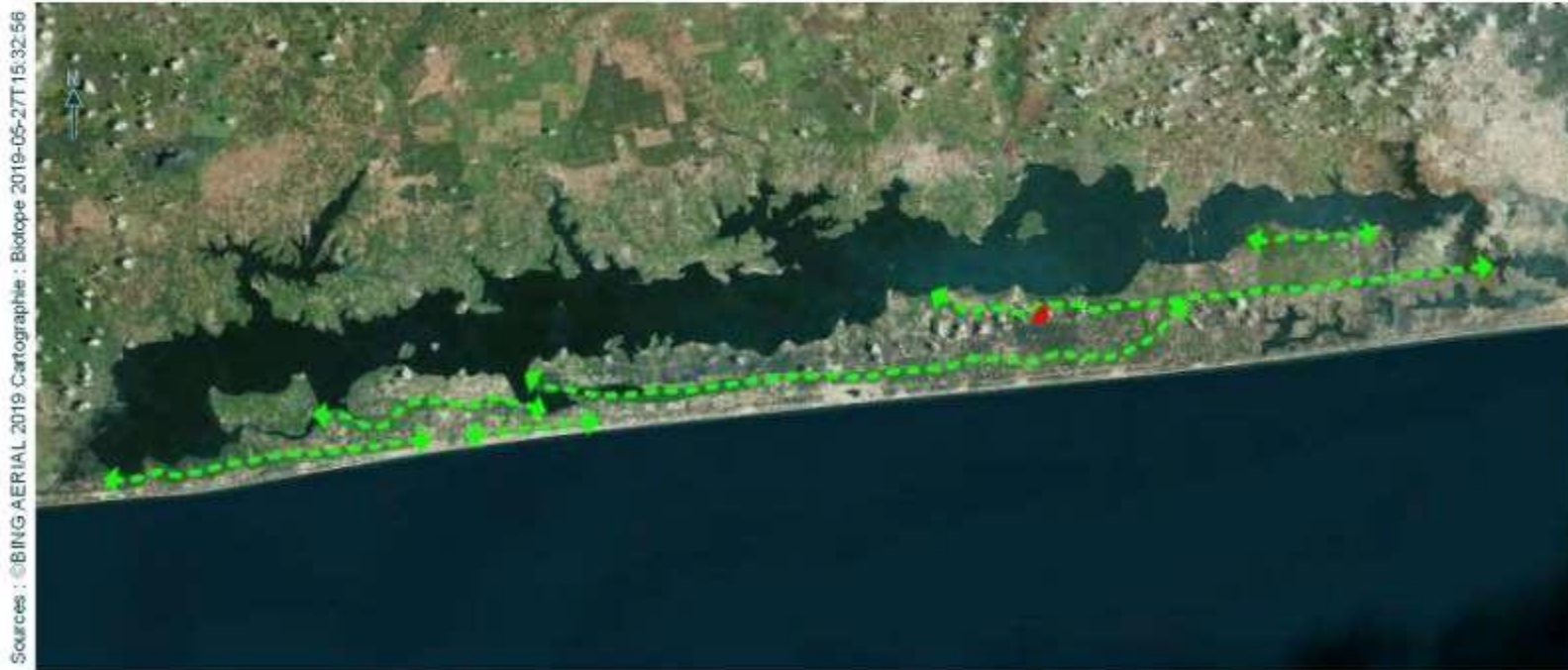


Figure 16: Main terrestrial ecological continuity of PUD land

5.5 Summary of critical habitats

Table 5: Summary of habitats considered critical

Species	critical habitats	DMU	Reason for designation as critical habitat	criterion PS6 ^a	
terrestrial					
<i>Phrynobatrachus</i> sp.	raffia areas, and temporarily flooded swamp forest	CRITICAL NATURAL HABITAT	1	<i>Phrynobatrachus</i> sp. : a species of amphibian not yet described, for the moment known from only 2 localities including the study area. Preliminary data suggest a restricted range for this species which could be dependent on forest habitats on the Ivorian coast.	2
<i>Morerella cyanophthalma</i>				<i>Morerella cyanophthalma</i> has not been observed, but the habitat is typical of this endemic species of the Ivorian coast, which is known only from 3 sites (Banco National Park and Azagny, marsh-Tanoé Ehy) ⁹ . The DMU corresponds to ~ 5% of its area of occurrence of 7692 Km ² .	2

^aThe Guideline No. 6 IFC recommends several criteria triggering the "critical" habitat that is presented in the methodology: Section 5.2.

⁹ See Konan et al. (2016): New data from *Morerella cyanophthalma* (Anura: Hyperoliidae) in Azagny National Park, southern-central Ivory Coast. *Herpetology Notes* 9: 59-65.

6 Demonstration of the project's compatibility with the management plans for protected areas

According to PS 6, the project's legality and the project's compatibility and ERC measures with the management plans spaces issues was analyzed.

6.1 Audouin Forest Reserve

The Audouin forest is included in the list of classified forests in the State forest domain and its management is therefore entrusted to SODEFOR (according to Order No. 33 MINAGRA of 13 February 1992 entrusting SODEFOR with the management of classified forests of the State forest domain). Since 1939, 6,600 ha of forest have been classified. But in recent decades, agricultural activities have caused many clearings within its boundaries (plantation and food crops). In 2018, the Council of Ministers published an ordinance (n° 2018-592) in the official journal redefining its limits (JO-CI 2018) in order to allow the installation of a military camp specialized in the fight against terrorism. At the same time, the western part of the classified forest, adjacent to the future military camp, was subdivided to allow the settlement of populations. Large arteries today bordered by power lines have been opened.



Figure 17: Classified forest Audouin

The classified forest Audouin not dispose of the management plan, and plans for the future - not official, do not seem to be compatible with those available to sustainable management of a biodiverse area

Given the absence of a management plan for the classified forest of Audouin, its advanced state of degradation as well as the recent re-delimitation concerning its western part which excludes part of the area concerned by the route of the high voltage line, there is no problem of legality or compatibility of the project and its measures.

6.2 Forest Kokoh

The Kokoh Forest is located less than 6 km west of the plant area. It is not among the classified forests managed by SODEFOR, and no document related to the classification or declassification of this area has been found. Located at the northern limit of the city of Jacqueline, only a lowland covered by secondary forest of swampy types and temporarily flooded remains.

Given the unclear status of the Kokoh forest, the absence of a management plan, and its advanced state of degradation, there is no problem of legality or compatibility of the project and its measures.

7 Evaluation of Ecosystem Services

7.1 The different types of ecosystem services (ES)

PS 6 distinguishes 2 types of ecosystem services (ES):

- ES Type I: ecosystem services of supply, regulation, culture and support, over which the client has direct control over management or a significant influence and when the impacts on these services can affect communities in a way negative (NO136). They will be considered as priority in the following circumstances (NO138):
 - o Project operations are likely to have a significant impact on ecosystem service;
 - o The impact will mean a direct negative impact on livelihoods, health, security and / or cultural heritage of the affected communities; and
 - o The project has direct control over management or a significant influence on the service.
- ES Type II: ecosystem supply, regulation, cultural and support services, over which the client has direct management control or significant influence and on which the project depends directly for its activities (NO139). They will be considered as priority in the following circumstances:
 - o The project depends directly on the service for its primary operations; and
 - o The project has direct control over management or a significant influence on the service.

The project, by modifying ecosystems through the construction and operation of the power plant and the high-voltage line, is likely to have a negative impact on ecosystem services. An in-depth review of priority ecosystem services within the meaning of IFC's PS6 is presented below.

7.2 Method for the characterization of ecosystem services

The Ecosystem Services (ES) dealt with in the 2018 ESIA are based on an analysis of uses through consultations with target populations.

The indirect and intangible benefits that populations derive from ecosystem services (mainly the regulation of water and fishery resources within the framework of the Atinkou project) are identified through an analysis comparing the typology of ecosystems on the site (see maps in previous chapters) and the services they provide. This analysis completes the characterization of ES in accordance with PS6.

Ecosystem/ES concordance with regulatory and support services is established by experts. For the other ES, the analysis is based on data from surveys and consultations of affected communities which were carried out as part of the Resettlement Action Plan (PAR), the Stakeholder Engagement Plan (SEP).

7.3 Identify priority ecosystem services

The Assessment of Ecosystem Services (ESA) carried out in the ESIA (chapter 7) made it possible to highlight 4 priority ecosystem services which are summarized in Table 6 below. It emerged from this analysis that 2 of them are type I and the other 2 are both types I and II.

Table 6: Evaluation of Ecosystem Services Review (ESR)

	Impact Level (Type I) <i>Are the project's operations likely to cause a significant impact on the ecosystem service?</i>	Relevance for the affected communities (Type I) <i>Will the impact translate into a direct negative impact on the livelihoods, health, security and / or cultural heritage of the affected Communities?</i>	Dependency level (Type II) <i>Does the project depend directly on the service for its primary operations?</i>	Level of Management Control (Type I and II) <i>Does the project have direct control over management or a significant influence on the service?</i>	Priority ? <i>If answer yes to all the previous questions concerning type I or II</i>
ES Supply					
Food: wild fish	Yes - Loss of fishing habitat - Fishing is the main livelihood activity / source of income in Taboth. (ESIA p7-73)	Yes - Some fish on the future area of the water main (ESIA p7-73) and at the crossing of the lagoon by the power line. The construction of the landing stage at N'Djem could affect fishing activities, but it could also be useful to fishermen afterwards.	No	No - the extent of the project is weak at the scale of the fishing areas used and accessible on the Ebrié lagoon	Priority Type I
Water	Yes - The project can potentially impact the quantity and quality of fresh water ("Continent Terminal" aquifer), which is vulnerable to the risks of industrial contamination and saline intrusion.	Yes - The aquifer is the source of fresh water for local populations (see ESIA Chapter 6.3).	Yes	Yes	Priority types I and II
ES Cultural					
Cultural value of the existence of the species	Yes - Several species of vulnerable flora and fauna (IUCN status) and / or with restricted distribution areas have been identified in the project area	Yes - the international community attaches importance to the preservation of vulnerable species of flora and fauna	No	No - The direct impact of the project on the conservation status of these species is negligible or low, except for Phrynobatrachus sp. and Morerella cyanophthalma which deserve special attention.	Priority Type I
ES control					
Regulation of surface water and groundwater	Yes - Vegetation has a recognized beneficial action in draining rain and surface water, promoting the good quality of water recharged in the aquifer by soil infiltration.	Yes - Site clearing and land use are likely to impact these water regulation services on which local populations are very dependent to meet their daily needs	Yes - The project will depend on the availability of groundwater for the success of its operations	Yes	Priority types I and II

8 Project Impacts and Mitigation Measures

8.1 Aquatic habitats: impact of the discharge of cooling water in the lagoon

The continuous discharge of water used to cool turbines to a maximum theoretical temperature of 33.55 ° C (see ESIA Chapter 3 - Project Description) will have a potential impact considered to be low on the surface waters of the lagoon. Given the strong dilution capacities of the lagoon, the already high water temperature (see chapter 6.3 ESIA, and the Lagoon Dispersion Analysis), and the fact that the water parameters will be controlled before their release (pH; PO4 <2.5 ppm, free chlorine <0.2 - 0.5 ppm), the potential residual impact is of minor severity before their release (pH; PO4 <2.5 ppm, free chlorine <0.2 - 0.5 ppm), the potential residual impact is of minor severity.

8.2 terrestrial habitats: impact of the plant and associated infrastructure

The areas affected by the Atinkou power plant and associated facilities will reach 110.13 ha. The developments (and their areas) causing the impacts are presented in Table 7 below :

Table 7 - direct rights of way project			
Construction Type	Area (ha)	Impact	%
Site of the Plant	30.5	Permanent	27.7
gas supply line	2.2	Permanent	2.0
Water line	1.9	Permanent	1.7
Electric line	75.7	Permanent	68.6
Total	110.13 ha		100%

The natural and semi-natural (forest, grassland and aquatic environments) represent 24.1% of the project area, more than 1032 ha (see details in Tables 8 and 9 and Figure 18 following pages).

Table 8 - Details of the habitat areas and in the zone of influence and right-of-way

habitats		Total area (Ha)	affected area (ha)	Loss or Gain%
Natural Habitats	Raffia	477.94	5.2	- 1.1%
	Swamp forest	107,18	1.2	- 1.1%
	Temporarily flooded forest	62.47	0.1	- 0.2%
	Grassy formation on sandy soil	172.03	2.7	- 1.6%
	Flooded praries	52.21	0	0
	Aquatic environment	32.04	0.6	- 1.9%
Disturbed Natural Habitats	degraded forests	129.07	3.6	- 2.8%
Subtotal Natural Habitats		1032.94	13.4	- 1.3%
modified habitats	Coconut plantations and agriculture	3173.87	96.6	- 3.0%
	villages	52.96	0	0
	rights of way roads	22.86	0.2	- 0.9%
Subtotal modified habitats		3249.69	96.8	- 3.0%

As a reminder, the habitats are as follows:

- **Raffia:** plant formation with peaty soil and subject to the tidal regime. Resulting from the degradation of temporarily flooded forests they consist only of raffia (Arecaceae).
- **swamp forest:** forest on year-round flooded ground covering the shallows.
- **temporarily flooded forest:** climatic formation subject to temporary flooding on often sandy soil, surrounds swamp forests.
- **grassland on sandy soil:** sandy soil covered with species of grasses and other short-cycle grasses, devoid of woody.
- **Flooded Prairie:** open and sparsely wooded formations, with cut-leaf grasses, which develop on flooded soils all year round.
- **Aquatic environment:** ecosystem of the lagoon Ebrié.

Table 9 - Surface of habitats in the Project RoW

habitats	Total area (ha)	affected area				Total area affected (ha)
		power plant	Water pipe	Gas line	Electric line	
Raphiale	477.94		0.1		5.1	5.2
sw amp forest	107,18			0.1	1.1	1.2
temporarily flooded forest	62.47			0.1		0.1
grassland on sandy soil	172.03	2.1	0.7			2.8
flooded Prairie	52.21					0
Aquatic environment	32.04		0.6			0.6
degraded forest	129.07	1.2	0.5	0.1	1.7	3.5
coconut	3173.87	27.2		1.8	67.6	96.6
villages	52.96					0
routes	22.86				0.2	0.2
Total	4282.63	30.5	1.9	2.2	75.7	110.3



Figure 18: Mapping of natural habitats in the area of indirect influence

8.3 Residual impacts on natural habitats and species triggering critical habitat

The residual impacts (before any compensation measures) from the construction and operation of thermal power plants and high-voltage lines are presented in the tables below, as well as the mitigation measures to be implemented. The mitigation measures constituting the BAP are presented in § 8.5 - Mitigation measures

Table 10: Summary of residual impacts on natural habitats and species likely to trigger a critical habitat designation

Natural habitat	Total impacts during construction	habitat area impacted in construction phase	Pre-construction/construction phase mitigation	Total impacts in operational phase	Habitat area permanently impacted	Operational phases mitigation	residual impact
<p>Rainforest (DMU # 1: 5180,88 ha)</p> <p>Various threatened species frequent this habitat in the project area, including <i>Cercopithecus lowei</i>, a primate endemic to Côte d'Ivoire and Ghana (VU)</p>	<ul style="list-style-type: none"> - Destruction of habitat - Habitat degradation by cutting vegetation over 3m below the power line - Deterioration of the quality of the habitat of the species: accidental pollution, increased human frequentation - Risk of animal mortality from accident with construction vehicles and machinery, and electrocution on the electricity transmission line - Increased risk of hunting due to easier access (access tracks) 	<p>CENTRAL LINE and High Voltage Line:</p> <ul style="list-style-type: none"> - Destruction of 10.1 ha of natural habitats 	<ul style="list-style-type: none"> - Reasoned clearing (preserving the maximum of forest areas) - Management of clearings related to social influx - Selective clearing for the maintenance of sensitive species - Application of the hunting ban - Prohibition to move away from work areas 	<ul style="list-style-type: none"> - Reduction of housing - Habitat fragmentation - Risk of electrocution (HV line pylons) - Increased mortality linked to the increase in hunting pressure linked to social influxes and / or conflicts with villagers linked to the reduction in housing 	<p>CENTRAL LINE and HV: Loss of habitat favorable to the species on the rights of way of power stations and associated facilities (detailed areas impossible to calculate given the capacity to adapt to degraded habitats)</p>	<ul style="list-style-type: none"> - Maintaining the quality of forest habitats - Fight against poaching - Support for small farming / reduction in hunting pressure - Monitoring of populations of the species (support) - Species conservation plan (support) 	Low

Natural habitat	Total impacts during construction	habitat area impacted in construction phase	Preconstruction/construction phase mitigation	Total impacts in operational phase	Habitat area permanently impacted	Operational phases mitigation	residual impact
<p>Ebrié lagoon aquatic ecosystem (UGD n ° 2: 56,600 ha)</p> <p>Various threatened species frequent this habitat in the project area, including the African manatee (<i>Trichechus senegalensis</i> - VU) whose Ivorian lagoons host one of the main world populations</p>	<ul style="list-style-type: none"> - Degradation of aquatic habitats - Degradation of lagoon habitat with accidental pollution, release of suspended matter (MES) 	<p>A negligible part: 0.6 ha impacted during the works phase on the 56,600 ha of the DMU</p>	<ul style="list-style-type: none"> - Special vigilance to avoid any accidental release in the lagoon 	<p>Local changes in the physico-chemical characteristics of the water, which will be "diluted" and become insensitive very quickly</p>	<p>Not evaluable, but tiny compared to the surface of the UGD, therefore considered negligible</p>		<p>Negligible</p> <p>The project will not cause a loss for this major African manatee settlement center</p> <p>Compensation not required to comply with IFC Performance Standard # 6 (no net loss)</p>

species concerned	associated natural habitat	IUCN status	Total impacts in construction stage	habitat area impacted in construction phase	Preconstruction/ construction phase mitigation	Total impacts in operational phase	Habitat area permanently impacted	Operational phases mitigation	residual impact
<p><i>Phrynobatrachus sp.</i></p> <p>Amphibian subservient to swamp forests</p> <p>New to science, restricted range</p>	<p>Swampy and temporarily flooded, raphial forests (DMU n° 1)</p> <p>5,180.88 ha</p>	<p>N/A</p>	<p>--Destruction of habitats favorable to the species (humid and raphial forests)</p> <p>- Potential mortality during clearing: crushing by machines, falling trees ...</p> <p>- Temporary occupation of the habitat</p> <p>- Overcrowding and degradation of habitats favorable to the species</p>	<p>PLANT :</p> <p>- Land clearing for the water pipe will impact 0.6 ha of the species's habitat, i.e. a negligible part of this type of habitat in the DMU</p> <p>High Voltage LINE:</p> <p>- Land clearing for the construction of the line and access roads will destroy and degrade 7.9 ha of habitats (0.2% of the DMU)</p>	<p>- Reasoned clearing to preserve forest habitats as much as possible</p> <p>- Management of clearings related to social influx</p> <p>- Selective clearing to maintain the habitat of species at stake</p>	<p>-Reduction of habitat for maintaining the right-of-way of the water pipe and the high-voltage line</p>	<p>PLANT:</p> <p>- Permanent hold of the water line 0.6 ha</p> <p>HV LINE:</p> <p>- Permanent footprint of the HV line (7.9 ha)</p> <p>It would be interesting to assess the capacity of these 2 species to maintain themselves in the vegetation subsisting under the HV line in operation</p>	<p>- Monitoring of populations of <i>Phrynobatrachus sp.</i> and <i>Morerella cyanophthalma</i> (accompaniment)</p> <p>- <i>Phrynobatrachus sp.</i> and <i>Morerella cyanophthalma</i> (accompaniment)</p> <p>- Promote the regrowth of low (raphial) forests under the HT line</p>	<p>Low</p> <p>0.6 ha destroyed 7.9 ha degraded due to vegetation management (height less than 3m)</p> <p>This is a very small percentage of UGD # 1 will be lost (0.2%), although it is one of only two known locations of <i>Phrynobatrachus sp.</i></p> <p><i>Morerella cyanophthalma</i> has not been observed, but the habitat is typical of this endemic species from the Ivorian coast, known from 3 sites.</p> <p>Compensation required to comply with IFC Performance Standard # 6 (net gain)</p>
<p><i>Morerella Cyanophthalma</i></p> <p>Amphibian known to only 3 localities of the Ivorian coast and restricted distribution</p>									

8.4 Proposed measures for the management of priority ecosystem services

In accordance with PS6, the 2018 ESIA and RAP plan to implement avoidance measures or reduction measures when the impacts are not avoidable. The additional analysis carried out by BIOTOPE made it possible to propose additional measures focused on priority ecosystem services (Table 12). These measures meet the requirements of PS6.

Table 11: Priority Ecosystem Services and associated measures

ecosystem services	Priority	Plans and associated measures		Additional measures planned in BAP
		Plans and measures integrated into the ESIA	Analysis of existing reduction measures	
SE Supply				
Food: wild fish	Priority Type I	<p>Implementation of a Wastewater Management Plan to ensure the proper implementation of the measures described in Chapter 3, Project Description, aimed at treating all discharged service water as well as contaminated rainwater and to control the parameters of the discharge water in accordance with the applicable standards.</p> <p>Modeling of the dilution of the thermal plume and the pollutants in the cooling water.</p> <p>Depending on the results of the modeling and monitoring of the waste water, plan to connect the purge water to the industrial water treatment system or install a dedicated intermediate buffer tank to lower the temperature of the waste water.</p> <p>The results of the monitoring of the quality of the discharged water will be communicated periodically to the relevant environmental authorities (CIAPOL). In the event of non-compliance, additional measures will be taken:</p> <ul style="list-style-type: none"> • Consultations with fishermen in the operational phase to assess their perception of the impact of the plant on their activities; and • Measurements of the quality and biophysical characteristics of the water near the discharge points and 200m in the canal for comparison 	<p>The implementation of the Wastewater Management Plan will ensure the discharge of quality water that complies with the applicable waters.</p> <p>The modeling study of the dilution of the thermal plume and pollutants in cooling water, in particular related to salinity, shows that the potential impact will be negligible</p> <p>If during the commissioning of the power plant, the periodic checks of the quality of the discharged water reveal non-compliance with the standards in force, these adjustment measures will allow the project to realign with the applicable standards, with the supervision of CIAPOL.</p>	<p>No additional measures are planned in the BAP concerning fishing</p> <p>In the event of a reduction in the catch by local fishermen, the causes of which are independent of the project - if the measures opposite are scrupulously implemented - a plan should be drawn up to prevent any unfounded accusation of the influence of the water pipe on fishery resources.</p>

ecosystem services	Priority	Plans and associated measures		Additional measures in BAP
		Plans and measures integrated into the ESIA	Analysis of existing reduction measures	
Water resources	Priority type I and II	<p>An analysis of the level of the water table and of the quality of the groundwater will be carried out once a month to detect any alarming drop in the level and any potential contamination caused by the Project during the construction phase and then quarterly during the exploitation phase.</p> <p>In the event of an impact on the quantity (drop in the level of the aquifer) or the quality (eg saline intrusion) of groundwater, the Project will assess the possibilities of reducing water consumption and / or study the possibilities of exploiting alternative sources (eg Lac Bakré).</p> <p>If pollution of the water table is identified, the authorities and communities must be informed.</p>	<p>Periodic analysis of the quantity and quality of groundwater will make it possible to detect any potential impact in good time, in order to be able to implement appropriate corrective measures.</p> <p>This aquifer constituting the main resource for the population of the village of Taboth, in the event of a problem, the project will inform the communities and local authorities without delay and will seek without delay alternative sources of water for its development and for the supply of the village communities.</p>	No additional measures are planned in the BAP concerning access to water for local populations, but measures aimed at the conservation of wetland habitats will benefit communities by regulating the local hydrological cycle.
Cultural ES				
Cultural value of existence of species	Priority Type I	Adapt construction plans to avoid the destruction of large threatened trees (eg <i>Nauclea diderrichii</i> and <i>Milicia regia</i> , VU) and forest environments	This measure to adapt the construction plans of the power station and the high-voltage line limits the impact on the SE of the value of cash.	BAP measures targeting natural habitats and endangered species found there maintain the associated existence values (absence of net loss and net gain in biodiversity)
Regulation ES				
Regulation of surface water and groundwater	Priority type I and II	No specific mitigation measures.	Water resource measures mitigate effects of loss of surface and groundwater regulatory services	No additional measures are planned in the BAP concerning access to water for local populations, but measures aimed at the conservation of wetland habitats will benefit communities by regulating the local hydrological cycle.

8.5 Mitigation Measures

8.5.1 Choosing a high-voltage line with little risk of collision (and electrocution)

This avoidance measure consists in avoiding the mortality of birds by collision in the high voltage line, and birds and primates by electrocution. In the case of 220kV lines the length of the insulators (typically $\geq 2.50\text{m}$), and more generally the spacing between the metal parts subjected to different voltage is such that the risk of electrocution is very low or even non-existent. It can be easily annihilated by a choice of pylon avoiding any risk of animal electrocution notably thanks to grounding systems. On the other hand, collisions in electrical transmission lines are an important cause of bird mortality, particularly raptors, large waders and migrants, at night or in the event of fog. This loss of avifauna can be easily circumvented by choosing a line with a double bundle of cables which is perceptible for avifauna and considerably reduces the risk of accident, as well as by placing "3D bird deflectors" (balls of "aviation" type) on the guard cables which, by their position, are the cause of the majority of accidents.

8.5.2 Maintaining water quality

This is an avoidance measure whose aim is not to modify the physico-chemical characteristics of fresh and lagoon waters, and to maintain an unchanged quality. During the construction phase, contractors will be vigilant to put in place erosion control and sediment runoff measures in the appropriate watercourses which will not release material suspended in the water. The main erosion control measures (detailed in Annex 4) will consist of tarmacing or spraying the tracks to avoid dust, setting up a network for recovering used water and runoff, minimizing deforested areas and stripping of surfaces, adapting the design of slopes and disbursements and working methods. Measures to reduce the intake of suspended solids and other pollutants into watercourses will involve managing the discharge of runoff water. They will be implemented by the contractors as detailed in appendix 4. During the operating phase, considering the negligible impact of the discharge of cooling water from the power station into the lagoon and the very high dilution potential of the lagoon, no specific measurement is not to be expected, except for a periodic check of the physicochemical properties of the discharge water (temperature, pH, etc.) of the plant's cooling circuit, so as to ensure that the thresholds regulations provided for in Guinean legislation are respected.

8.5.3 Best practices for clearing

Land clearing schedule respectful of the species at stake

This avoidance measure consists in optimizing the schedule of forest clearings that will be carried out during the pre-construction phase to avoid any impact on the species of wildlife at stake in conservation.

Consideration should be given to the reproductive periods of forest species of amphibians, primate and avifauna (*Phrynobatrachus* sp. and *Morerella cyanophthalma* priority which trigger critical habitat) to define periods of work outside periods of vulnerability.

The Project will rely on the expertise of qualified ecologists (herpetologist, primatologist and potentially ornithologist) who will carry out a field visit prior to any clearing to identify the areas sheltering possible anurans, group of monkeys and / or nesting bird. In the event of the discovery of one or more of these sensitive species, the choice will be made either to mark out the area concerned if site constraints allow it not to clear it, or to translocate the animals observed (anurans), either to their scaring in order to avoid mortality (primates, birds). In any case, avoid clearing any forest area if it is not strictly necessary.

It would be doubly beneficial to carry out the inevitable clearings of low land forests during the dry season in order to avoid damaging the reproduction of target species and to reduce the risks of degradation that can be caused to wetlands in water.

Reasoned Clearing

A reduction measure whose objective is to minimize the loss and fragmentation of natural habitats, and the potential mortality of animals due to land clearing (crushing by gear, falling trees. It will also mitigate the potential decrease in supply capacities of local populations (ecosystem services: harvests, wild food, biochemicals, natural medicines and pharmaceuticals, wood and other wood fibers ...) as well as the modification of the water regulation capacity by the soils.

These objectives will be achieved through the adoption of good logging practices with low environmental impact described by the International Tropical Timber Organization (ITTO); see Annex 4 - Measure 1.4). Timber harvesting operations will be subject to intensive planning and careful control in order to reduce the area to be cleared to the minimum necessary for the needs of the site. The clearing must be oriented in space and sequenced in time so as to allow the fauna to flee, and the contractors must provide a detailed Clearing plan presenting the planning of the works.

Management clearing related to social influx

This reduction measure aims to limit the clearings linked to the influx of populations (for the needs of domestic wood, charcoal, agriculture ...). This can be achieved by promoting local hiring and by discouraging workers from coming with their families, the rotation time planned as a result could be 3 to 4 weeks on site, to be adapted according to construction constraints. The contractor in charge of clearing will implement a policy of local recovery of cutting residues (wood and branches) which will be made available free of charge to the local population.

Selective clearings for the maintenance of species at stake

In sectors where this is compatible with the site (e.g. outside areas where the ground will be raised, access areas, etc.), and in particular for access tracks to pylons, this reduction measure aims to mitigate the loss and degradation of the habitat, food resources and trees necessary for nesting for avifauna, as well as the destruction of plants with conservation issues.

It will be necessary to involve an ecologist and a botanist in order to carry out the physical marking and to note the GPS coordinates of sectors or species with high conservation stake (*Baphia bancoensis*, *Milicia regia*, *Nauclea diderrichii* and all other plant species with stakes / potential uses, evergreen trees suitable for nesting and fruit species for forest birds (not critical). Areas favorable to the maintenance of all of these key species, or simply identified trees, will be preserved throughout the duration of the site and the operating phase.

The success of this measure also depends on the identification and maintenance of tree species favorable to the forest rookie and rigorous management of topsoil to reuse it and guarantee soil fertility at the end of the project.

8.5.4 Monitoring of potentially present conservation species

In view of the suitability of certain forest habitats for the reptile and amphibian species of avifauna potentially present in the Project area - the red owl, *Scotopelia ussheri* (VU), the turtles *Kinixys erosa* (EN) and *Kinixys homeana* (CR), and the amphibians *Kassina arboricola* (VU), *Phrynobatrachus ghanensis* (NT), *Hyperolius viridigulosus* (NT) -, their known distribution areas as well as the information gathered from the villagers concerning their presence, it is recommended to the Project that they are subject to monitoring in case they are discovered during construction work. These watches must be carried out by experts from each group during site preparation and before clearing. In the event of discovery during the pre-construction phase, and the constraints linked to the progress of the construction site allow it, it will be necessary to carry out appropriate markings around their nesting / living place in order to preserve their habitat from any impact. If, however, the constraints linked to the site do not allow it, mitigation measures will be implemented.

8.5.5 Prevention and Management of Invasive Flora and Fauna

Invasive alien species (IAS) are the second leading cause of global biodiversity loss after habitat destruction. Some of these species are already present in the Atinkou Project area (*Chromolaena odorata* and *Lantana camara* in particular) and it is known that the probability of invasion by IAS is higher in habitats that are altered and disturbed, for example after a clearing or baring the soil. Consequently measures to prevent the introduction and spread of invasive species are required in the context of the application of PS6.

All the directives concerning the prevention and management of IAS stress the importance of prevention, control and surveillance actions. The Project and all of its contractors will therefore be particularly vigilant in strictly implementing realistic and appropriate control measures.

9 Strategy for Compensation and no net loss of biodiversity

Despite various mitigation measures (avoidance, reduction), including the restoration of temporary rights-of-way (works phase), residual impacts remain on 10.1¹⁰ ha of terrestrial habitats and the species they host, as well as two species with restricted range triggering a “critical” habitat designation (Chapter 8). These impacts must be compensated for the project to comply with the requirements of PS6.

This chapter presents the biodiversity compensation strategy¹¹, which is the last step in the mitigation hierarchy. This strategy should allow the project to achieve an absence of net loss of biodiversity, or even a net gain for certain species, in accordance with the requirements of IFC's PS6.

Compliance with performance standard 6 of the International Finance Corporation requires the design and implementation of a biodiversity compensation strategy. This will have to respect several principles including the equivalence species - species and habitat - habitat and the additionality of the actions implemented.

A compensatory measure is defined as an action aimed at offering a positive counterpart to a non-reducible damaging impact caused by a project, so as to maintain biodiversity in a state equivalent (no net loss) or better (net gain) to that observed before the project is completed.

In accordance with the PS6 standard, the measures proposed for natural habitats must make it possible to aim for a zero net loss of biodiversity by the conservation and restoration of the same habitats within the DMU or in nearby territories. The measures proposed below should make it possible to aim for a net gain for the species concerned.

9.1.1 Support for the National Park Azagny

The option proposed to compensate for the loss of riparian and swamp forest habitat and temporarily flooded in the project area consists of financial support to Azagny National Park for the conservation of these habitats. The choice turned to this park rather than that of Banco because in addition to its proximity, it contains all the categories of natural terrestrial and aquatic habitats encountered in the project site. In addition, it is known to constitute a refuge area favorable to all forest species with conservation stake in the project area (except *Phrynobatrachus* sp., The presence of which may perhaps be highlighted), as well as African manatee, the three species of crocodiles and the Lowe's cercopithecus. This measure will compensate in one place for the loss and degradation of the habitat of these species as a result of the project. This is compensation by "avoided loss" rather than ecological restoration, which seems relevant insofar as the project undertakes not to clear or fill the shallows crossed by the power line, which should therefore be able to continue to host many species (including *Phrynobatrachus* sp. and *Morerella cyanophthalma*)

¹⁰ 13.4 ha of natural habitat least 3.3 ha (+ flooded meadows not impacted aquatic habitat)

¹¹ Details of the measures available in the Appendix. Their implementation could usefully benefit from specialized technical support.

The study by Lindsey et al. (2018) analyzes the financial data of 218 protected areas in Africa and estimates that 900 euros constitutes the minimum amount necessary for the effective management of 1 km² of protected area. In addition, based on the experience of the Singrobo-Ahouaty project in Côte d'Ivoire (in the framework of which 300,000 euros will be paid over 30 years in support of the Lamto reserve to compensate for more than 110 ha directly impacted (drowning) of the facts of the project) - and in view of the relatively weak impacts of the Atinkou Project (less than 13 ha impacted) - financial support half as small (reduced to the same time scale) appears reasonable. On this basis, it was decided to allocate 100,000 euros over 20 years - or 5,000 € per year - which should make it possible to cover the annual costs of managing an area of more than 5 km² in the national park (depending on the management practices and priorities).

The sizing of this amount was also carried out with the prospect of effectively and lastingly protecting an area proportionally equivalent to the allocated budget: 5,000 euros representing just over 2% of the Park's annual budget (which is 150 million FCFA), the objective is to manage to conserve and improve the quality of at least 2% of the surface of the forest types which will be impacted by the Atinkou Project. Flooded and raphial forests represented 8,800 ha within the Azagny Park in 2000 (Konan 2008), but taking into account the annual rate of deforestation calculated for the park (1.80%; Konan 2008) it is estimated that today 6,100 ha are expected to continue. Two percent of this area corresponds to 120 ha, which ensures total adequacy between the amount allocated and the areas involved / management constraints since

- 120 shares present almost 2 times the area to compensate for achieving the gain objective (which is 65 ha): this offers the possibility of compensating well beyond the objectives set;
- 120 shares present in approximately the quarter of the area that it is possible to manage annually with funding of € 5,000 (which is at least 500 ha): the financial management constraints will not hinder the achievement of the objectives.

Moreover, in addition, the managers of the Atinkou project have assessed the adequacy of this amount - which is added to the National Park budget and does not replace it in any case - in partnership with the OIPR, with which a collaboration agreement is in progress of establishment. This agreement sets the terms of cooperation whose objective is to compensate for the impacts of the Atinkou project while being part of the priority actions of Azagny National Park.

The main management difficulties existing at the level of the park are linked to a strong anthropogenic pressure on the 12 natural resources, an insufficiency of budget, and a state of advanced degradation of tourist infrastructures.

The priority actions targeted by the park management plan belong to three main categories:

- Support for good environmental practices: fight against poaching and development of a monitoring program, fire management as a management tool (relative to coastal savannas)
- Support for research and conservation: bio-monitoring to monitor changes in the natural environment, relaunch of the manatee monitoring program, launch of a large mammal monitoring program
- Rehabilitation of infrastructure (reception, network of trails, canals and walkways for access to the park) and a botanical trail.

¹² <http://oipr.ci/index.php/parcs-reserves/parcs-nationaux/parc-national-d-azagny>

The funding provided by the Atinkou project will therefore be used to meet the management expectations of the Parc d'Azagny by supporting the generalization of good environmental practices, and strengthening ecological monitoring missions aimed at describing the dynamism of animal populations - particularly research and conservation of amphibians (see § 9.1.2 Support for herpetological research) - and of the ecosystems supporting these critical species. Preliminary discussions took place between Atinkou and the OIPR in September and November 2019, in the presence of officials from the southern zone and the OIPR branch. On the basis of these discussions, the current management needs of the Azagny National Park and this Biodiversity Action Plan, the OIPR has drawn up a proposal for a collaboration agreement which will be validated by Atinkou. This agreement includes an action plan providing a framework for ensuring the achievement of compensation objectives, which requires the precise definition of compensatory measures, the methods of their implementation and their monitoring.

The priority compensatory actions to be developed will specifically target the critical habitats impacted by the project, that is to say the raffia, swampy and temporarily flooded forests. Raffia trees are mainly found in the north-central part of the Park, while flooded and temporarily flooded forests are more represented in the north and south-west. The precise definition of the specific actions that will be implemented was made in partnership with the park's managers and agents, who have a good knowledge of the reality on the ground with its needs, wealth and constraints. These actions will be broken down as follows

- Monitoring and Protection

A general measure concerning good environmental practices will consist in protecting all forest habitats from deforestation, so as to reduce the human footprint within the Park. To achieve this objective, the surveillance operations currently carried out by park officials will be strengthened to make them more effective. Patrols will contact the areas most affected by human activities as well as those that are usually little or not visited, they will be more frequent and unpredictable. They will particularly aim at the application of the law, and possibly the eviction of people carrying out illicit activities inside the limits of the park (to be discussed with the OIPR). If the need was confirmed, part of the funding could be used to acquire the patrol equipment necessary for the proper implementation of this surveillance and protection measure.

- Communication and support to community projects for behavior change

Public information - education - communication programs to change the behavior of the local communities inhabiting the 11 villages in the peripheral area of Azagny will be implemented. They will take place successively in each of the villages and will aim to strengthen villagers' support for conservation activities and efforts to protect the environment, in general and that of the park in particular. In addition, the OIPR will encourage the emergence and provide financial and / or material support to community projects aimed at the conservation of natural habitats and fauna: agricultural programs which will aim to increase production yields so as to limiting the need for arable land, agroforestry, market gardening, development of alternative sectors to fuel wood and charcoal, animal breeding programs ... Promoting the improvement of the livelihoods of the communities living near the park will help to divert their attention of the protected area by improving their living conditions, and thus reducing the human footprint in the national park,

Park waterfront communities will divert their attention from the protected area by improving their living conditions, and thus reduce the human footprint in the national park.

- Research and Ecological Monitoring

These general surveillance, protection and communication measures will be reinforced by actions focusing more specifically on the species and habitats triggering critical habitat: the procession of amphibians from flooded, temporarily flooded and riparian forest environments. The development of this measure will be done on a separate budget line, and the OIPR will provide support for field missions which will be conducted by a qualified herpetologist as described in detail in § 9.1.2 Support for herpetological research. Better knowledge will better protect these ecosystems. And at the same time, it is important that surveillance patrols be organized specifically in these habitats in order to progressively decrease hunting, fishing, collection, harvest, exploitation of wood and non-wood products within them and gradually increase their level of quality to ensure the expected net gain. The performance indicators put in place will make it possible to follow the evolution of the surface and the state of the types of forest concerned over time, and thus to adapt in real time the compensation measures according to the expected results in order to "improve their implementation" (see Chapter 10 - Biodiversity monitoring and evaluation plan).

- support for the management of the park

Compensation could also go through material support to the OIPR which would allow it to specifically direct its research, conservation and law enforcement actions towards the habitats impacted by the Atinkou Project (riparian, swampy forests and temporarily flooded which represent the majority habitat types within the Azagny National Park). This is yet to be discussed with OIPR officials, but the purchase of a boat or outboard motor, terrain equipment suitable for swamp forest habitats may be necessary

Compensation is a long-term commitment, and it would be useful to identify a sustainable funding mechanism to ensure that the resources made available by CIPREL are well used. A trust or consignment with a reputable banking institution could be envisaged, but the use of a specialized environmental trust fund such as FPRCI¹³ seems more appropriate. The FPRCI is a recognized vehicle for financing Ivorian national parks and independent of the Ivorian government, which could provide annual payments from interest on a capital endowment, or in the form of a sinking fund. The amount of the endowment will depend on the expected interest rate and the related management fees.

9.1.2 Support for research Herpetological: description of the species *Phrynobatrachus* sp. and knowledge of *Morerella cyanophthalma*

Support for the herpetological research focused on the description of the species *Phrynobatrachus* sp. and improving knowledge on *Morerella cyanophthalma*. These are unknown or poorly known amphibian species with a restricted range on the Ivorian coast. In addition to maintaining favorable habitat under the power line (wet raffia), acquiring better knowledge of the biology of these species and their distribution will contribute to their conservation.

¹³ <http://fondationparc.ci/>

The first activity to be carried out in this context is to conduct reconnaissance, in partnership with the OIPR, aimed at confirming / denying the presence of *Phrynobatrachus* sp. in the Parc d'Azagny. The most favorable period for the batrachological inventories being the rainy season, this reconnaissance activity will be conducted from April 2020. The project's environmental monitoring program will include monitoring dedicated to these species in the Azagny National Park as well as in the right-of-way of the project (near the factory and under the high-voltage line), with in particular the study of the capacity of *Phrynobatrachus* sp. to maintain itself in the vegetation lowered under the high-voltage line see chapter 10 - Biodiversity monitoring and evaluation plan

In addition to the compensatory measures proposed above, the plan provides for measures to manage the clearings that will be carried out, measures relating to alien invasive terrestrial species, in particular through re-vegetation of temporary work areas, as soon as they are completed. Of these, measures to maintain the quality of the water, and actions to secure the high-voltage line preventing the risk of electrocution of avian and arboreal fauna (primates), but also the risk of nautical and aeronautical percussion, particularly along the route crossing the lagoon (see § 8.5 Mitigation measures)

The implementation of the compensation strategy will respect several important principles:

- The compensation is a long-term commitment for the entire duration of the operating concession
 - The compensation will help increase the capacity in Ivory Coast of knowledge on biodiversity and conservation thereof.

In order to achieve these objectives, assistance to specialized project management will accompany the project at the start of the implementation of the BAP.

9.2 Summary on the achievement of the objectives of no net loss of biodiversity for natural habitats

It is by correct sizing of the compensation for biodiversity that the absence of net loss can be demonstrated. The "losses" linked to the residual impacts of the project must be compared with the expected "gains" from ecological compensation. In order to assess these "losses" and "gains" in a comparable manner, the concept of hectares-quality is often used. It makes it possible to assess the quality of the surfaces which will be impacted and which will benefit from compensation. The areas concerned are multiplied by a quality index, based on the opinion of experts or measurable indicators, and / or in comparison with a habitat of the same type considered of good quality, generally located in a protected area, and serving benchmark (Quétier & Lavorel 2011; World Bank Group 2016).

Here a quality index has been determined based on expert opinion using the precautionary principle. A coefficient of 1 has been assigned to the aquatic ecosystem of the Ebrié lagoon. Concerning terrestrial habitats, a reduction coefficient of 0.95 was applied to the 3 mature forest types on the project site (raphial, swamp forest and temporarily flooded forest) by considering that the forest blocks in the Azagny park are in better condition, larger and more functional. The flooded meadow and the aquatic ecosystem of the lagoon.

Ebrié is applied a coefficient of 0.9 indicating a lower quality on the Project site than in the Park. Finally, a reduction coefficient of 0.75 was applied to degraded forests, signifying the need to compensate 3 units of this type of habitat in equivalent to 1 unit of degraded "healthy forest". This coefficient takes into account the diversity and floristic composition of lower quality of secondary forests compared to mature forests, as well as the time necessary for the maturation of secondary forest.

9.3 Summary on achieving targets for biodiversity net gain for the species

The strategy for obtaining a net gain in biodiversity is based on "losses avoided" in the neighboring Azagny National Park: that is to say the loss of habitats that compensation makes it possible to avoid (or the difference between the current deforestation rate in the park and the reduced rate that will result from the support of the Atinkou project).

Konan (2008) shows that between 1978 and 2000, the area of dense forests in Azagny NP was reduced by 38%, that of swamp forests by 36%, while that of flooded forests increased by 5%.

The annual deforestation rate is calculated using the following formula (FAO 1995); with T deforestation rates, and S_1 and S_2 forest areas respectively t_1 and t_2 dates:

$$T = ((S_2 / S_1)^{(1/(t_2-t_1))} - 1) * 100$$

Based on data from Konan (2008), the calculated average annual clearing rate of mature forests in the park is 1.80%, over the period 1978 - 2000 (22 years). A more recent study conducted by FAO (2017) on the whole of Côte d'Ivoire gives annual national deforestation rates of 3.04% over the period from 1986 to 2000 and 2.66% over the period from 2000 to 2015. Côte d'Ivoire is one of the countries where deforestation is the most intense in the world. Deforestation rates can be much higher in some cases, for example during the localized "invasion" of a protected area. Brou (2009) has calculated an annual rate of 10% for the Bossematié classified forest in the east of the country.

Based on these data, and setting the horizon 2040 (end of the Atinkou concession) as the deadline, we propose the following scenario of avoided losses (see Table 12 and Figure 19 below):

- The proposed counterfactual scenario considers an annual clearing rate of 2.23%. This rate represents the average value of all types of forest combined between the rates estimated by Konan (2008) in the Azagny NP between 1978 and 2000, and by the FAO (2017) over the entire Ivorian territory between the years 2000 and 2015.

The scenario of avoided losses applies this deforestation rate of 2.23% the first 2 years (2020 and 2021), the time that the compensation measures are put in place and organized at the level of the NP of Azagny. He considers that thereafter the annual deforestation rate of Azagny Park will decrease by 0.1% each year due to the progressive effectiveness of the compensation measures put in place. In this hypothesis, the Park would reach an annual deforestation rate of 0.33% in the 20th year, that is to say in 2040.

- This scenario of avoided losses, which implies an effective implementation of measures to combat deforestation by park staff, makes it possible to take into account a differential in the effectiveness of the measures over time. It also has the advantage of not applying a constant rate over time; this progressive and continuous nature allows it to integrate possible changes linked to the application of national policies or one-off events involving breaks in the curves.

- On the other hand, this scenario of avoided losses does not consider the beneficial effects of the gradual natural regeneration of secondary forests, which if well protected, will progressively evolve towards mature forests. This natural regeneration process, which has not been accounted for, will act as a catalyst that will accelerate and amplify the net gain in biodiversity obtained by the Atinkou Project
- The ecological equivalence for critical habitats will be reached by 2022 with an avoided loss of 6.63 ha. The target of net gain with a ratio of 10: 1 will be achieved in the year 2026 at the end of which 91.35 ha of losses will have been avoided. This 7th year, the deforestation rate will have reached a value of 1.83%, which therefore constitutes a completely reasonable and accessible objective since equivalent to the rate of clearing which was calculated by Konan for the Azagny park on the period 1978-2000
- If the reduction in the rate of deforestation is maintained at such a rate of 0.1% per year, by 2040 the compensation measures implemented in the Azagny National Park will have made it possible to compensate 919.3 ha, i.e. net gain close to 150 times greater than the area of forest impacted (see Figure 19 and associated Table 12). Even if, however, the implementation of compensation actions was faulty and did not allow us to go below this rate of 1.83%, the objective of net gain for swamp forests, temporarily flooded and raphials would have already been achieved and even exceeded

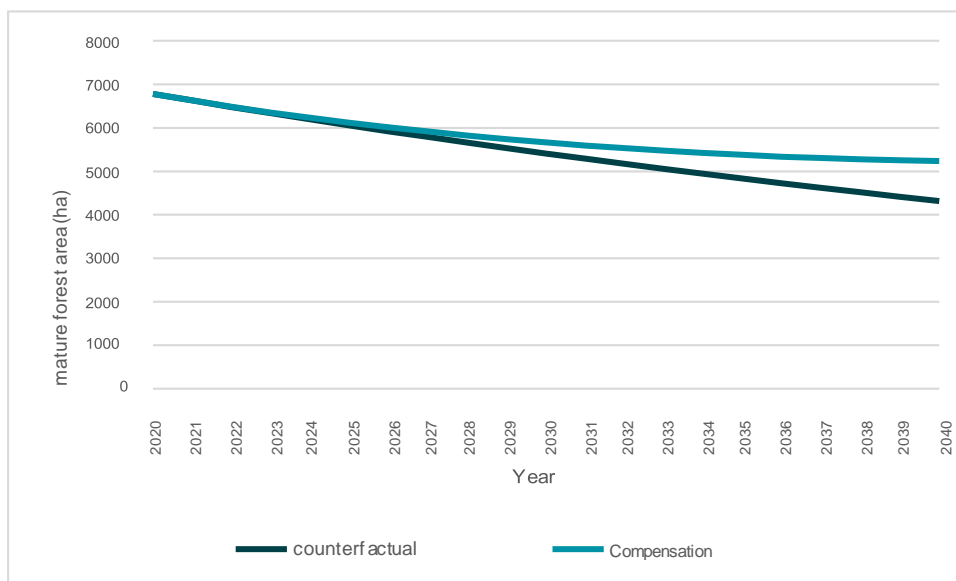


Figure 19: Calculation of avoided losses in 2040 by the establishment of a more effective protection of forests PN Azagny

The last 3 points above justify the fact that an overall reduction of 0.1% in the annual deforestation rate smoothed over 20 years is completely reasonable and possible. They also make it clear that even if the compensation strategy is not fully implemented, the target - which is 150 times lower than the avoided loss strategy - will inevitably be achieved. The surface data would benefit from being updated, and the counterfactual scenario, although realistic and containing a certain margin of adaptability, is debatable in essence. But given the relatively low impact of the Project on natural habitats (13.4 ha) compared to the compensable areas in Azagny National Park (12,430 ha according to Konan, 2008), it is obvious that the objectives of absence of net loss and net gain will be achieved relatively quickly, and insured even in the event of partial failure of protection of the park.

Table 12: Calculation of losses avoided per year

	Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	
mature forest area	counterf actual (ha)	6932	6777.42	6600	6.28	6478.51	6334.04	6192.79	6054.69	5919.67	5787.67	5658.60	5532.41
	Compensation (ha)	6932	6777.42	6600	6.28	6485.14	6353.49	6230.87	6116.84	6011.02	5913.04	5822.57	5739.31
	losses avoided (ha)	0	0	0	6.63	19.45	38.08	62.15	91.35	125.38	163.97	206.90	
	Year	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	
mature forest area	counterf actual (ha)	5409.04	528.42	5170.4		5055.19	4942.46	4832.24	4724.48	4619.12	4516.12	4415.41	4316.94
	Compensation (ha)	5662.98	553.32	5530.1		5473.16	5422.26	5377.25	5338.00	5304.37	5276.26	5253.57	5236.23
	losses avoided (ha)	253.94	304.90	359.63		417.97	479.80	545.01	613.52	685.25	760.14	838.16	919.29

The counterfactual scenario corresponds to the forest area of the Park without compensation action by applying an annual rate of deforestation of 2.23%.

The compensation scenario gives the areas of forest that will remain in the Park with the application of compensation. It applies a reduction of 0.1% to the rate of deforestation each year from 2022.

The losses avoided correspond to the difference between the two scenarios, i.e. the forest areas that the compensation will protect.

10 Monitoring Plan and biodiversity assessment

An operational monitoring and evaluation program will be implemented to assess the appropriateness of the implementation of the compensation measures and their effectiveness. Performance indicators have been developed and retained to assess each of the measures developed within the framework of this plan (see table 13 below). Depending on the values taken by these indicators at the end of the monitoring, the methods or practices of implementation will have to be revised in order to improve their effectiveness and make it possible to achieve the expected objectives.

The fundamental questions facing the Plan are:

- Has the compensation achieved the objectives set for the targeted ecosystems and species?
- Can methods and techniques be improved to improve cost-effectiveness and optimize the implementation of measures, and thus the effectiveness of compensation?

As far as possible, all surveillance and monitoring actions that allow it will be carried out by directly involving the populations (principle of participatory monitoring)

Table 13: Monitoring Plan and Biodiversity Assessment

Title of the measure	Arrangements for monitoring	Effectiveness indicators for measures and objectives	frequency Monitored	Project Phase	Responsible for monitoring
Choosing a power line with little risk of electrocution and collision	Monitoring of the mortality of animals (birds and primates) under the line	0 animal found dead through electrocution or collision	Monthly (year 1) Bimonthly (2 years 5) Then biannual	Surgery	maintenance operator of the line
Maintaining water quality	<ul style="list-style-type: none"> - Measuring the quality of discharges and water upstream and downstream of discharges (sampling + analysis) - Visual inspection of the traces of erosion and sediment runoff into streams / lagoon by field visits 	<ul style="list-style-type: none"> - The quality of discharges and water conforms to the national standards and regulations and force - No trace of erosion or sediment runoff 	<ul style="list-style-type: none"> - Monthly the first year and biannual - Monthly rain season 	Surgery	Atinkou
clearing schedule respectful of species conservation facing conservation challenges	The operators record the clearing of the completion dates in field notebooks	100% of the clearing is realized outside sensitive periods for the reproduction of amphibians and primate (dry season)	Once before clearing (planning) and once after	Construction (clearing)	Atinkou through the operator
reasoned clearing	<ul style="list-style-type: none"> - Audit clearings Management Plan - Audit of clearing activities and their compliance with the Plan 	<ul style="list-style-type: none"> - The Plan adopts best practices and minimize the impacts clearings - 100% of the clearings are conducted in accordance with the Plan 	<ul style="list-style-type: none"> - Once when the plan is submitted - Daily during works 	<ul style="list-style-type: none"> - Preconstruction - Construction (clearing) 	Atinkou and operator
Management of clearings related to social influx	<ul style="list-style-type: none"> - Audit workers about where and with whom they live - Audit of the late clearing activities to assess waste recovery plant 	<ul style="list-style-type: none"> - 80% of workers have not brought their families - 100% of crop residues are measured 	<ul style="list-style-type: none"> - After the start of the project and annually - once at the end of the clearings 	<ul style="list-style-type: none"> - Preconstruction - Construction 	Atinkou and operator

Title of the measure	Arrangements for monitoring	measures performance indicators and objective	frequency followed	Project Phase	Responsible for monitoring
selective clearing for maintaining species facing conservation challenges	A botanist counts the number of marked trees that have been preserved	100% labeled trees preserved	Annual	Construction	Atinkou operator and in collaboration with botanist
Standby for species potentially present conservation challenge	Ornithologist of experts and herpéthologue prospect extensively the area of work in pre-construction and operation	<ul style="list-style-type: none"> - 100% of the work zones traveled day and night - 100% of the marked areas are preserved construction phase and beyond - No loss of sensitive wildlife 	1 times after the clearings and annually thereafter	<ul style="list-style-type: none"> - Preconstruction - Surgery 	Atinkou
Prevention and management of invasive terrestrial flora and fauna	Estimated recovery of invasive plants on site inspection	Less than 5% of the site is overgrown with EEA	Annual	Surgery	Atinkou
Support for the Azagny National Park and Conservation flooded forests	<ul style="list-style-type: none"> - Signing of a cooperation agreement with the PN Azagny (OIPR) including a plan of action research and conservation to lead - Annual audit of the support program in the terms described in the Partnership Agreement 	<ul style="list-style-type: none"> - Report of the "Working Group" on conservation activities of the flooded forests of the park - Indicators surface quality and flooded forests of the park (the area is increasing every year and the quality is not reduced) 	Annual	<ul style="list-style-type: none"> - Construction - Surgery 	OIPR (National Park Azagny)
Support for Herpetological research	<ul style="list-style-type: none"> - Conduct reconnaissance to confirm the presence of <i>Phrynobatrachus</i> sp. in Assagny National Park - Study of the bibliography - Assess the capacity of <i>Phrynobatrachus</i> sp. to remain in the vegetation remaining in the HV line - Monitoring population trends 	<ul style="list-style-type: none"> - GPS Tracks pipes recognitions - Scientific publications - Indices of presence, abundance and distribution of known populations <i>Phrynobatrachus</i> sp. and of <i>Morerella cyanophthalma</i> 	<ul style="list-style-type: none"> - In dry season and rainy to identify the presence of the species - Monthly 	exploitation	University Jean Lorognou Daloa

11 General conclusion

The construction of the Atinkou thermal power plant will destroy and degrade 97 ha of modified habitats - mainly coconut groves - and 13 ha of natural habitats, part of which (around 8 ha) can be considered critical for conservation amphibians endemic to the Ivorian coast.

Natural habitats include 6.5 ha of well-preserved forest areas divided between raffia trees (5.2 ha), swamp forest (1.2 ha), temporarily flooded forest (0.1 ha) to which are added 2.7 ha of grassland on sandy soil and at least 0.6 ha of aquatic environment¹⁴ (Ebrié lagoon).

The project has no impact on a protected area. The boundaries of the Audouin classified forest were redefined in 2018, independent of the project, and today exclude a portion comprising part of the route of the high-voltage line.

The site is mainly distinguished by its raphiales, swampy and temporarily flooded forests characteristic of the coastal region, between ocean and lagoon. It hosts significant and still relatively significant biodiversity, including critical habitats for the conservation of two species of amphibians:

- *Phrynobatrachus* sp. (n/a): a new amphibian species to science (not described) which is known as the site and the Banco forest. Its conservation status is not known, but it has a limited range.
- *Morerella cyanophthalma* (VU): a species of endemic amphibian of the Ivorian coastline that is known only 3 sites (national parks and Banco Azagny, swamp forests Tanoé - Ehy). Although she has not been seen on the site, there are habitat.

Also note the presence of two mammalian species, which after a detailed study does not trigger the criticality of habitat land and water:

- *Cercopithecus lowei* (VU): the monkey Lowe, an endemic primate of southern Ivory Coast and South West of Ghana.
- *Trichechus senegalensis* (VU): African manatee, where the lagoon complex of Côte d'Ivoire is a major global populations.

As such, these species were the subject of an in-depth assessment of the project's impacts, and of measures making it possible to mitigate and compensate for these impacts so as to ensure a positive effect of the project (net gain) for these species, in accordance at IFC PS6.

The project has low to negligible residual impacts on the 4 species mentioned above and their habitats (in particular swamp and temporarily flooded forests, as well as raphials), as well as on the procession of forest species of natural habitats. To deal with its residual impacts, the project will have to carry out a compensation strategy in accordance with international environmental performance standards. The main compensatory measures proposed here are:

¹⁴ This calculation does not include the crossing of the lagoon by the power line and the pier to be built in N'Djem

- Support for the Azagny National Park for the conservation of swamp and riparian forests. Like many protected areas, the park currently suffers from a lack of resources to fully carry out its missions. This is compensated by "avoided losses" which will better protect refuge zones favorable to forest species triggering critical habitat.
- Support for research programs targeting amphibians on the Ivorian coast, and description of the species *Phrynobatrachus* sp

The implementation of the compensation strategy will respect several important principles:

- The compensation is a long-term commitment for the duration of the operating concession.
 - The compensation will help increase the capacity of Ivory Coast in knowledge on biodiversity and conservation thereof, including Herpetofauna.

The application of the mitigation hierarchy to the project will allow it to not adversely affect the state of conservation of natural wetland and wetland forest habitats in the project area, and thereby the many species characteristic of forests from West Africa found there. These forests have indeed suffered a massive decline in recent decades, particularly in Côte d'Ivoire. In this context, the Atinkou project will be an example in taking biodiversity into account. The BAP will be the daily tool of this exemplarity.

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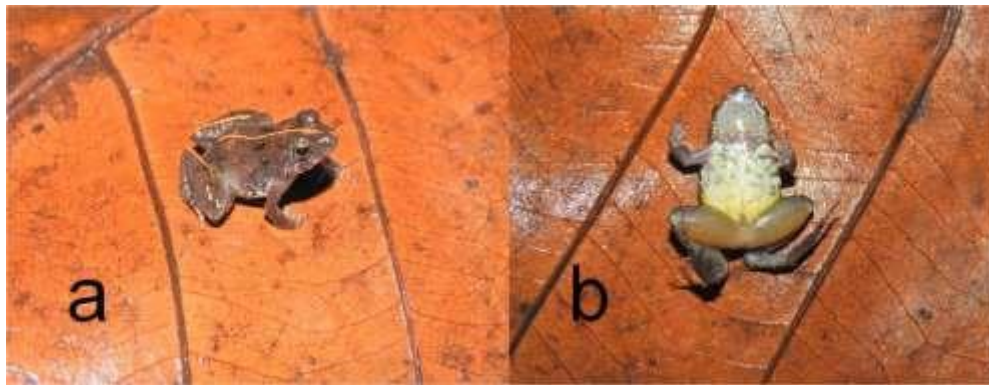
Appendix 1 - Overview of species meeting the criteria PS6 critical habitat designation

Phrynobatrachus sp. Species IUCN Red List: Vulnerable (VU). **CRITICAL HABITAT**

Family Phrynobatrachidae

This is the most important amphibian species in this assessment. It looks like it can be mistaken for the frog *Phrynobatrachus ghanensis* which is listed as "near threatened" on the IUCN Red List. This species has so far only been observed in the Banco forest in Abidjan, the project site constituting only the second location from which the species is known. In the current state of knowledge, a very limited distribution area is foreseen for this new species for science.

The terrestrial DMU (No. 1) contains one of the two populations known for this species with a likely very small distribution area, it therefore represents a critical habitat for this species according to criterion 2b.



Photos of *Phrynobatrachus* sp and temporarily flooded forest habitat (Source NG Kouame)

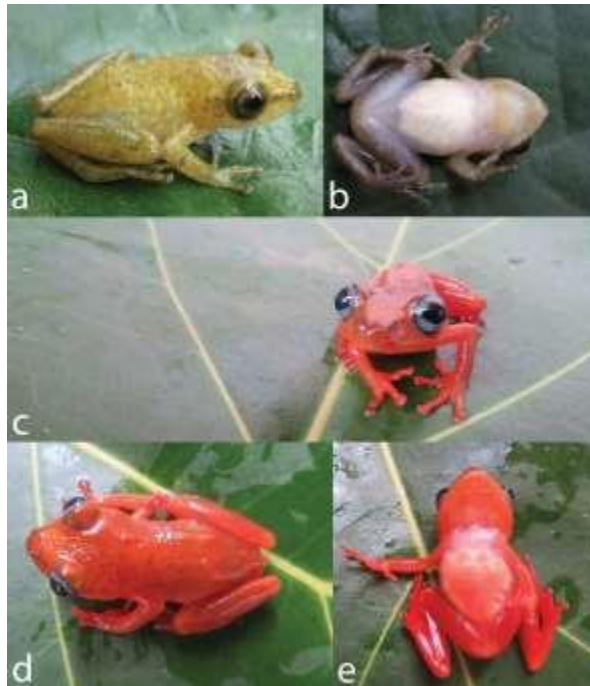


Morerella cyanophthalma* - IUCN Red List: Vulnerable (VU). CRITICAL HABITAT*Family Hyperliidae**

This species of amphibian in the family Hyperliidae was not directly observed on the project site, but its preferred habitat is swamp forests. In addition, the data currently available on the distribution of this frog reveals its presence exclusively on the Ivorian coast from only 3 sites including the Banco and Azagny national parks which are on either side of the project site.

This species is subservient to swamp forests. In Azagny National Park it has been observed exclusively in raffia trees. After 48 days of census, only 14 individuals could be observed at a single site, still on raffia palms approximately 2 m above the ground. The ground was covered with a thick layer of leaf litter, the closed canopy was relatively low, and the site was near former cocoa, cola and oil palm plantations (Konan et al 2016).

This frog seems preferentially active at night. A very marked sexual dimorphism characterizes the species, with males of a yellowish-brown color, while the females are of a very marked uniform red.



Morerella cyanophthalma captured the National Azagny Park. a and b show the dorsal and ventral sides of a male individual. C, d and e show a view of face, and E back and the belly of a female individual. Source: Konan et al. 2016

The PUD land is situated between 2 of the 3 sites where the species is known. The project site contains the preferred habitat of the species and numerous plantations. The similarity with the habitats observed in the national park Azagny makes the presence of the species in the highly unlikely project site.

Appendix 2 - Other species have been the subject of special attention

***Nauclea diderrichii* - IUCN Red List: Vulnerable (VU) -NOT CRITICAL**

family of *Rubiaceae*

This species has a wide distribution in tropical Africa from Guinea and Sierra Leone in West Africa, to Uganda in the east and Angola in the south.

Nauclea diderrichii is a tall to very large tree up to 50 m tall, evergreen or deciduous. Its bole without branches for 30 m, straight, cylindrical, reaching 150 to 180 cm in diameter, with low buttresses or without buttresses. It occurs from sea level up to an altitude of 1650 m in regions where the average annual rainfall is between 1600 and 3500 mm, and which have a long dry season of 0–6 months. It is a pioneer species demanding in light which grows in a multitude of environments and which is present in particular in the evergreen humid forest and in the semi-deciduous humid forest. It is also found in swampy regions. *Nauclea diderrichii* prefers light to medium-textured, well-drained, neutral to slightly acidic soils, and does not grow well on excessively moist or lateritic soils. In West Africa, it is often associated with other light-demanding species such as *Bridelia grandis* Pierre ex Hutch., *Terminalia ivorensis* A.Chev. and *Zanthoxylum gillettii* (De Wild.) P.G.

Waterman

The range of *Nauclea diderrichii* is large, but it remains uncommon and subject to rampant exploitation in many regions. Although regeneration is usually good in large forest gaps, it often suffers from competition from other pioneer species. This is why it is listed as vulnerable on the IUCN Red List of Threatened Species, the status of the species having to be reviewed regularly. In Liberia, the export ban on the species has been decreed, while in Ghana slaughter has been subject to special authorization since 1998.

Nauclea diderrichii is a popular commercial lumber species that produces very durable wood with good mechanical properties. However its density in the natural forest is low, and if one wishes to develop its sustainable exploitation, it is necessary to deepen the research relating to judicious methods of management in natural forest and the establishment of commercial plantations. It has a future in larger-scale plantations for lumber production because it combines both excellent properties of wood and good growth rates. There also appears to be a need for further studies on its chemical compounds for the possible development of drugs by the pharmaceutical industry.

The field mission made it possible to show the presence of habitats particularly suitable for this species and to observe many individuals still of small size (the largest individuals having been exploited).

***Milicia excelsa* - IUCN Red List: Vulnerable (VU) - NOT CRITICAL**

family of *Moraceae*

Milicia regia also called Iroko is endemic to West Africa whose distribution is limited to the Senegal to Cameroon.

It is a timber that is highly valued for construction, and forestry companies do not differ from its close relative: *Milicia excelsa* listed "near threatened" (NT) on the red list of IUCN. The pace of logging is the main cause of its classification at this high level of threat.

Cercopithecus lowei* - IUCN Red List: Vulnerable (VU) - NOT CRITICAL*Family Cercopithecidae**

This is a species of primate of the family Cercopithecidae with limited distribution, known only from the southern half of the Ivory Coast and the west of Ghana.

The species is well known around the Ebrié lagoon as mentioned by various studies, with a very fragmented distribution and almost always having low densities (Gatti 2010, Danquah 2012, Galat-Luong et al. 2013, Gonedele Bi et al. 2014). A study over several years was held in Adiopodoumé in Côte d'Ivoire (in the old ORSTOM park, at kilometer 17 on the road to Dabou and at the edge of the Ebrié lagoon) in the late 1960s (Bourlière et al. 1970). The size of the known groups varies between 6 to 16 individuals within territories ranging from 1.5 to 40 hectares

The most recent field research has shown that populations of *C. lowei* have declined by more than 30% over the last 3 generations, qualifying this species for the status of "Vulnerable" (Gatti 2010, Danquah 2012, Galat-Luong et al. 2013, Gonedele Bi et al. 2014). Since 2008 the species has been listed as "of least interest" for conservation by the IUCN, and in January 2019 it went directly to the status of "Vulnerable", showing the rapid and worrying decline of its population. There are currently less than 10,000 individuals of the species in the wild. The main threats to its survival are the degradation of its preferred habitat, and increased hunting pressure. Although it has been able to adapt to different types of degraded habitats, this species shows a very great preference for humid forest habitats, the relics of which are increasingly poorly represented within the study area. The terrestrial UGD corresponds to less than 1% of the range of this species, and cannot be considered critical for its conservation within the meaning of IFC performance standard No. 6.

Although adaptable to habitats modified by man, the Low e's cercopithecus will be sensitive to the disappearance of its preferred habitat which are the different types of humid forests, as well as to the accentuation of the break in continuity between the different forest relics of the region.



Geographical distribution *Cercopithecus lowei*. (Source IUCN Red List 2019)

***Pel's flying squirrel peralbus* (mammal - Anamolure Pel) - IUCN Red List: Data Deficient (DD) - Not evaluable**



Family Anomaluridae

Anomalurus pelii is a mammal species endemic to the Guinean forest area of West Africa. Three subspecies of *Anomalurus pelii* are described. A subspecies (*A. p. Auzembergeri*) occurs west of Sassandra. Another is found west of Bandama (*A. p. Peli*). The last (*A. p. Peralbus*) is endemic to Côte d'Ivoire, the area between Sassandra and Bandama.

This species is globally assessed in Data Deficient (DD) due to the lack of knowledge about its distribution area, its natural history, the threats hanging over it and its conservation status. It is a forest species dependent on the presence of cavities in the trees (rather mature trees).

This species is known from Azagny National Park. The individuals most likely belong to the endemic subspecies *A. p. peralbus*. Given the lack of data on this subspecies in Côte d'Ivoire, it is not possible to conclude on the criticality of its habitat. This hypothesis cannot however be ruled out. Knowledge building measures seem to be planned for this species.

Trichechus senegalensis* (Manatee Africa) - IUCN Red List: Vulnerable (VU) - NOT CRITICAL*Family Trichechidae**

The order of the Sirenians includes 2 living families: the dugongidae and the trichechidae. There are 3 species of trichechidae, including the African manatee. Data relating to the genetics of the African manatee populations indicate great variability (Vianna et al. 2006, Keith Diagne 2014), while confirming the non-existence of different subspecies (Vianna et al. 2006, Keith Diagne 2014).

It is a large herbivorous aquatic mammal, with a streamlined body, living in shallow coastal waters, in lagoons or the mouths of rivers and coastal marshes in the Atlantic tropical zone. They are peaceful animals that need water of at least 20 C to live. Manatees live in brackish rivers, fresh or salt, but shallow, where vegetation can grow thanks to the sun that enters the water. This includes estuaries, rivers, lakes and bays, and lagoons. They live in virtually all aquatic ecosystems, and are able to adapt to saline environments as well as freshwater ecosystems. Populations living in brackish water ecosystems such as that of lagoons tend to be more sedentary, with less change in habitat type over time (Marsh et al. 2012).

The few researches that have taken place on the species in Ivory Coast, Gabon, Guinea-Bissau, Gambia, Senegal and Cameroon, and on the basis of knowledge on other manatee species, it is estimated that it would remain at maximum 10,000 manatees in all its range. It is estimated that a continuous population decline of at least 10% over a period of 90 years (3 generations) is plausible due to threats from anthropogenic origins which are constantly increasing, in particular poaching and fishing accidental, as well as habitat degradation.

The species has been listed since 1965 on the IUCN Red List, its primary status having been "Unknown". In 1986 it was reassessed "Vulnerable", and the 8 reassessments that have taken place since (the last in 2015) have always kept it in this category, for lack of more consistent data on its populations. The complex lagoon system of Côte d'Ivoire is recognized as an important settlement area for the species.



Geographical distribution *Trichechus senegalensis*. (Source IUCN Red List)

***Anonyx capensis* and/or *Hydrictis maculicollis* - IUCN Red List: Near Threatened (NT) - NOT CRITICAL**

family of *Mustelidae*

Otters belong to the mustelid family. These are mainly aquatic animals that are rarely found far from water. They can sometimes be seen in marine habitats, on or near rocky and / or rocky shores. They are particularly sensitive to good quality water with low pollution.

They also show a preference for forest habitats with a dense and closed canopy.

It is assessed as "Near Threatened" by the IUCN because, despite a relatively wide distribution area, the spaces still suitable for its development are increasingly scarce and limited. The main threats to these species are the loss and degradation of their habitat, pollution and degradation of aquatic ecosystems, as well as the introduction of invasive exotic species such as the water hyacinth and the perch. Nile. For all these reasons, a decrease of 20% of their populations is expected over the next 23 years (3 generations), justifying this classification.

The species is well known to local populations, and several people spontaneously revealed its presence during the field surveys carried out in May 2019. Presence which had been reported during the additional study on chimpanzees

Appendix 3 - Summary of certain species have been analyzed (criticality)

***Baphia bancoensis* (plant) - Not evaluable.**

This is the only plant endemic to the Ivory Coast which was identified in the study area. Given the lack of data on the range of this species, the criticality of the habitat can not be assessed, as was confirmed after consultation with expert botanists of Biosciences Faculty of University Félix Houphouët Boigny (Professor CY Adou Yao and Dr Koffi KAD)

***Scotopelia ussheri* (bird - Owl Ussher or rufous fishing owl) - Not Critical (VU)**

This species of bird has a range of less than 50 000 km². Previously assessed at risk with an estimate of the number of individuals in the order of 2500, the number of species was revalued upwards (between 2,500 and 15,000 individuals) and it went in "vulnerable" status. Its populations are small and its range is severely fragmented. She frequents riparian forests and mangroves. She is known small rivers swamp forests in the Tai National Park. It can survive in secondary forests near rivers. It's well located in primary forests, forest trimmings and also recruits on old cocoa plantations and bamboo.

She is known for less than a hundred sites: in Guinea (Forest Ziama), Sierra Leone (4 data next to the Gola Forest, small area next to the Mt Loma, and 4 to 6 sites in the forest Gola: Kwadi Mogbai and rivers), Liberia (quite present with recent data on Nagorno Dube, Zwedru, Grand Gadeh and Lofa Country), Ivory Coast (5 sites only: Lamto and 5 protected areas: Tai Azagny, Mt. Peko and Marahoué) and Ghana (known from several sites).

Although the number of locations is quite low for this species, given the low areas of forest in the study area in relation to the species' range, and the presence nearby National Park Azagny where the presence of the species has been reported by the teacher-researcher DB Ahon University Jean Lorognou Guede Daloa, DMU land can constitute a critical habitat for this species. Measures dedicated to forests (catering ...) could be favorable to him.

Note that other species present in the study area but not triggering critical habitat have also been analyzed, it is the following species:

- *Osteolaemus tetraspis* or Dwarf Crocodile (VU): This national park Azagny by an expert (Dr. M. Shirley of Tropical Conservation Institute of Florida International University and the Foundation 'Rare Species Conservatory') And probably on the study area, but not observed in the mission field in May 2019. In addition the species has a wide distribution in Africa.
- *Azelia africana* (VU): this plant has a wide distribution in Africa
- *Albizia ferruginea* (VU): this plant has a wide distribution in Africa

Appendix 4 - Mitigation, compensation and support for meeting the PS6

1.1 Choosing a power line with little risk of electrocution and collision

Code measure: Choosing a power line with little risk of electrocution

Type of measure: Avoidance

PURPOSE OF THE MEASURE

Critical habitats concerned: No

Species concerned:

- Bird whose r apaces and large wading birds and migratory species.
- *Cercopithecus lowei*

Impacts addressed by the measure: Risk of electrocution and collision

IMPLEMENTATION OF THE MEASURE

project phase for measure: Pre-construction

Measurement duration: During the exploitation period

Measure Description

- Choosing an online dual wire harness that is noticeable for birds and collision avoidance; development of type balls "flying" on guard cables
- Choice of pylons avoiding any risk of animal electrocution, including through grounding systems

Responsible for the implementation of the measure: Project team CIPREL 5

institutional or technical support: /

A guarantee the sustainability of the measurement:

If cable replacement, the features are the same as during the initial installation and will be visible to birds. Note that the transmission line will not be made, and therefore maintained by Atinkou but by the Ivorian government.

Objective: No Net Loss

MONITORING THE MEASURE

Methodologies for monitoring measures effectiveness indicators

It is recommended that the manager of the line carries a mortality monitoring of birds and primates during maintenance operations online

Indicators of efficiency measures and target

Number of birds (raptors, large wading birds...) and / or dead primates by collision or electrocution: 0 / year

Responsible for the implementation of the follow: maintenance operator of the line

ESTIMATED BUDGET

Details: No additional cost for the BAP: integrated technical choices in project design budget

EUR Cost: 0

1.2 Maintaining water quality

Code measure: Maintaining water quality

Type of measure: Avoidance

PURPOSE OF THE MEASURE

Critical habitats concerned:

No

Priority Ecosystem Services

Species concerned:

- otters *Aonyx capensis* and *Hydrictis maculicollis*
- *Crocodylus suchus* - Crocodile West Africa
- *Osteolaemus tetraspis* - Dwarf Crocodile
- Non-critical consituant fish fishery resources

Impacts addressed by the measure:

- degradation of fish habitat: accidental pollution, release of MES with degradation of spawning grounds including clogging
- Habitat degradation: accidental pollution, release of MY

IMPLEMENTATION OF THE MEASURE

project phase for measure: Construction on site

Measurement duration: For the duration of construction and operation

Measurement Description:

Minimize the risk of erosion especially anticipate the increased risk during the rainy season (especially in areas where the soil is not sandy):

- Pave the tracks, and if sprayed water runs regularly to prevent dust projection
- Provide a rainwater recovery network to prevent soil erosion and transport of MES
- Minimization of deforested areas and stripped the vegetation will be maintained to the maximum especially on sites where there is no need for excavation. If a simple enough land clearing, grazing the vegetation cover and root systems will be maintained. The use of tracked vehicles will be forbidden to perform land clearing in these areas.
- Adapting the design of embankments and disbursements as well as perennial phase than during temporary phases of construction.
- Adapt working methods adopted for all earthmoving and materials management

On the site areas where the soil is exposed, the contractor will implement erosion control measures based particularly on the 2 following:

- a drainage network site recovery of rainwater or runoff the following objectives:
- divert and channel the water to prevent an uncontrolled runoff of rainwater
- treat drainage water before discharge into the natural environment
- ecological engineering solutions (ground cover, planting, mulching ...) which will compete temporarily or permanently limit erosion sites.

Reduce intake of suspended solids and other pollutants into waterways by managing stormwater discharges, contractors must specify:

- The stormwater treatment measures including the description of the processing units (location, design facilities, capacity, type of treatment, quality control the output of the unit) and the expected results in terms of quality of releases the environment.
- The water treatment measures drained by underground work including description of the processing units (location, design facilities, capacity, type of treatment, quality control the output of the unit) and the expected results in terms of quality the release to the environment.
- The water treatment measures from washing concrete mixers and concrete plants including the description of the processing units (location, design facilities, capacity, type of treatment, quality control output of the unit) and results expected in terms of quality of discharge into the environment.
- Wastewater treatment measures from sanitation (toilets and showers/sinks) on construction sites and Permanently offres constructions including the description of the processing units (location, design facilities, capacity, type of treatment, quality control the output of the unit) and the desired results in terms of quality of the discharge into the environment.

Periodic measurements of the physicochemical properties of wastewater from the central cooling system in the lagoon will be conducted so as to assure that regulatory thresholds in the Guinean law are respected.

Responsible for the implementation of the measure: Atinkou and Entrepreneurs

institutional or technical support: /

A guarantee the sustainability of the measures: /

Objective: No Net Loss

Identification of constraints to implementation and other remarks:

treatment stations of domestic waste must be planned for both temporary and permanent structures

For these stations are proposed to incorporate both concentration criteria and benchmarks on the treatment efficiency. The criteria for rejection of effluents into the natural environment respect the Ivorian regulations.

MONITORING THE MEASURE

Methodologies for monitoring measures effectiveness indicators

Setting up a quality control system releases into the environment which will be based on regular analyzes of discharges themselves and water courses upstream and downstream of the discharge to measure if a significant impact of construction activities on the quality of these rivers. This system should detail:

- The location of points of release into the environment (GPS coordinates)
- The location of the points of water quality measurements
- For each measurement point or rejection, the water quality parameters analyzed and the analysis frequency
- For each parameter, the type of measurement and analysis (draw volume, analysis equipment used, calibration reference standard, instead of analysis)
- The laboratory facilities of water quality analysis required for the project including hardware list now onsite and competent staff to analyze and monitor the water quality.

Visual inspection of the traces of erosion and sediment runoff throughout the project influence area

Indicators of efficiency of measure and target

- Absence of impacts of environmental releases related to project activities in construction and operation phases of the quality of rivers and lagoon Ebrié
- No trace of erosion or sediment runoff

Responsible for the implementation of the monitoring: Atinkou

ESTIMATED BUDGET

Details: No additional cost for the PAB included in the project design

EUR Cost: 0

1.3 Schedule respectful clearing of land for species in question

Code measure: Schedule respectful clearing of land for species in question

Type of measure: Avoidance

PURPOSE of the MEASURE

Critical habitats concerned:

Yes. Media forest sheltering the *Phrynobatrachus sp.* and *Morerella cyanophthalma* especially swamp forests and seasonally flooded. Special attention for clearing related to the water pipe and passages over the shallows of the power line (priority areas)

Priority Ecosystem Services

Species concerned:

- *Phrynobatrachus sp.* - New species

of tailless

- *Morerella cyanophthalma*

- *Cercopithecus lowei* - Cercopithecus Lowe

- Fauna and avifauna uncritical forest

Impacts addressed by the measure:

- potential mortality subservient to amphibians rainforest by desiccation during clearing
- potential mortality of birds during clearing: forest area destroyed with nests or broods with young ...
- potential mammalian mortality during clearing: crushing gear, falling trees ...

IMPLEMENTATION OF THE MEASURE

Project Phase of the measure: Pre-construction Construction on site

Measurement duration: During preliminary clearing and subsequent

Measure description:

- Optimizing forest clearing schedule to reflect the breeding season of forest species cited above (priority *Phrynobatrachus sp.* and *Morerella cyanophthalma*) see main reproductive periods to be considered below .
- Conduct a preliminary field visit at any clearing to identify areas harboring potential tailless and / or group of monkeys
- Avoid clearing any forest area if it is not strictly necessary

Reproductive periods to consider:

- *Phrynobatrachus* sp. and *Morerella cyanophthalma*: Given the lack of information on these species the reproductive period is unknown. But it is felt that it could be done all year round with a preferential period of rainy season, as is the case in the majority of amphibians.
- *Cercopithecus lowei*: fertile mating is performed at the beginning (or middle) of the rainy season, and after approximately 6 months of gestation, females give birth between November and February (end of rainy season - early season dry). The young stay with their mother for a few months.

Responsible for the implementation of the measure: Contractor + Consultant for site supervision

institutional or technical support: Experts ecologist (herpetologist, primatologist and ornithologist) that carry out site investigations just before the clearing so as to ensure that no sensitive wildlife on areas to be cleared. In case of presence it will proceed either to the marking of the area if the requirement for the construction permit to avoid them, or translocation of these animal species (amphibians) or scaring them (primates, birds) to avoid their mortality by the work.

A guarantee the sustainability of the measures: /

Objective: No Net Loss

Identification of constraints to implementation and other remarks: /

MONITORING THE MEASURE

Methodologies for monitoring measures effectiveness indicators

- During clearing, dates (and location) are recorded after the operator and compared to the sensitivity clearing periods

Indicators of efficiency measures and target

- Timespan preliminary clearing 100% made advocated period

Responsible for the implementation of the follow: ATINKOU, contractor + Consultant monitoring site

ESTIMATED BUDGET

Details: No additional cost for the BAP as this strain does not cause a delay of other work

EUR Cost: 0

1.4 reasoned clearing

Code measure: reasoned clearing

Type of measure: Reduction

PURPOSE OF THE MEASURE

This measure is a measure of general framework, to warn about the need to organize the clearing in a reasoned way. More detailed measures specifying:

- *management clearings related to social influx*
- *selective clearing for maintaining species issues*

Critical habitats concerned: Yes.

- Low lands and marshy forest environments and temporarily flooded housing amphibians *Phrynobatrachus* sp. and *Morerella cyanophthalma*, and the monkey Low e.
- Aquatic environments (non-critical habitat)

Priority Ecosystem Services

Species concerned:

- *Phrynobatrachus* sp.
- *Morerella cyanophthalma*
- *Cercopithecus lowei*
- protected flora species
- All other species of fauna and avifauna forest

Impacts treated by measuring

- Reduction and habitat fragmentation
- potential mortality of animals during clearing: crushing gear, falling trees ...
- potential mortality of birds during clearing: Cutting of trees with nests with young ...
- Degradation of fish habitat: release of MES with degradation of spawning grounds including clogging
- potential destruction of plants
- Reduced capacity (ecosystem services) supply: crops, wild food, biochemicals, natural medicines, pharmaceuticals, wood and other wood fiber
- Changing the water regulation capacity by soils

IMPLEMENTATION OF THE MEASURE

project phase of measure: Construction on site

Measurement duration: During clearing

Description of measure:

- Limiting the impact of land clearing by implementing low-impact logging techniques (EFI <http://www.itto.int/fr/feature15>). As called The International Tropical Timber Organization (ITTO), timber harvesting operations will be the subject of intensive planning and careful monitoring to reduce the surfaces to clear the minimum essential needs of the site.
- material extraction zone - Career: clearing only the strictly necessary surface mining, driving gear and deposits of materials, and extend only time it became necessary
- High Voltage Line: minimization of non sylvandi area with a 50 m RoW which will be released by the contractor for the line corridor. Only trees over 3 m high in the line corridor and those who are likely to fall on drivers will selectively culled (limited risk because of land use of the planned area for the line cultures, wasteland and plantations)
- Tagging and strictly control the uncleared areas on the area for 4 years to prevent / limit excessive drift and clearing

For any kind of clears:

- Provide sequential cleared with regular stops to allow wildlife to flee.
- Orient the cleared areas degraded to natural areas that will be retained to guide the flight of wildlife refuges and to avoid rambling.
- Prohibit hunting on site and implement the ban
- Implementation by companies of "deforestation Management Plan" which will provide detailed at least:
 - o the areas markup system and marking wood to be cut,
 - o control of extraction machines and transporting timber,
 - o the quotas set by subcontractors stakeholders to deforestation,
 - o monitoring implementation to control this deforestation management plan.

Responsible for the implementation of the measure: Atinkou and entrepreneurs

institutional or technical support: /

A guarantee the sustainability of the measures: /

Objective: No Net Loss

Identification of constraints to implementation and other remarks: /

MONITORING THE MEASURE

Methodologies for monitoring measures effectiveness indicators

- Deforestation management plan (planning)
- Audit of daily ground clearance phase to verify that the implementation is consistent with the Plan

Indicators of efficiency measures and target

- Deforestation Management Plan is consistent with the practices of the ITTO, it minimizes the maximum the impacts of land clearing on natural habitats
- 100% of the measures in the Plan are faithfully implemented

Responsible for the implementation of the follow: Atinkou

ESTIMATED BUDGET

Details: No additional cost for BAP: included in the delivery of business

EUR Cost: 0

1.5 Management clearings related to social influx

Code measure: Management clearings related to social influx

Type of measure: Reduction

IT MEASURES

Critical habitats concerned

Yes, the slums and forest areas housing the *Phrynobatrachus* sp. and *Morerella cyanophthalma* particularly swamp forests and seasonally flooded. Priority Ecosystem Services

species concerned

- *Phrynobatrachus* sp.
- *Morerella cyanophthalma*
- *Cercopithecus lowei*
- All other terrestrial species and birdlife

Impacts treated by measuring

- Reduction and degradation of terrestrial habitats
- potential mortality of animals during clearing: crushing gear, falling trees ...
- potential mortality of birds during clearing: Cutting of trees with nests with young ...
- fish habitat degradation: release of material in suspension (MES) on degradation of spawning, including clogging
- potential destruction of plants
- Decreased supply capacities: crops, wild food, biochemicals, natural medicines, pharmaceuticals, wood and other wood fiber
- Changing the capacity of soils to regulate water

IMPLEMENTATION OF THE MEASURE

project phase measurement: Construction on site

Measuring time: During preliminary clearing and subsequent

Description measurement

- Limit clearing related to the influx of people (charcoal needs and agriculture):

- o promoting local hiring and discouraging workers bring their

- o allowing local value logging residues (branches) residues

- cutting (branches) whose diameter is greater than 10 cm will be sterc (in pieces 1m long). They will be available for free to the local population on the storage areas near the villages or next spontaneous concentration areas

Responsible for the implementation of the measure: Atinkou and contracted companies

institutional or technical support: /

A guarantee the sustainability of the measures:/

Objective: No Net Loss

Identification of constraints to implementation and other remarks

Despite the ban to come with their families and social influx will occur: Families ignoring the ban, traders attracted by the potential of workers consumption ...

MONITORING THE EXTENT

Methodologies for monitoring measures effectiveness indicators

- Audit of workers as to where and with whom they live, turn-around time on website
- Auditing the end of the activities of clearing and storage of plant residues sites

Indicators of efficiency measures and target

- 80% of workers have not brought their families
- 100% plant clearings residues are effectively recovered

Responsible for the implementation of the follow: Atinkou and contracted business

ESTIMATED BUDGET

Details: No additional cost for the BAP: included in the delivery of business

EUR Cost:0

1.6 selective clearing for maintaining species issues

Code measure: selective clearing for maintaining species issues

Type of measure: Reduction

PURPOSE OF MEASURES

Critical habitats concerned:

No

Priority Ecosystem Services

species concerned

- *Baphia bancoensis*
- *Nauclea diderrichii* (VU)
- *Milicia regia* (VU)
- Other plant species conservation issues
- Species noncritical forest birds

Impacts treated by measure

- Reduction and habitat degradation
- Reduction of food resources for birds
- Reducing the number of necessary high trees for nesting
- Popper plants to conservation issues (*Baphia bancoensis*, *Nauclea diderrichii* *Milicia regia* ...)

IMPLEMENTATION OF THE MEASURE

project phase of measure: Construction on site

Measure duration: During clearing

Description of measure

- On sections where this is compatible with the site (eg. Excluding areas where the soil will be raised, access areas ...), in particular for access roads to the towers, involve an ecologist and botanist to make physical marking and take GPS coordinates of sectors or species:
 - o *Baphia bancoensis* and any other plant species issues / potential uses
 - o Some large evergreen trees for nesting
 - o Fruit species for food forest bird species (non-critical)
 - o Large trees can serve as semancers for rehabilitation post-project
 - o Trees can provide shade to the site
 - o Great vulnerable and popular trees for construction *Milicia regia*, *Nauclea diderrichii*
- Sectors in favor of keeping these species or identified trees will be preserved throughout the site.
- Species favorable to forest trees will be maintained up rookie

- Manage topsoil for reuse and ensure soil fertility at the end site: stripping differentiated plant / inert land suitable storage to maintain the biological functioning (bund <2m to maintain the biological functioning of the soil, outside areas of water accumulation)

Responsible for the implementation of the measure: Atinkou and Environment Consultants

institutional or technical support: /

A guarantee the sustainability of the measures: /

Objective: No Net Loss

Identification of constraints to implementation and other remarks: retention areas and trees must be compatible with the planned operations on site.

MONITORING THE MEASURE

Methodologies for monitoring measures effectiveness indicators

- During annual tours, a botanist going to count the number of labeled trees that have been preserved.

Indicators of efficiency measures and target

- Number of hectares surveyed 110 ha (work areas)
- Number of labeled trees and preserved: an average of 2 plants / ha or 220 in the case 110 ha to go (to be confirmed depending on the density of trees)
- Number of marked plants and destroyed: 0

Responsible for the implementation of the follow: Atinkou and entrepreneurs

ESTIMATED BUDGET

Details: Passages ecologist and botanist to plant identification to preserve:

- travel costs: 50 euros / car / day x 9d: 450 euros
- locating and marking: 10 jours.hommes = 2000 euros
- restitution (2 days): 2 x 200 euros = 400 euros
- miscellaneous costs 300 euros

EUR Cost: 3500 Or 3150 euros in the case of 110 ha to go

1.7 Monitoring concerning species with conservation issues potentially present

Code measure: Mitigation of construction impacts on wildlife

Type of measure: Reduction

PURPOSE OF MEASURE

Critical habitats concerned:

Yes (potential if the presence of sub-species cited confirmed)

species concerned

- *Scotopelia ussheri* (VU)
- *Forest hinge-back tortoise* (EN) and *Kinixys homeana* (CR)
- *Kassina arboricola* (VU) *Phrynobatrachus ghanensis* (NT) *Hyperolius viridigulosus* (NT)

Impacts treated by measure

- Disruption and potential mortality to wildlife

IMPLEMENTATION OF THE MEASURE

project phase of measure: Pre-Construction and Construction

Measure duration: During site preparation and construction phase

Description of measure:

Before the adequacy of certain forest habitat for species of reptiles birds and amphibians potentially present in the Project area, and their ranges known as well as information gathered from villagers about their presence, it is recommended to project they are subject to a standby should they be discovered during construction of the plant and the power line.

Monitoring recommended for these species potentially present conservation issues should be conducted by experts from each group (birds, reptiles and amphibians) during the site preparation and before the clearing (especially concerning the power line).

- If they were discovered in the pre-construction and that the constraints of the progress of construction permitted, it should achieve an appropriate markup around their nesting / life to preserve their habitat of impact.
- If the constraints of the construction permit does not apply the measures described below
- Upon discovery of these species during the construction phase, measures scaring will be in place by the ornithological expert *Scotopelia ussheri*, and removal / relocation for the 5 species of amphibians and reptiles (by the expert herpéthologue).

Responsible for the implementation of the measure: Atinkou

institutional or technical support: Consultants environmental experts in ornithology and herpetology

A guarantee the sustainability of the measures: /

Objective: net gain

Identification of constraints to implementation and other remarks: The findings of these species the earliest possible stage of the construction phase will determine the success of mitigation of impacts

MONITORING THE MEASURE

Methodologies for monitoring measures effectiveness indicators

- In pre-build the expert ornithologist and herpéthologue prospect so extensive work zone

Indicators of efficiency measures and target

- 100% of the area recognized work, day and night for several weeks before the work begins. Number of hectares surveyed 110 ha (work areas)
- 100% of the marked areas (containing the target species of measurement) are preserved in phase site and beyond
- No loss of sensitive wildlife regrettable

Responsible for the implementation of the follow: Atinkou and entrepreneurs

ESTIMATED BUDGET

Details: Ten passages for each expert (herpéthologue and ornithologue) to identify potential sites for the presence of this sensitive fauna:

- travel costs: 50 euros / car / dx (10 days + 10 nights): 1000 euros
- recognition and marking potential: 20 jours.hommes = 4000 Euros
- return (1 day): 1 * 2 * 200 euros = 400 euros
- ornithologist presence on site clearance phase: 5 jours.hommes = 1000 euros
- miscellaneous costs 300 euros

Cost EUR: 6700

Or 6700 euros in the case of 110 ha to go

1.8 Prevention and management of invasive terrestrial flora management

Code measure: Prevention and management of invasive terrestrial flora management

Type of measure: Reduction

PURPOSE OF THE MEASURE

Critical habitats concerned: No

Species concerned: All invasive alien terrestrial plants

Impacts addressed by the measure:

The exposure of phases of soil, land clearing, soil and fire stripping favor the installation and the spread of invasive plant species. The transmission and the transfer material, machinery and vehicle can lead to the spread of invasive species.

IMPLEMENTATION OF THE MEASURE

project phase of measure: Construction on site

Measure duration: Throughout the construction period

Description measurement

- Invasive alien species (IAS) are the second cause of erosion of global biodiversity after habitat destruction. The likelihood of invasion by EEE is highest in habitats that are altered and disrupted, for example, after clearing. The EEA have the following characteristics:
 - o Rapid growth;
 - o rapid reproduction;
 - o high dispersion capacity;
 - o Tolerance of a wide range of environmental conditions;
 - o Ability to live a wide range of media types and operate a wide diversity of resources; and
 - o Association with human activities.
- Measures to prevent accidental introductions of invasive species are required as part of the implementation of PS6. The following requirements must be met:
 - o No EEA introductory proven even if consistent with the existing regulatory framework;
 - o The introduction of exotic species is subject to a risk assessment invasion;
 - o Implementation of measures to prevent the introduction or spread accidental of exotic species (see below); and
 - o Consider the measures implemented to eradicate EEA habitat Natural Atinkou on which exercises management control.
- More detailed guidance on the prevention and management of IAS were published. All strategic frameworks related to this issue highlight the fact that priority should be given to prevention.

- Preventive measures, control and monitoring will be implemented in the following aspects of the project:
 - o The introduction and use of exotic species will be subject to an assessment of risks: indeed, many species commonly used for soil stabilization or agro-ecology are also known for their invasiveness. The use of native species should be encouraged and risk assessment must be made before any introduction of exotic species.
 - o Minimize travel gear and materials and distance (Propagation vectors).
 - o Contain all invasive alien species identified following features and capabilities releases of species.
 - o Minimize disruption or displacement of soil and vegetation.
 - o Prevent soil erosion.
 - o Make sure the soil / other imported materials are safe and free of EEE (source from a reputable supplier, request information on the origin of the soil and free status certification AIS if possible).
 - o Prevent the establishment of EEE on stock soil extracts (do not store materials near known sources of EEA).
 - o Retain as much natural vegetation as possible.
 - o Educate maintenance teams to the identification of EEE present and those could potentially install (plug, training ...).

Responsible for the implementation of the measure: Atinkou

institutional or technical support: Experts who made the initial inventories

A guarantee the sustainability of the measures: /

Objective: No Net Loss

Identification of constraints to implementation and other remarks: /

MONITORING THE MEASURE

Methodologies for monitoring measures effectiveness indicators

- During maintenance operations on the site, estimated recovery by invasive plants.

Indicators of efficiency measures and target

- Less than 5% of the site invaded by the EEA

Responsible for the implementation of the follow: Atinkou contractors and contracted

ESTIMATED BUDGET

Details: No additional cost for the BAP: included in the delivery of business

EUR Cost: 0

1.9 Support for the National Park Conservation Azagny and flooded forests

Code measure: Support to the National Park Azagny

Type of measure: Compensation

PURPOSE OF THE MEASURE

Critical habitats concerned: Yes

species concerned

- *Phrynobatrachus* sp. ?
- *Morerella cyanophthalma*
- *Crocodylus suchus* - West African Crocodile
- *Osteolaemus tetraspis* - Dwarf Crocodile
- *Cercopithecus lowei*
- otters *Aonyx capensis* and *Hydrictis maculicollis*
- *Scotopelia ussheri* - The owl fisher redhead
- *Trichechus senegalensis* - The African manatee
- All other terrestrial species (birds and amphibians noncritical mammals)
- All plant species conservation issues

Impacts addressed by the measure: Habitat Reduction

IMPLEMENTATION OF THE MEASURE

project phase of the measure: Off-site construction

Measure duration: During the exploitation period

Description measurement

- Signing a partnership agreement with OIPR (Ivorian Parks and Reserves) indicating its content and its terms.
- On the basis of the Park Management Plan Azagny, identify the most relevant restoration and conservation measures for endemic amphibians Ivorian coast
- annual payments of € 5,000 (net of taxes) to OIPR from Atinkou or a trusted third party such as a Trust or FPRCI
- possible signing of a partnership agreement with a trustee or FPRCI to secure funding dedicated to the measurement throughout the operating life

The concrete compensation measures that will be implemented are of 2 types:

- General measures promoting good practices to reduce human ENVIRONMENTAL grip on all natural habitats and forest park. Fight against deforestation, reduction in global human footprint in the Park (possibly eviction of people cultivating in the PN; chatting with OIPR) and incentive to settle outside the Park (improved means livelihoods of local communities, eg with support livestock animal or agricultural programs programs to increase production yields so as to limit the need for arable land). Awareness programs in the local community environment will be implemented to this end there.

- Measures specifically targeting research and conservation of raffia, swamp forests and seasonally flooded inside the Park. ecological monitoring missions throughout the course will be set up in order to better know these habitats and their fauna, and thus be better able to protect them. Performance indicators regarding the quality and the surface of these habitats will be set up to monitor these types of habitats in the park. At the same time not conducted regular patrols monitoring the park officials will be established in these areas and ensure the application of the law. Their objective will be to progressively reduce hunting, fishing, gathering, harvesting, exploitation of timber and non-timber products they are subject to progressively increase their quality level to ensure the net gain expected. The raffia are mostly found in the north central part of the park while flooded forests and flooded temporarily are more common in the north and southwest.
- Compensation could also go through material support to OIPR enabling it to specifically focus its research, conservation and law enforcement to the affected areas as Atinkou Project (raffia, swamp forests and seasonally flooded which represent the majority types of habitats within the National Park Azagny). This should be discussed with officials OIPR but buying a boat or outboard motor, ground equipment adapted to the swamp forest habitats may be necessary.

Note that OIPR updated and updated its strategy and operating performances of riparian measures dedicated to reconciling conservation of protected areas and socioeconomic development of its bordering protected areas.

Responsible for the implementation of the measure: Atinkou PN Azagny and OIPR, FPRCI

institutional or technical support: Support the actions of restoration and conservation of flooded forests and raffia park.

A guarantee the sustainability of the measures: In addition to annual payments from Atinkou, the use of a trusted third party would ensure the parties involved-the sustainability of financing the measure throughout the period of operation of the central Atinkou: escrow account or letter of commitment from a bank, payment of an allocation to the FPRCI an amount to be agreed, etc.

Objective: net gain

Identification of constraints to implementation and other remarks: /

MONITORING THE MEASURE

Methodologies for monitoring measures effectiveness indicators

- Signing of partnership agreements (*Memorandum of Understanding*)
- Signing of a financing agreement
- Annual audit of the program provided in the Partnership Agreement

Indicators of efficiency measures and target

- Reporting conservation activities of the flooded forests of the park

Responsible for the implementation of monitoring

- OIPR (National Park Azagny). External support structures

ESTIMATED BUDGET

Details:

Estimated cost in Euros: 5000 € per year during the operating life of the plant (20 years); the minimum duration of this commitment is the duration of the exploitation concession.

1.10 Support for Herpetological research: description of the species *Phrynobatrachus sp.* and knowledge of *Morerella cyanophthalma*

Code measure: Research Program for *Phrynobatrachus sp.*

Type of measure: accompaniment

PURPOSE OF MEASURE

Critical habitats concerned: Yes, terrestrial habitats

Species concerned:

- *Phrynobatrachus sp.*
- *Morerella cyanophthalma*
- All species of amphibians

Impacts addressed by the measure: Conversion of terrestrial and aquatic habitats

IMPLEMENTATION OF THE MEASURE

project phase of measure: exploitation

Measure duration: For 10 years after the project start

Description measurement

- Describing formally the new species *Phrynobatrachus sp.* (scientific publication)
- Check for *Phrynobatrachus sp.* in the National Park Azagny by implementing a program of research and monitoring. If the species is not found in Azagny research efforts (and conservation) should focus on the Project area where its presence has been detected in the complementary prospections.
- Realize herpetological surveys on Ivorian coast to better understand the distribution and ecology of *Morerella cyanophthalma* (among other species) and put the inventory data available to the scientific community (database GBIF)

Responsible for the implementation of the measure: Atinkou and Universities partners

institutional or technical support:

- University Nangui Abrogoua, Environment Laboratory and Aquatic Biology.
- University Jean Lorognou Daloa

A guarantee the sustainability of the measures: /

Outcome: /

Identification of constraints to implementation and other remarks: Impacts will be put into perspective with the monitoring of impacts on habitat and known herpetological stands and updated classified forest Audouin.

MONITORING THE EXTENT

Terms monitoring measures effectiveness indicators: /

Indicators of efficiency measures and targets: /

Responsible for the implementation of the follow: University Jean Lorognou Daloa

ESTIMATED BUDGET

Details: visit 10 sites, for a unit cost of 3000 €

EUR Cost: 30000

1.11 Assistance for project management

Code measure: Assistance for project management

Type of measure: accompaniment

PURPOSE OF MEASURE

Critical habitats concerned: Yes, terrestrial habitats

Species concerned: /

Impacts addressed by the measure: /

IMPLEMENTATION OF THE MEASURE

project phase of measure: Off-site construction and operation

Measure duration: Upon construction, and for the first 5 years of operation

Description of measure:

Accompany ATINKOU and its partners in starting the implementation of the BAP and conduct an audit of progress on the horizon 3-5 years after the project launch

Responsible for the implementation of the measure: Atinkou and a specialized service

institutional or technical support: specialized service

A guarantee the sustainability of the measures: /

Outcome: /

Identification of constraints to implementation and other remarks:

The implementation of the BAP requires support to formulate the content of agreements and contracts with external providers (compensatory measures, in particular) and to better promote synergies between measures.

MONITORING THE EXTENT

Terms monitoring measures effectiveness indicators: /

Indicators of efficiency measures and targets: compensatory measures in the BAP are implemented with respect to the expected timing

Responsible for the implementation of the follow: provider specializing

ESTIMATED BUDGET

Details:

- Identification of providers and preparation of contracts and agreements (construction phase): 5000 €
- Accompanying the launch of the implementation of the offset program: 10,000 €
- Audit of progress on the horizon 3-5 years: 5000 €

EUR Cost: 20,000 €

Appendix 5 - Meetings ATINKOU - OIPR

REMINDER

Draft power plant construction and energy ATINKOU drainage system

compensatory measures related to the reduction of habitat

Abidjan, September 10, 2019

1. A meeting was held Tuesday, September 10, 2019 from 9:00 to 9:30 in Abidjan, in the offices of the OIPR (Ivorian Parks and Reserves), as part of the construction of the power plant and ATINKOU network evacuation of the energy produced.

2. The implantation site of the plant is located in an area whose ecosystems are close to those of the national park Azagny. There are shallow swamps remaining swamp forests and seasonally flooded in relatively good condition. The discharge line from the site Taboth also crosses some bafonds.

In addition to the ESIA, an additional study on natural habitats was conducted by the firm Biotope accordance with IFC standards, which finances the project.

3. Present at the meeting: To OIPR,

o Colonel Hillihase BAKAYOKO

o Lieutenant Colonel Azani DEDE

For CIPREL,

o Mohamed Traore, Project Coordinator.

4. The agenda of the meeting was:

- Project Presentation and countervailing measures;
- Notice OIPR on measures and proposals
- Various.

Presentation of the project and measures

5. In response to the growing electricity needs of Côte d'Ivoire, ERANOVE company, operator of the power plant in the industrial area CIPREL Vridi, provides for an extension of its production capacity of electricity to the means of a new plant Atinkou named an installed capacity of 390 MW. It will be located near the village of Taboth Prefecture Jacqueline. Fifteen kilometers of power line will be built towards the east to connect the power line Azito - Akoupé to build.

6. The main proposed compensatory measures are:

- Financial support of 5,000 € per year Assagny National Park, for the conservation of coastal rainforest environments. As many protected areas, the park currently lacks means to fully carry out its missions.

- Support for the improvement of knowledge about the distribution and ecology of amphibians Ivorian coast, especially *Morella cyanophthalma* and *Phrynobatrachus* sp. he will make the description.

Notice OIPR on measures and proposals

7. OIPR asked whether the impacted communities by the project were taken into account. CIPREL replied that the ESIA covers both environmental impacts that social impacts. ESMP and RAP will be deployed as part of this project.

CIPREL states that the ESIA of the plant has already been validated by ANDE and that the line is in progress.

8. Concerning the countervailing measures, OIPR agrees with the proposed principle is common practice already applied to several projects. However, before OIPR takes a final decision on the issue, the draft documents to be submitted to him for more information.

9. Also OIPR he noted that the although insufficient financial support could strengthen environmental monitoring missions (dynamics of animal populations) of the species living in the park Azagny of habitats and monitoring habitat (secure site). CIPREL responded that the project does not directly impact the park and that this support is reasonable, but said that the compensatory measures referred from the findings of the ESIA. OIPR has indicated in response that the park will be impacted because the destruction of the targeted ecosystems will further enhance the biogeographic isolation of this heritage and increasing population pressure on resources that this park will be the only site to house the raffia and other plants collected in the area to be stripped.

10. OIPR CIPREL informed that for some projects, accompanying measures in terms of working hardware equipment have been negotiated with the developer.

CIPREL said it would be difficult to consider other measures beyond those mentioned. However, CIPREL remains open to proposals OIPR.

Various

OIPR wants to involve the general direction in trade and to this effect another meeting at a date to be mutually agreed.

NB: *This present document is only a debriefing*



Direction Générale

N/Réf.: DG/XHO/dfa/028-19

Abidjan, le 12 Novembre 2019

**A l'attention de Monsieur
TONDOSSAMA Adama
Directeur Général de l'OIPR**

ABIDJAN

Objet : Mesures compensatoires liées à la réduction de l'habitat

Monsieur le Directeur,

Dans le cadre de l'instruction du projet Ciprel V et de la gestion de l'affaire citée en objet, vous avez bien voulu nous accorder une séance de travail avec vos équipes compétentes, et nous vous en remercions.

En effet, après la rencontre avec vos équipes le 10 septembre dernier, cette deuxième rencontre avait pour objectif de définir les modalités de mise en œuvre des mesures compensatoires définies dans l'étude d'habitat critique que nous vous avons transmise.

Nous vous prions de bien vouloir trouver ci-après les conclusions de nos échanges :

- L'OIPR va proposer un plan d'action déclinant les propositions identifiées dans l'étude BAP transmise.
- Le plan d'action sera validé par ATINKOU.
- Ce plan d'action sera intégré dans une convention à soumettre par L'OIPR. Cette convention est destinée à définir le cadre des relations entre l'OIPR et Atinkou au regard des compensations, du suivi de la mise en œuvre du plan d'action et du contrôle des effets attendus.
- L'OIPR propose la mise en place d'un comité de suivi composé des deux parties. Ce comité aura pour mission le suivi de la mise en œuvre du plan d'action et de l'évaluation des effets de celui-ci. Ce comité sera l'interlocuteur des organismes d'évaluation internationaux qui interviendront périodiquement.

En attendant la mise à disposition des documents et les prochaines rencontres, veuillez agréer, Monsieur le Directeur, l'assurance de mes dévoués sentiments.

Le Directeur de Projet

Xavier HORROT



ATINKOU SA

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S.A. au capital de 10.000.000 FCFA, RCCM : CI-ABJ-2017-B-19383, CC 1734420 T

Appendix 6 - Convention - Cooperation Framework between CIPREL and OIPR



COOPERATION FRAMEWORK AGREEMENT

Between,

The Ivorian Parks and Reserves (OIPR) - 06 BP 426 Abidjan 06 - Tel: (225) 22 41 40 59 - Fax: (225) 22 41 37 69 -
E-mail: info@oipr.ci represented by Colonel TONDOSAMA Adama, as CEO, vested with sufficient powers and functions and necessary

Hereinafter referred to as "OIPR".

Firstly

And

ATINKOU Society Eranove group, resident in Abidjan-XXXXXXX, represented by its **General manager**, Mr.

Hereinafter "ATINKOU".

On the other hand

Preamble

Considering that OIPR is a Public Establishment type Nation established by Decree No. 2002-359 of 24 July 2002 establishing the organization and functioning of the Ivorian Office of Parks and Reserves (OIPR) that his client is to sustainable management of Parks and Natural Reserves ivory coast, home to the country's biodiversity and its functions are:

- The management of wildlife and flora, and their biotope that is the basis;
- The management of land assets which represents the basis of the fauna, flora and water bodies;
- The exercise of administrative and judicial police according to law No. 2002-102 of 11 February 2002, below mentioned in Article 3;
- The implementation of a sustainable management policy by promoting activities legally permitted based on the legal nature of the park or reserve considered and its peripheral area;

- If necessary, coordination or undertaking studies necessary to create) the expansion or development of a park, a reserve or its peripheral area;
- Information, education and communication.

Provided that ATINKOU created..... whose mission is electricity generation plants construction and operation of these.

As part of the construction of the thermal power Taboth, project called CIPREL 5 Atinkou realized the legal environmental impact studies and critical habitats related studies requested by the lenders of the project and the recommendations of IFC and ADB.

Studies conducted by the international firm BIOTOPE led to formulate recommendations for funding of an estimated action plan to hundred thousand euros over 20 years to compensate for environmental impacts. The report also recommends that the OIPR be responsible for the implementation of this action plan (see report 20191218_CIPREL-CHA BAP_V11_Biotope).

This funding - sized next to the impacted area to Taboth ATINKOU by the project will be used to specifically compensate for residual impacts on habitats supporting critical species (that is to say, the raffia palm groves, swamps and temporarily flooded forests and their attendant amphibians), while from meeting the expectations and Park Azagny management needs. It comes superadded to the existing budget of the park, and will replace any. Based on preliminary discussions that took place between ATINKOU and OIPR in September and November 2019, this agreement sets the framework for cooperation between the two parties and proposes an action plan with clear definition of compensatory measures, the modalities of their implementation and monitoring.

The compensation strategy proposed to treat residual impacts of the project is based on two key measures:

1. Support for the National Park Conservation Azagny swamp forests,

temporarily flooded and raffia. It is compensation for "avoided losses" that will better protect refuge areas favorable to forest species

amphibian triggering critical habitat, while adhering to the expectations of the park in management.

o Strengthening surveillance and protection

Protect all forest habitats from deforestation, thereby reducing the human footprint within the park. Currently monitoring operations conducted by park staff will be strengthened to make them more effective. Patrols contact the most affected areas by human activities as well as those that are usually little or no visited, they will be more frequent and unpredictable. They will particularly intend application of the law, and possibly the eviction of people conducting illegal activities within the park boundaries (to be discussed with the OIPR).

Patrols will be specifically organized in critical habitats to gradually decrease the hunting, fishing, gathering, harvesting, exploitation of timber and non-timber products in them, and gradually increase their level of quality to ensure the net gain expected.

o Change Communication environmental practices and support community projects along the lines of conservation

Information programs - education - communication for behavior change local communities inhabiting 11 villages Azagny park peripheral zone will be implemented. They will take place successively in each of the villages and will aim to strengthen the adhesion of villagers in conservation and environmental protection efforts, in general, and particularly that of the park. Moreover, OIPR promote the emergence, and provide financial support and / or equipment, community projects along the lines of the conservation of natural habitats and wildlife, agricultural programs that aim to increase production yields to limit the need for arable land, agroforestry, gardening,

o Support for the management of the park

Compensation could also go through material support that would allow OIPR specifically direct its research, conservation and law enforcement to the affected areas as a Project Atinkou (acquisition of mobility and equipment patrolling adapted to flooded areas).

2. Support for research and Herpetological Conservation, ecological monitoring of populations amphibian Ivorian coast

This measure is interested in procession amphibians marshy forest, temporarily flooded and raffia Park Azagny and the project area. More specifically it is to improve the state of knowledge concerning the kind of restricted distribution *Morerella*

cyanophthalma s, and the presence in the new species for science park
Phrynobatrachus sp and make its description. Population dynamics will be studied over the duration of the action plan. The development of this measure will be on a separate budget line to support the park, and OIPR provide support to field missions to be conducted by a trained herpetologist. Better know will better protect these ecosystems / sensitive species.

Performance indicators will be established to monitor the area and condition of forest types affected over time, and so to adapt in real time based on the results expected compensation measures to improve their implementation.

OIPR and ATINKOU jointly called the "Parties" have come together and agree as follows:

Article 1st: of prior exposure value

The above preamble to the same legal value as the present Convention forms an integral part.

Article 2:

This Protocol aims to define the scope of cooperation between ATINKOU and OIPR in the Project CIPREL 5 thermal power plant to combined cycle Atinkou for the implementation of the strategy and compensation 'no net loss of biodiversity, namely the support to the management of the national park Azagny pursuant to Article 4 below.

Article 3: Scope

This protocol applies to Assagny National Park and its peripheral area as provided for in Article 16 of Law No. 2002-102 of February 11 on the establishment, management and funding of national parks nature reserves.

The park's peripheral zone comprises the territories of the eleven (11) centers village sub - prefectures of Atoutou to Toukouzou and Grand Lahou.

Article 4: Areas of Cooperation

The framework agreement covers the following areas of cooperation:

- operational capacity building for monitoring and anti-poaching the Assagny National Park;
- acquisition hardware equipment monitoring and biomonitoring;
- specific monitoring of conservation targets;
- operations support monitoring and biomonitoring;
- support for research on amphibians National Park Azagny;
- support for local development of the park's surrounding communities;
- support and awareness program of environmental education for residents of the park

Article 6: Commitments parts

6.1 Commitment ATINKOU

ATINKOU agrees to provide assistance before and during the operation of the Central Thermal Atinkou to combined cycle:

- financing activities for the conservation of Assagny National Park (monitoring, ecological monitoring, awareness, riparian measures);
- participate in conservation activities by the periphery;
- make available its expertise whenever possible to support OIPR in connection with the performance of its missions;
- with OIPR ensure monitoring and evaluation of actions and development projects initiated in the framework of this Convention;
- make available to OIPR all equipment as defined in the budget appended to the action plan.

6.2 Commitments OIPR

OIPR agrees:

- Driving fully implementing activities aimed at ensuring the conservation of the park and the preservation of habitats for the perpetuation of the species and endangered flora and fauna in the project implementation area;
- Make available to ATINKOU, in due time, all documents and information relating directly to the park and protect its biodiversity related to endangered species in the project implementation area;
- Strictly enforce the activities monitoring and evaluation mechanism;
- participate in any activity ATINKOU have a direct or indirect impact on the park;
- associate in possible ATINKOU its activities for which skills are proven;
- make available to the skills available ATINKOU OIPR conservation of biological diversity;

6.3 common Commitments

ATINKOU and OIPR undertake towards each other as part of their partnership:

- make available their human, financial and institutional capacity for achieving the objectives of this framework agreement of cooperation;
- achieve together or separately, all actions that can contribute to the proper implementation of this framework agreement of cooperation, within their respective areas of competence;
- at the service of the partnership, their expertise and human, material and financial resources;
- establishing and maintaining a framework of permanent exchange and consultation by setting up a group of Labor (GT);
- make available any of the other documentation and information requested in the implementation of this Convention.

Article 7: Action Plan

An action plan in ten (10) years of implementation of the agreement will be drafted and adopted by both parties.

This action plan will be part of this agreement and will be enforced by the parties which shall agree entire annual program of activities to achieve and ensure information and training their staff on their activities in the said program activities.

Article 8: Coordination of the framework convention

For the coordination, monitoring and evaluation of learning and preparation of actions in the framework of this agreement, the GT is especially responsible for:

- validate the project's action plan of this agreement and its budget before submission to the parties;
 - develop plans of action and subsequent successive and submit to the parties for validations and
 - monitor and evaluate the implementation of the action plan.

The WG meets once every six months or as needed, in the premises of ATINKOU or OIPR. The institution in which the meeting is held in the GT the chair.

Upon execution of this Agreement, each Party shall designate by letter duly addressed to the other, the name of its focal point in the WG.

Article 9: Monitoring and Evaluation

Once a year, and ATINKOU OIPR will meet to assess the implementation of this Convention and shall bring appropriate the necessary improvements. The organization of this meeting is the responsibility of ATINKOU.

Article 10: Procedure for the implementation of activities

The parties undertake to carry out their budgetary commitments and their respective management procedures.

Article 11: Amendments

Any modification of one or more provisions of this Agreement must be subject to a writing signed by both parties and having value endorsement.

Article 12: Termination

This Agreement may be terminated at any time by either party. The party takes the initiative of the information must inform the other party by letter, three (3) months before the termination date. However, this cancellation does not challenge any activities and execution of court provision governed by riders with specific terms of termination.

Failure by either party of its obligations is likely to cause the termination at the initiative of the other, if he chooses, of this Convention. The damaging consequences possibly incurred by that party will open right to compensation in accordance with the laws in Ivory Coast.

Article 13: Privacy

The parts undertake to keep confidential information expressly designated as "confidential information" transmitted from one party to another.

Article 14: duration

This agreement takes effect from the date of pronouncement of the order commencement of work (NTP - Notice To Proceed) is concluded for the duration of ten (10) years.

Article 15: Litigation

Any litigation or dispute arising between the Parties in the interpretation, application or implementation of this agreement will be a priority for a settlement at the kind between the parties themselves.

In case of disagreement, the parties will rise information to their guardianship, which are the Ministry for Energy and the Ministry for ATINKOU in charge of national parks and nature reserves for OIPR.

Article 16: Election of domicile and notification

The parties elect homes in their respective seats, mentioned in the description of the parties, or any notification or execution of the agreement can be validly made to them.

for ATINKOU
The Director General

For OIPR
The Director General

.....

Collar. Adama TONDOSSAMA

ANNEX: ACTION PLAN FOR TEN YEARS**(in euros)**

Ref.	DESIGNATION	A1	A2	A3	A4	AT 5	A6	A7	AT 8	A9	A10	TOTAL
1	MONITORING AND PROTECTION											
1.1	Strengthen surveillance operations	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	20000
1.2	Acquisition of equipment	2000					1500				1500	5000-
	S / T 1 Result	4000	2000	2000	2000	2000	3500	2000	2000	2000	3500	25000
2	COMMUNICATION FOR BEHAVIOUR CHANGE											
2.1	Strengthening the accession of players in conservation activities											
2.1	Implementing an IEC / CC program	500	500	500	500	500	500	500	500	500	500	5000
2.2	Support community projects along the lines of conservation	20000	10000		10000		10000	20000	10000		10000	50000
	S / T 2 Result	500	10500	500	10500	500	10500	500	10500	500	10500	55000
3	ECOLOGICAL RESEARCH AND MONITORING											
3.1	Support for research and monitoring of amphibians PNA	500	500	500	500	500	500	500	500	500	500	5000
3.2	Support data collection missions	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	20000
3.3	Acquire the ecological monitoring equipment	2000				2000					4000	
3.4	Strengthening the capacity of ecologists	500		500	-	-	500	-	500		500	2500

	S / T 3 Result	1000	500	1000	500	500	1000	500	1000	500	1000	7500
4	MANAGEMENT											
4.1	<i>Certify the accounts</i>	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	5000
4.2	<i>Disseminate technical and financial progress reports</i>											
4.3	<i>Conduct monitoring and evaluation activities</i>	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	5000
4.4	Acquisition of mobility	20000				40000					40000	20000
	S / T Result 4	20000	0	0	0	0	0	0	0	0	0	20000
	TOTAL	25500	13000	3500	13000	3000	15000	3000	13500	3000	16000	107500

Point 3 "Research and Ecological Monitoring" (7500 €) will be developed on a specific budget line for herpetological research, apart from the measure of support to the national park Azagny.



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