Environmental and Social Impact Assessment (ESIA) Of Energy Infrastructure Projects

File: IS-360
Version: Draft Report
Date: 16 July 2019

Project title : ESIA of Energy Infrastructure Projects
Project number : IS-360
Document : ESIA Report

Version	Status	Compiled by	Validated by	Signature	Date
1.0	First Draft	Punwasi S / Ramdat N / Nakchedi A/ Bharosa V	Koenjbiharie S; Noordam D;		16th of July 2019

Table of Contents

List of Figures

List of tables

Abbreviations

ABS	General Bureau of Statistics *(Algemeen Bureau voor de Statistiek)*
AEEB	Allodial ownership and inheritable property (*Allodiaal Eigendom en Erfelijk Bezit)*
ANSI	American National Standards Institute
BO	Local staff in the communities employed by Ministry of Regional Development. (*Bestuursopzichter).*
CBB	Central Bureau for Citizens Affairs *(Centraal Bureau voor Burgerzaken)*
CITES	Convention on International Trade in Endangered Species
CR	Community Relations
dBA	Decibel using the A-weighting setting
DC	District Commissioner
DEV	Rural electrification department of the Ministry of Natural Resources (*Dienst Elektriciteits Voorziening)*
EBS	N.V. Energie Bedrijven Suriname
EHS	Environment, Health and Safety
EPAR	Energievoorziening Paramaribo
ESG	Environmental and Social Safeguards
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
G.B.	Grondbesluit
GEG	General Environmental Guidelines
GLIS	Geographical Land use and Information System *(Geografische Land Informatie Systeem)*
GoS	Government of Suriname
GPS	Global Positioning System
ha	Hectare
HDD	Horizontal Directional Drilling
HFO	Heavy Fuel Oil
HSE	Health, Safety and Environment
HSEQ	Health Safety Environment & Quality
ICOMOS	International Council on Monuments and Sites
IDB	Inter-American Development Bank
IEC	International Electro Technical Commission
IEEE	Institute of Electrical and Electronics Engineers
IFC	International Finance Cooperation
ITCZ	Inter Tropical Convergence Zone
IUCN	International Union for Conservation of Nature
JAP -airport	Johan Adolf Pengel airport
kV	kilo Volt

kWp	kilowatt peak
LAeq	Equivalent Sound Pressure Level using the A-weighting setting
LVV	Ministry of Agriculture, Animal Husbandry and Fishing (Ministerie Landbouw, Veeteelt en Visserij)
MAR	Mariënburg
Ministry of OWT & C	Ministerie van Openbare Werken, Transport en Communicatie
MINOWC	Ministry of Education, Science and Culture (Ministerie van Onderwijs, Wetenschap en Cultuur)
Mtoe	Million Tonnes of Oil Equivalent
MULO	Middle school *(Meer Uitgebreid Lager Onderwijs)*
MUMA	Multiple Use Management Area
MW	Megawatt
NATIN	Technical school *(Natuurtechnisch Instituut)*
NGO	Non-Governmental Organization
NIMOS	National Institute for Environment and Development in Suriname (Nationaal Instituut voor Milieu en Ontwikkeling in Suriname)
NMR	Nationale Milieuraad
NPS	National Power System
NR	Nature Reserve
NVB	National Transportation Service (*Nationaal Vervoers Bedrijf)*
OHL	Overhead Line
OP	Operational Policy
POW	Powaka
PP	Peperpot
PS	Performance Standards
PV	Photo Voltaic
RGD	Regional Health Service *(Regionale Gezondheids Dienst)*
ROC	Right Bank of the Commewijne River
SBB	Stichting Bosbeheer en Bostoezicht
SIA	Social Impact Assessment
SS	Substation
SWM	Surinaamse Waterleiding Maatschappij
ToR	Terms of Reference
UCC	United Caribbean Contractors
VIDS	Association for indigenous Village Leaders in Suriname *(Vereniging Inheemse Dorpshoofden Suriname)*
VSG	Association of Saamaka Authorities (*Vereniging van Saramakaanse Gezagsdragers*)
WB	World Bank
XLPE	polyethylene

Glossary of Terms

Term	**Definition**
Area of Direct Influence	An area in a circle with a 100m radius around the construction site
District	Administrative Unit. Each district has its own district government with limited powers of decision-making, headed by a District Commissioner (DC).

Domain Land *domeingrond*	All land, to which third parties cannot prove land tenure rights is domain land, that is, property of state.
Grievance Mechanism	This is a process by which Project beneficiaries or Project Affected Persons can raise their concerns and grievances to Project authorities.
Household	A group of persons living together, who share the same cooking and eating facilities, and form a basic socio-economic and decision-making unit. One or more households may occupy a house.
Indigenous Peoples (IDB definition)	Those who meet the following three criteria: i. They are descendants from populations inhabiting Latin America and the Caribbean at the time of the conquest or colonization; ii. Irrespective of their legal status or current residence, they retain some or all of their own social, economic, political, linguistic and cultural institutions and practices; and iii. They recognize themselves as belonging to indigenous or pre-colonial cultures or peoples.
Involuntary resettlement	Resettlement is considered involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in physical or economic displacement. This occurs in cases of (i) lawful expropriation or temporary or permanent restrictions on land use and (ii) negotiated settlements in which the buyer can resort to expropriation or impose legal restrictions on land use if negotiations with the seller fail.
Livelihood	The term 'livelihood' refers to the full range of means that individuals, families, and communities utilize to make a living, such as wage-based income, agriculture, fishing, foraging, other natural resource-based livelihoods, petty trade, and bartering.

Annexes

Annex I- EBS-EHS Policy
Annex II- Stakeholder Consultations
- IIA Consulted Stakeholders
- IIB Kick-off meeting-23rd May 2019
- IIC Meeting with DC Brokopondo-10th June 2019
- IID Meeting with DC Commewijne-11th June 2019
- IIE Meeting with DC Para-11th June 2019
- IIF Meeting with Brownsweg Community -17th June 2019
- IIG Progress Meeting-9th July 2019

Annex III- Village of Hannover and Road under Construction
Annex IV- Snowhills Allotment Project

Executive Summary

This document presents the results and recommendations of the Environmental and Social Impact Assessment (ESIA) for the preparation of four (4) infrastructure projects.

The ESIA entails the following:

- Powaka- Zanderij transmission line project: construction of a new 33 kV transmission line between substation Powaka and substation Zanderij.
- Koina Kondre Project: extension of the 12kV grid from substation Powaka along the Afobaka road to Koina Kondre.
- Upgrade critical infrastructure Commewijne including solar plant Alliance (hereafter the Commewijne project): construction of a new 33 kV overhead double circuit from substation Peperpot towards substation Mariënburg and Plantation Richelieu, installation of a second underwater 12 kV cable from substation Mariënburg to Johanna & Margaretha and construction of a 200 kWp solar plant in Alliance.
- Brownsweg solar plant project: construction of a 500 kWp grid-connected PV power plant in Brownsweg.

The appointed Consultant has prepared this ESIA based on the environmental assessment and social impact guidelines of The Inter-American Development Bank (IDB) as guidance, as well as international best practice. The analysis and this report were prepared according to the approved Terms of Reference by the Inter-American Development Bank (IDB).

In the Screening Phase of the ESIA, the IDB determined that the project is a Category B – project *(telcon with Mr. Abadal on the 12th of April)*, thus meaning a limited ESIA.

The study was carried out in the period between June and July 2019.

For the compilation of the baseline section, data of previous studies and from existing sources have been used for traffic, noise, air quality, land and soil, hydrology, water quality, vegetation and ecosystems. Fieldwork has been carried out for general orientation and land-use.

Also public consultation was undertaken, during which local public stakeholders, local government representatives and district authorities were consulted. A socio-economic survey was conducted in order to collect general information on households, the public utilities and to learn about the opinion and concerns about the project.

The ESIA describes the available information on project designs and operations. The collected data is considered adequate for the analysis of the impact and is covered in this report in nine chapters and four Annexes.

Most of the impacts that are scored minor are reduced to negligible after implementation of the mitigation measures. A few of the impacts that are scored minor cannot be reduced because they are project inherited. These impacts are related to the environmental aspects: land and soil (land take for solar plants and substation locations), vegetation (clearing for solar plants and riser pole locations) and visual and aesthetics (permanent presence of transmission lines).

Few significant potential socio-economic impacts have been determined. Two negative moderate potential impacts are identified with respect to “false expectations”. Such impacts can only be solved by clear and transparent communication with local stakeholders during the planning and preparation phases. Procedures for this are already in place at EBS and should be applied. Furthermore, a few negative potential impacts and some positive socio-economic impacts were identified. All other potential socio-economic impacts are minor or negligible, whereby the minor impacts are reduced to negligible after implementation of the mitigation measures.

In case archaeological site are discovered during the project activities the procedures described in the ICOMOS (1990) “Charter for the Protection and Management of the Archaeological Heritage” should be taken into consideration. In addition, Project stakeholders must comply with the Government of Suriname (GoS) Monument Law of 2002 for immoveable archaeological resources found during the course of the project.

Finally, the investment in a solar power plant at Alliance is not justified, because there is a small and decreasing population and electricity is already available (though not very reliable).

1. Introduction

1.1 Purpose of this document

This document presents the results of the environmental and social impact assessment (ESIA) of four (4) Infrastructural Projects under the operation of the IDB SU-L1055 Loan: Consolidating a Sustainable Energy Sector. In addition, recommendations are given to ensure that the proposed development takes into consideration appropriate measures to prevent or mitigate/minimize any adverse impacts through all the phases of implementation.

This ESIA entails the following infrastructural projects:

- Powaka- Zanderij transmission line project: the construction of a new 33 kV transmission line between substation Powaka and substation Zanderij.
- Koina Kondre project: extension of the 12kV grid from substation Powaka along the Afobaka Road to Koina Kondre.
- Project "Upgrade critical infrastructure Commewijne including solar plant Alliance" :
  - Construction of a new 33 kV overhead double circuit from substation Peperpot towards substation Mariënburg and Plantation Richelieu,
  - Construction of a substation at Mariënburg;
  - The installation of a second underwater 12 kV cable from substation Mariënburg to Johanna Margaretha, and
  - The construction of a 200 kWp solar plant in Alliance.

In below report, this project will shortly be indicated as the Commewijne project.

- Brownsweg solar plant project: construction of a 500kWp grid-connected Photo Voltaic (PV) power plant in Brownsweg.

The ESIA has been carried out in compliance with the relevant standards and guidelines of the Bank, the IDB's Operational Policy (OP) on Environmental and Safeguards Compliance Policy (IDB OP-703). As part of the Social Impact Assessment, the applicability of the IDB OP-710 on involuntary resettlement and IDB OP-765 on Indigenous Peoples has also been assessed. In addition, national regulatory requirements and the ESIA guidelines of the National Institute for Environment and Development in Suriname (NIMOS 2009) have been taken into account. Corporate Standards, Guidelines and Procedures of the borrower (EBS) which are relevant to the proposed project have also been taken into consideration (Health, Safety and Environment (HSE) Policy, Community Relations (CR) Policy, and supporting procedures). Furthermore, research procedures adhered to professional ethical standards for anthropological research.

As a first step, the screening of the project was executed by the Bank. The project has been categorized as a Category B project meaning operations that are likely to cause mostly local and short-term negative environmental and associated social impacts and for which effective mitigation measures are readily available.

1.2 Background and Motivation to the Project

The Inter-American Development Bank (IDB or the Bank) policy requires that an Environmental and Social Impact Assessment (ESIA) is carried out by the project sponsor/borrower for all projects to be financed by the Bank with potentially significant impacts on the natural and human environment. In Suriname, the Ministerie van Natuurlijke Hulpbronnen (Ministry of Natural Resources, MNH) has responsibility for energy policy and supervision of the energy sector. The N.V. Energie Bedrijven Suriname (EBS, borrower) is the state-owned utility company supervised by the MNH and in charge of the operation of the power system. EBS's operations entail generation, transmission, distribution and commercialization of electricity.

The National Power System (NPS) consists of seven isolated power networks served by EBS based on hydro and thermal generation. Energievoorziening Paramaribo (EPAR), see
Figure 1, is the largest network which serves around 143,485 customers in the urban Paramaribo area, the semi-urban district of Wanica and the surroundings rural districts of Saramacca, Commewijne and Para, with peak demand of around 203 Megawatts (MW). EPAR has mainly depended on power supply from the 189 MW Afobaka hydropower plant but with increased electricity demand in recent decades, EBS entered into purchase agreements with Staatsolie, the state oil company, and has also needed to generate electricity from Heavy Fuel Oil (HFO) and diesel in two power plants totaling 169.6 MW of installed capacity.

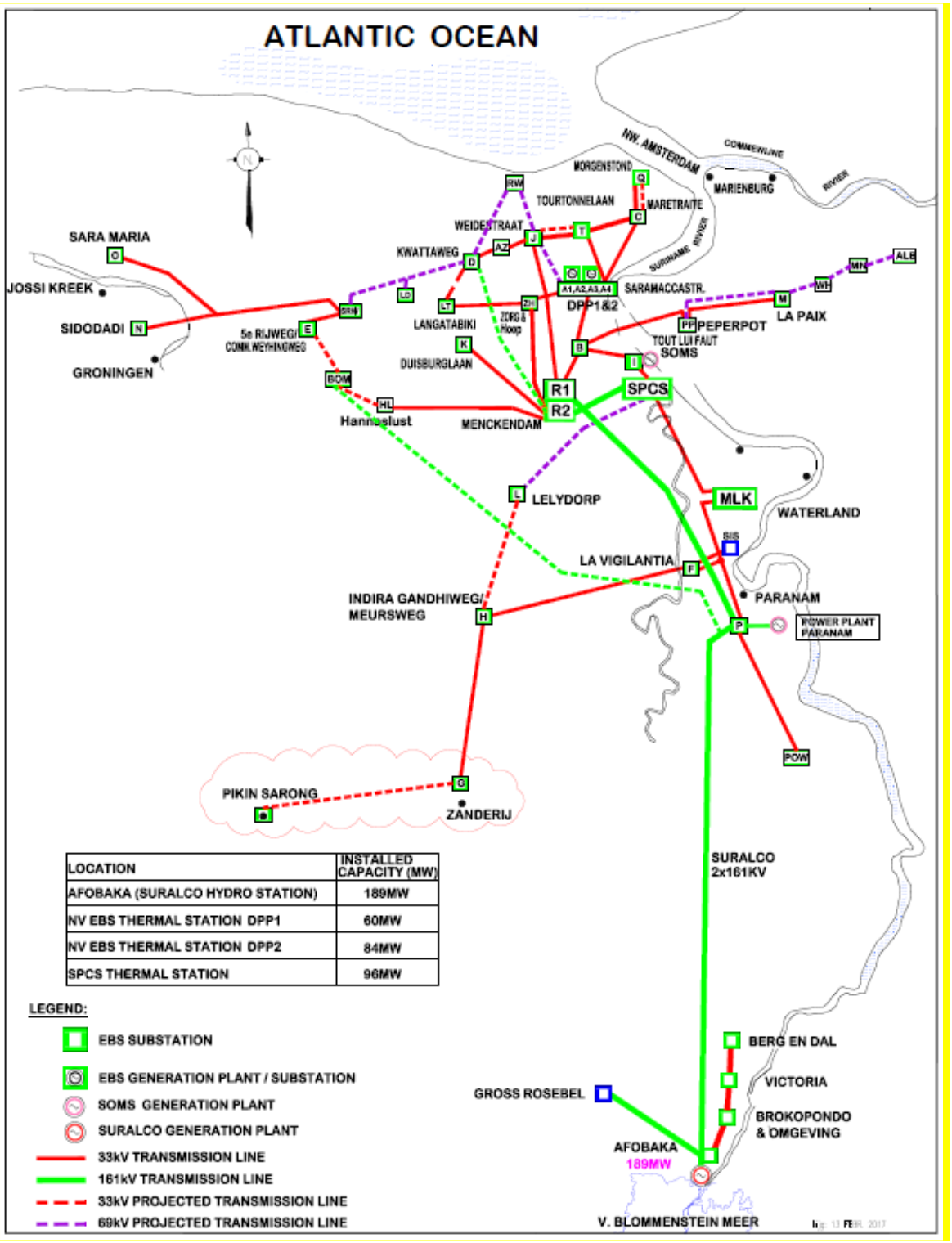

Figure 1: Map of the Transmission System of EPAR and Brokopondo. Source: EBS

To create a redundancy in the grid in order to meet the growing demand and as well to increase the security and reliability of the electricity service in its service area, the following projects, all located in the EPAR system, are included in the Scope of this study:

Powaka - Zanderij transmission line project

EBS has identified the necessity to build a new 33 kV transmission line connecting the substation Powaka with the substation Zanderij (see **Figure 2**). The Zanderij substation is currently supplied from the substation Meursweg. In case of a failure in the connection from substation Meursweg to substation Zanderij, the entire service of substation Zanderij, including the international airport of Suriname, the Johan Adolf Pengel (JAP) airport, would be interrupted. The same situation occurs for the Powaka area when the connection from substation Paranam to substation Powaka would fail. The aim of this project is to create a redundancy in the grid in order to meet the growing demand, increase the reliability and flexibility of the grid and to improve the quality in the service of both areas. The transmission line will also benefit several rural communities located in the west of Zanderij which EBS is progressively connecting to the EPAR grid. The new transmission line will be installed in the Right of Way of a new road (9.5 km), which is currently under construction by the Ministerie van Openbare Werken, Transport en Communicatie (Ministry of Public Works, Transportation and Communication).

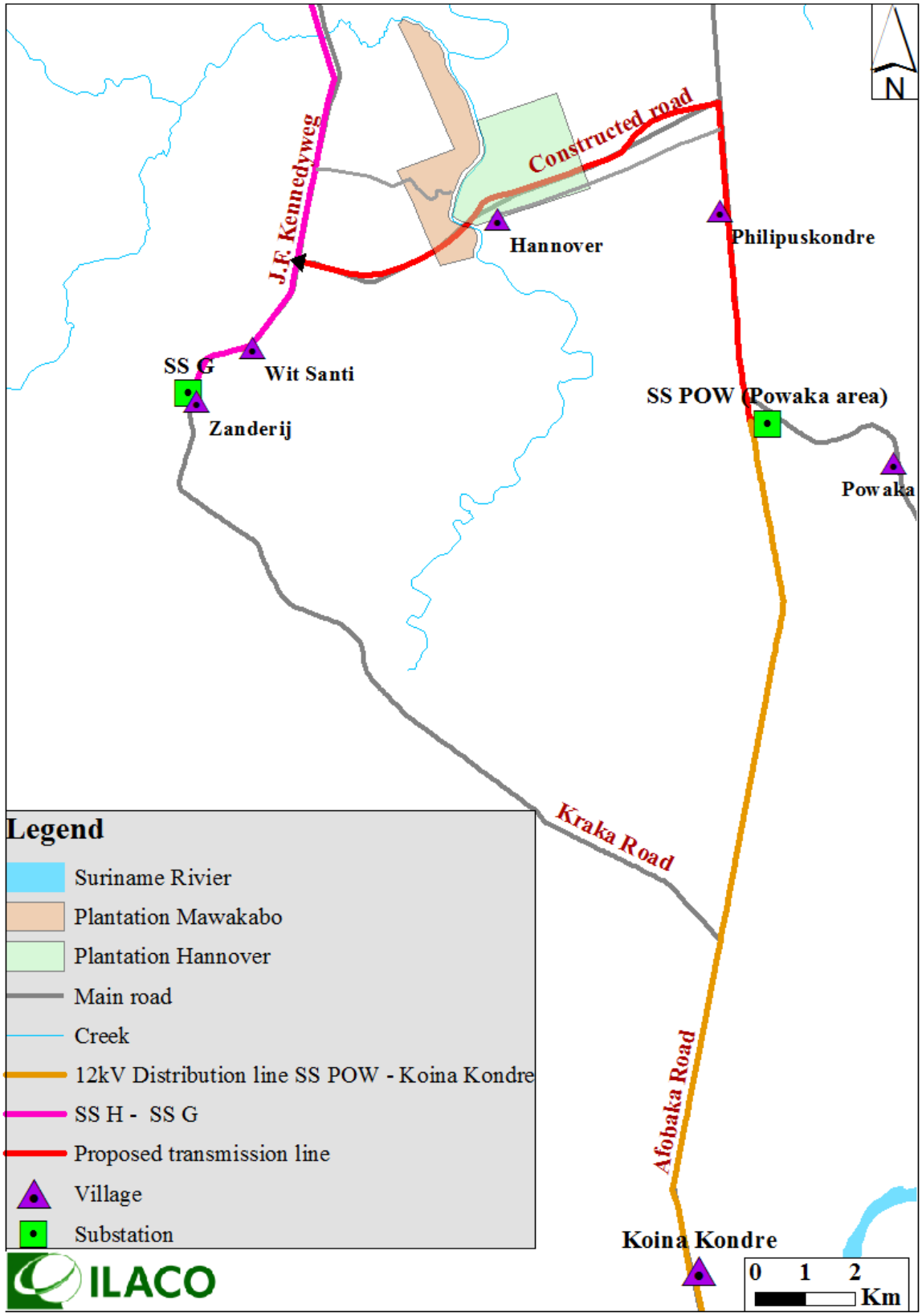

Figure 2: Overview Powaka - Zanderij transmission line project

Koina Kondre project

The substation Powaka is in operation since 2016, providing 24/7 electricity to the surrounding villages (Powaka, Ayo, Pierre Kondre, Redi Doti, Casipora). The substation was designed taking into consideration the future expansion plans to connect new customers to the grid. The villages located in the area between substation Powaka and the southern village of Marchallkreek are not yet connected to the EBS grid. On this stretch of approximately 24 km along the Afobakaweg the biggest community is Koina Kondre (see **Figure 3**). In the surrounding of Koina Kondre, there are several smaller communities which are currently receiving 4-5 hours a day electricity, provided by. Dienst Energie Voorziening (DEV, rural electrification department of the Ministry of Natural Resources). EBS plans to provide 24/7 electricity to the households and businesses (such as wood concession and eco-resorts) in the area by extending a 12 kV grid (approximately 24 km) starting at the substation Powaka along the Afobakaweg.

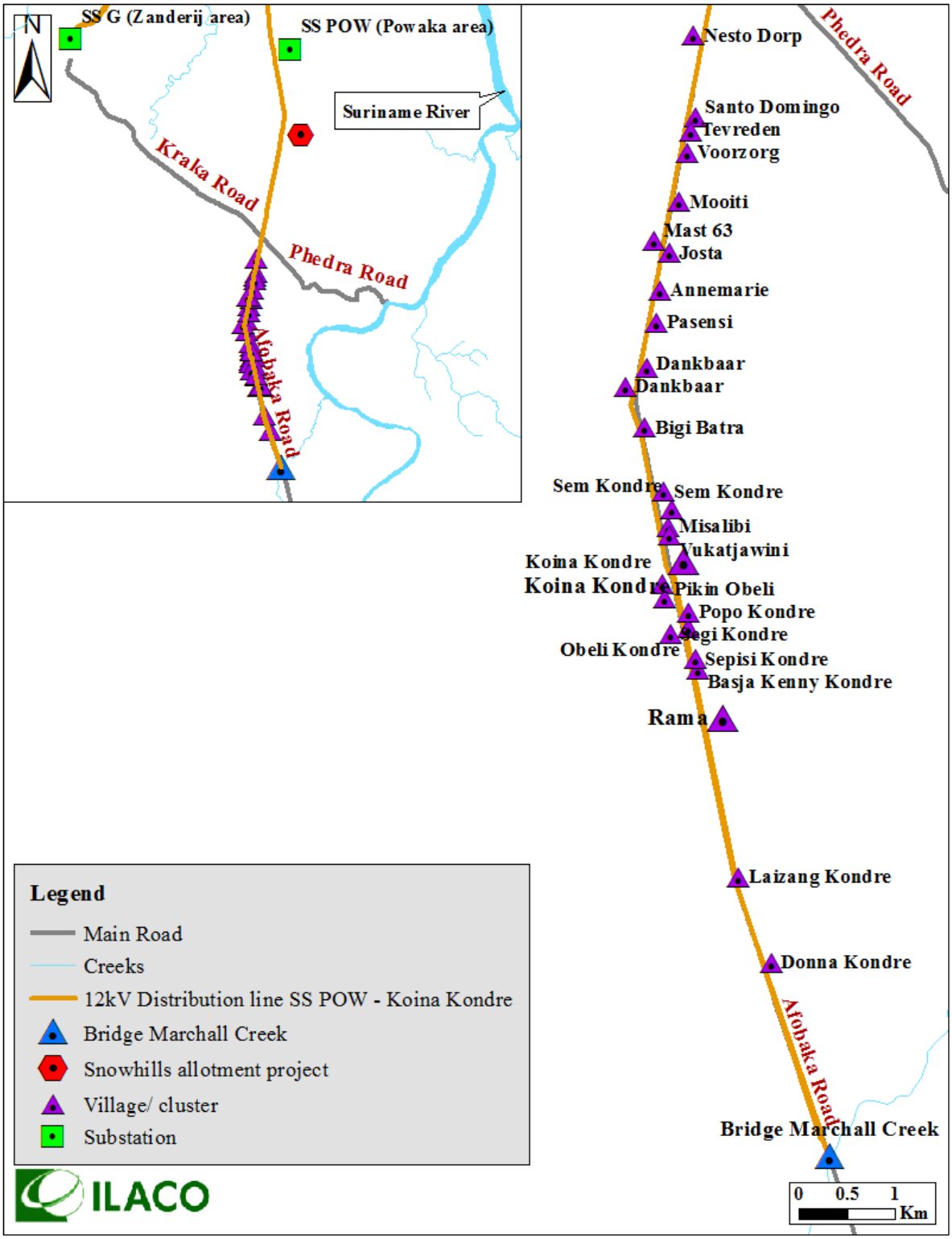

Figure 3: Overview Koina Kondre project

Commewijne project

EBS has identified the necessity to upgrade the transmission infrastructure in the Right Bank of the Commewijne River in order to create a redundancy in the grid and to meet the growing demand in the area. The area (comprised by the old plantations in Alliance, Reynsdorp, Johanna Margaretha, Kroonenburg and Rust & Werk) is currently supplied with electrical energy with a 12kV line from substation Mariënburg (La Paix) and a 12 kV underwater cable through the Commewijne River to Kroonenburg. Substation Mariënburg is currently radially supplied from substation Peperpot by a 33 kV line single circuit (see Figure 4). In case of a failure in this transmission line a major part of the service area of District Commewijne is interrupted including Mariënburg and the right bank of the Commewijne River.

EBS plans to build a new 33 kV overhead double circuit from substation Peperpot towards the corner of Richelieu (8.5 km) along the existing road. From this point, the 33 kV will be split into two single 33 kV overhead lines. One 33 kV line (10 km) will be connected to a new substation (MAR) and the other will connect Richelieu with substation Mariënburg.

In order to create a redundancy in the right bank of the Commewijne area, it is proposed to install a second underwater 12 kV cable from the new substation MAR to Plantation Johanna Margaretha. This will be done through a horizontal directional drilling (HDD) or by a bottom cable underneath the Commewijne River.

Finally, EBS proposes to build a 200 kWp solar plant in Alliance in order to increase the reliability of the supply in the area. This project expects to enhance the economic growth of the Commewijne district, in particular the Mariënburg and the Right Bank area of the Commewijne.

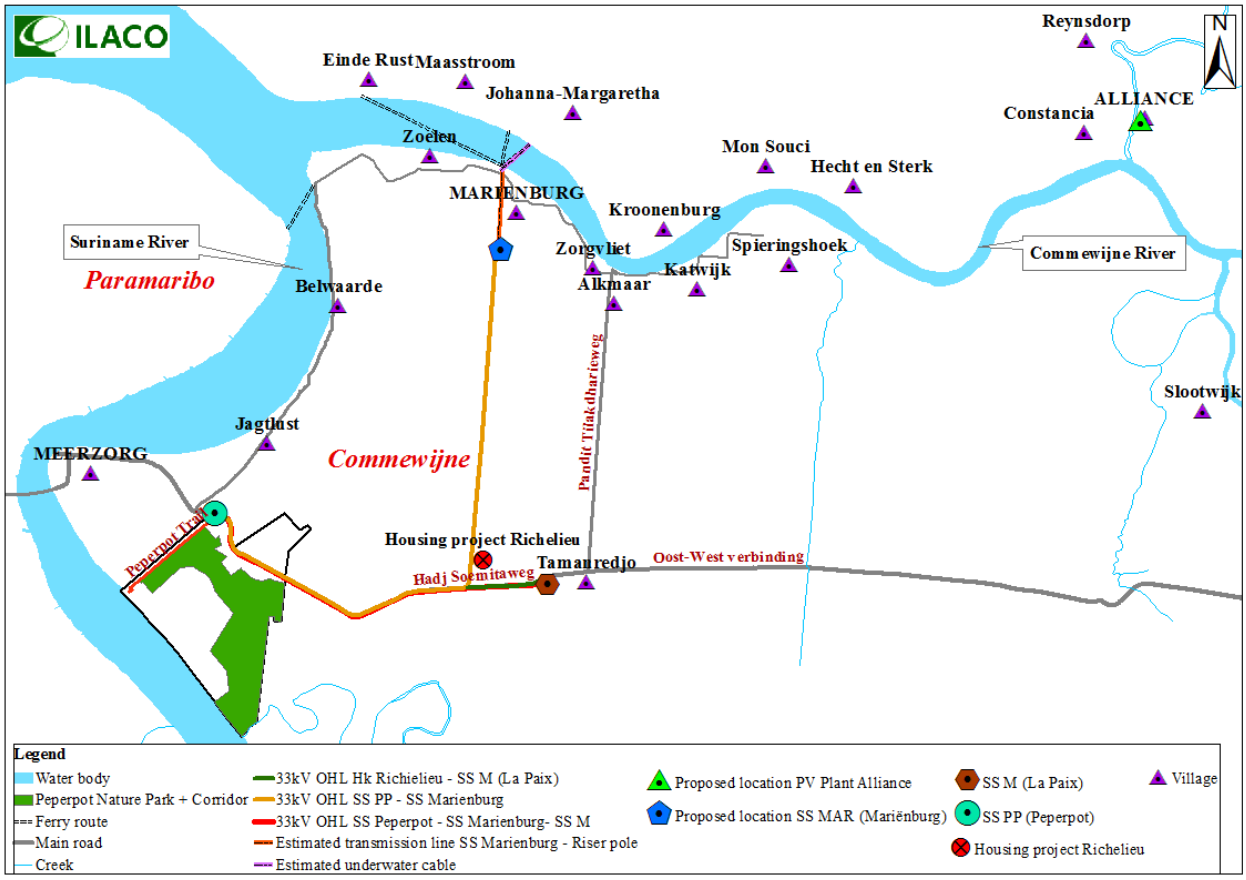

Figure 4: Overview Commewijne Right Bank project

Brownsweg Solar Plant Project

The Brokopondo District is one of the electricity service areas of the N.V. EBS. This area is in the center of Suriname and is provided with electricity from the national grid. The service area covers the following areas and surroundings: Village Near Hydro "Afobaka Dorp, Baling Soela, Brokopondo-Centrum, Compagniekreek, Klaaskreek and Brownsweg village. The major means for the livelihood of the local population in Brokopondo are mining, forestry, tourism, fishing and agriculture.

The Brokopondo service area has approximately 5,500 connections, with an average peak power demand of 1,900kW. The system is composed by a 33 kV overhead transmission line originated in the main station Afobaka and connecting six substations along the Afobaka road. The Brownsweg village is supplied by a 25 km single circuit overhead line of 12 kV, connected to the substation Berg & Dal. Brownsweg has about 2,200 inhabitants. Due to aging of the infrastructure, a difficult Right-of-Way, and no rerouting possibilities of the 12 kV line feeding the Brownsweg area, the maintenance of the line is a complex task. Consequently, the reliability of the 12 kV has decreased significantly. Additionally, in case of 12 kV distribution failure of the Brownsweg feeder in substation Berg & Dal the entire area of Brownsweg will be interrupted. Another critical factor in the current supply is the limitation of capacity to accommodate demand growth and therefore hampering economic growth and development in Brownsweg.

In order to increase the security and reliability of the electricity service in the Brownsweg, to reduce the transmission loses and avoid overloads in the grid, EBS plans to implement a 500 kWp grid-connected Photo-Voltaic (PV) power plant in Brownsweg (see **Figure 5**). The solar plant might include a small storage system to supply the electricity during the peaks of consumption.

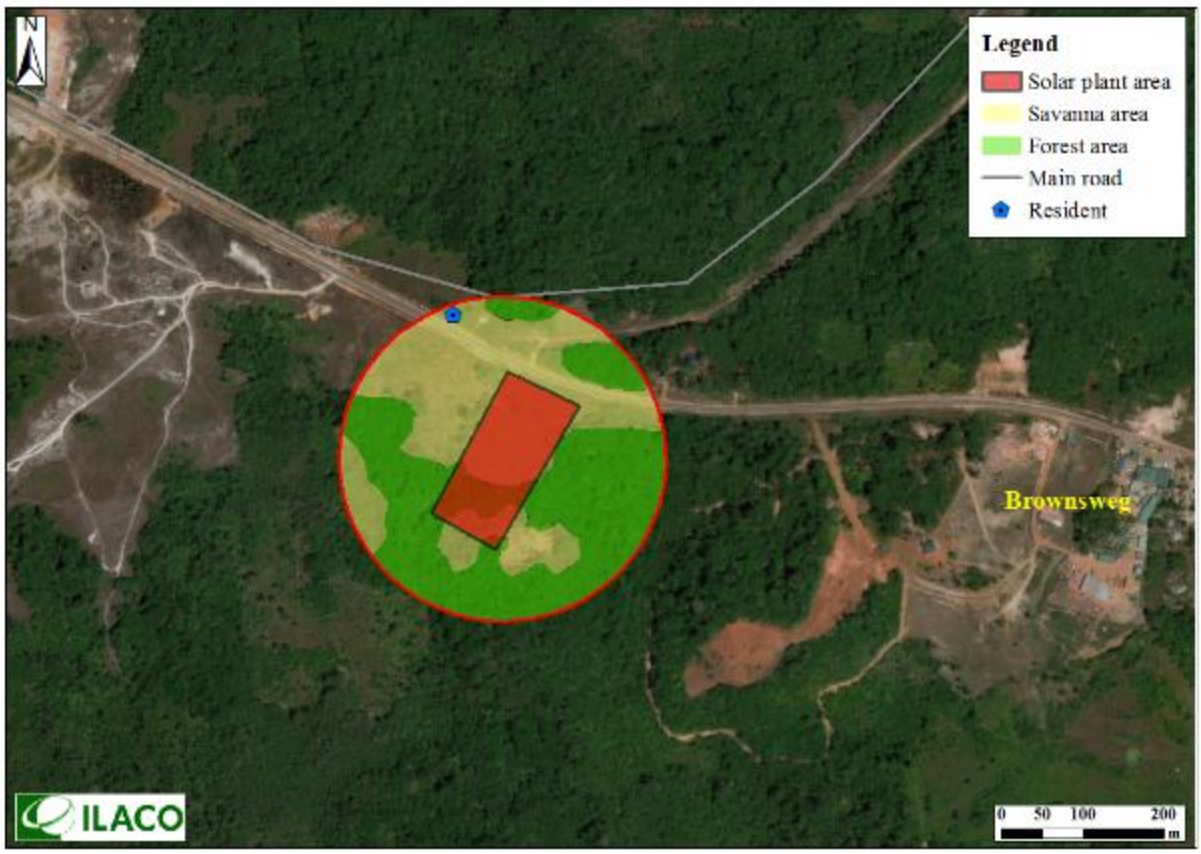

Figure 5: Overview Brownsweg Solar Plant Project

1.3 Objectives of the Assignment

The main objectives of this study are to:

- Inform and obtain contributions from stakeholders, including relevant authorities and local area inhabitants, and address their relevant issues and concerns;
- To identify the positive and/or negative alterations of the human and natural environment which may affect the quality of life as well as present and future options for sustainable social and economic development in the operations area of influence;
- To identify preventive or mitigation measures to minimize the negative impacts and enhance the positive impacts of project alternatives;
- Prepare an Environmental and Social Impact Assessment Report including Management Plan compliant with the IDB guidelines and other relevant laws, regulations and best practice.

1.4 Team of Experts

The Bank has appointed ILACO Suriname to undertake the ESIA for the abovementioned four infrastructural projects. The ESIA has been executed by a team of qualified experts with ample national and international experience in similar projects:

Ravindra PATANDIN, M.Sc.	Project Director
Shareen KOENJBIHARIE, B.Sc.	Team Leader/ Environmental Management Engineer
Ir. Dirk NOORDAM	Sr. ESIA Specialist
Marieke HEEMSKERK, Ph.D.	Social Specialist
Celine DUIJVES, M.Sc.	Social Specialist
Sandhia PUNWASI, B.Sc.	Project Engineer

2. Methodology

2.1 Introduction

This chapter presents the methodology used to meet the objectives of the assignment as listed in paragraph 1.3. The approach involved an understanding of the project background, the preliminary (basic) design, implementation and commissioning of the project. The current study has been categorized as a Cat B project and thus principally been conducted as a desk study, supplemented by field reconnaissance, stakeholder consultations and interviews. The key tasks during the execution of the assignment are listed in the following paragraphs.

2.2 Baseline Study

Baseline information was gathered through desktop and existing studies, physical observations, survey, photography, public consultation of key members representing the community and discussions with the Project Proponent. The baseline descriptions are based on existing maps, photographs and images, literature reviews, documents, field observations and interviews. Baseline data also have been acquired from records held by government services and others.

2.2.1 Environmental Baseline

The environmental setting described in this section provides baseline conditions from which an assessment of the potential effects of project development was determined. In addition, the baseline information can be used as a benchmark by which future monitoring results will be compared.

Specific sources of information per component are listed in **Table 1**.

Table 1: Overview of gathered information and information sources

Component	Information and data sources	Fieldworks
Climate including air quality	Records held by Meteorological Survey Website www.meteosur.sr (MDS 2018) Background literature and documents (see references)	None. A qualitative description of the ambient air quality is made based on expert judgment on emission sources and prevailing winds (air quality)
Noise	General background literature and existing noise studies (see references)	None.
Land and soil	Existing soil maps and reports (see references)	None.
Hydrology	Existing studies and reports (see references	None.
Water quality	Existing reports and publications (see references)	None
Topography	Aerial Photographs, Satellite imagery, topographical maps (Google images, GLIS imagery, Landsat)	Field checks
Vegetation and Fauna	Existing publications (see references)	Field check
Land and water use	Satellite imagery, existing publications and studies	Field checks, oblique pictures.

Detailed field checks were executed in the period 10th of June 2019- 5th of July 2019 during which existing information was validated and additional information was gathered through field observation, interviews with key stakeholders and community meetings. Gathered information included:

- General observations
- Landownership and land use
- Vegetation
- Identification of sensitive receptors
- Communities livelihood and objects

Relevant objects were photographed and GPS coordinates were taken.
Data entry was conducted concurrently with data collection in the field. After the data entry, a check was done to ensure that the data entered matched the collected data. All data collected has then been analyzed.

The findings from the field data analysis and document review have been compiled into this report.

2.2.2. Social Baseline

The assessment started with a review of existing secondary data. Consulted secondary data included books, consultancy reports, data from the Suriname General Bureau of Statistics (Algemeen Bureau voor de Statistiek – ABS), data from websites from international organizations and online news media.

Community meetings
Stakeholder consultations were initiated through informative meetings with District Commissioners from the various districts, as listed below:

- District government Brokopondo, 10 June 2019, at EBS headquarters in Paramaribo
- District government Commewijne, 11 June 2019 at the Commewijne district office
- District government Para, 11 June 2019, at the Para district office

After the initial meetings with district governments, stakeholder meetings were held in the communities to inform traditional authorities and other community members with interests in the impact area (see **Table 2**). Meetings were focused on the projected construction activities, and to elicit concerns and suggestions of stakeholders to minimize negative project impacts and maximize project benefits. It is advised that EBS organizes follow-up meetings as project activities proceed (see also Social Management Plan).

Table 2: Overview of consultation meetings

Community	Date	Comment	Stakeholders
Commewijne Right Bank Project	11 June 2019	Only informative meeting District government because of limited expected impact project. Project was explained to the plantation manager, LVV staff and other inhabitants of Alliance during field visit.	
Powaka-Zanderij Transmission Line Project	11 June 2019	Not yet planned, in preparation.	Owners and descendants of plantations Hannover-Mawakabo
Koina Kondre Project	20 June 2019	Consultation meeting organized by EBS. Discussion of overall project, but no timeline shared.	District Government, Minister of Natural Resources, EBS director, EBS project team, ILACO social expert, community members (~60)
Brownsweg Solar Plant Project	17 June 2019	Consultation meeting organized by District Commissioner Brokopondo.	EBS Project team, ILACO Project team, District Government (9), Village inhabitants (~8), One traditional authority.

Stakeholder interviews

Information gaps and issues that remained unclear after literature review were completed and clarified through interviews with key experts and other stakeholders. These interviews also served to verify, modify and correct existing written information. Moreover, stakeholder interviews served to document stakeholder perceptions on the potential positive and negatives effects of the listed infrastructure projects, and to more fully explore potential challenges and opportunities to Project Affected Persons (PAPs).

Consulted experts and key knowledge persons included relevant representatives of NV EBS as well as other stakeholders representing government, organizations and civil society. Government representatives included the District Commissioners (DC) of Commewijne, Brokopondo and Para and their local staff in the communities (*Bestuursopzichters* – BO). Meetings also were held with area inhabitants and businesses in the four Areas of Impact.

A full list of consulted individuals is presented in **Annex IIA**.

2.3 Impact Assessment

The significance of all potential impacts that would result from the proposed project is determined in order to assist managers.

Key issues identified during scoping require further studies to determine whether they are likely to occur and to assess how they will manifest themselves.

For key potential impacts identified by the scoping study, it will be necessary to determine the significance of each impact, based upon qualitative or quantitative assessment of the following attributes:

- magnitude
- geographical scale
- duration
- probability of occurrence

The resulting impact will be indicated by their significance class, which classes are defined as:

Table 3: Classes of impact significance

< Impact significance >
Major (significant) effect: effect expected to be permanent or continuous and non-reversible on a national scale and/or have international significance.
Moderate (significant) effect: long-term or continuous effect, but it is reversible and/or it has regional significance.
Minor (not significant) effect: effect confined to the local area and/or of short duration, and it is reversible.
Negligible (not significant) effect: effect not detectable.
Unknown effect: insufficient data available to assess the significance of the effect.

In addition, impacts have been classified as:

- Positive: indicating whether the impact will have a positive (beneficial) effect; or
- Negative: indicating whether the impact will have a negative (adverse) effect on the environment, including affected people.

The degree of detail will enable the determination of required mitigation and possible enhancement measures, respectively to prevent or reduce significant negative impacts and to promote any positive impacts already in the planning phase. The implementation of mitigation measures will reduce negative environmental impacts to an acceptable level as much as possible.

After implementation of mitigation/enhancement measures the significance of the impacts will again be determined.

The impact assessment methodology is described below.

The **significance** of an impact is defined as a combination of the **severity** of the impact occurring and the **probability** that the impact will occur. The significance of each identified impact will be rated according to the methodology set out below:

First the **intensity/magnitude/size**, **scale** and **duration** of the impact are determined according to below tables (see **Table 4**,

Table *5* & **Table 6**).

Table 4: Defining the intensity / magnitude / size of negative impacts

Rating	Description of Rating for		
	Natural environment	Socio-cultural	Health/safety
High	Irreversible damage to highly valued species, habitats or ecosystems	Irreparable damage to highly valued items of cultural significance, or social functions or processes are severely altered	Event resulting in loss of life, serious injuries or chronic illness; hospitalization required
Medium	Reversible damage to species, habitats or ecosystems	Repairable damage to items of cultural significance, or impairment of social functions and processes	Event resulting in moderate injuries or illness; may require hospitalization
Low	Limited damage to biological or physical environment	Low-level damage to cultural items, or social functions and processes are negligibly altered (nuisance)	Event resulting in annoyance, minor injuries or illness, not requiring hospitalization
Negligible	No relevant damage to biological or physical environment	No damage is done to cultural items and social functions and processes are not altered	Event is not experienced by receptors or only occasional minor annoyance

Table 5: Defining the intensity / magnitude / size of the positive impacts

Rating	Description of Rating for		
	Natural environment	**Socio-cultural**	**Health/safety**
High	Direct benefits to species, habitats and resources with significant opportunities for sustainability	Benefits to local community and beyond	Health and safety will be significantly improved
Medium	Moderate benefits to species, habitats and resources with some opportunities for sustainability	Benefits to many households or individuals	Health and safety will be improved
Low	Minor benefits to species, habitats and resources with possible opportunities for sustainability	Benefits to few households or individuals	Health and safety will be slightly improved

Table 6: Defining duration and scale of the impact

Rating	Definition of Rating
Duration– the time frame for which the impact will be experienced	
Short-term (ST)	Up to 2 months (construction time per zone)
Medium-term (MT)	2 to 10 months (total construction time)
Long-term (LT)	More than 10 months
Scale– the area in which the impact will be experienced	
Small (SS)	Localized spot – tower or substation location
Medium (MS)	Part of study area (East-West connection Road and other roads with construction)
Large (LS)	Study area or beyond

Then the severity **rating** of the impact is determined by combining the **magnitude** of the impact with **duration** and **scale** of the impact (see **Table 7**) as set out below.

Table 7: Determination of the Severity Rating of the impact

Magnitude	High	Medium	Low	Negligible
Duration and/or Scale				
LT-LS, LT-MS or MT-LS	High	High	Medium	Negligible
LT-SS, MT-MS, MT-SS, ST-MS or ST-LS	High	Medium	Low	Negligible
ST-SS	Medium	Low	Negligible	Negligible

The next step is to define the probability of an impact to occur, as defined below (see **Table 8**).

Table 8: Defining the probability of the impact

Probability– *the likelihood of the impact occurring*	
High	Sure to happen, or happens often
Medium	Could happen, and has happened in Suriname
Low	Possible, but only in extreme circumstances

Finally, the overall significance of the impact is determined as explained below (see **Table 9**).

Table 9: Determination of the overall significance of the impact

Severity	High	Medium	Low	Negligible
Probability				
High	Major	Moderate	Minor	Negligible
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible

The overall impact assessment will be presented summarized using a table:

Project activity	Resources affected	Impact description	Likelihood	Characteristics and consequence	Impact significance	Mitigation measures	Residual impact

3. Legal and Institutional Framework

3.1 Introduction

This section provides a description of the regulations set by the Republic of Suriname for environmental protection and social planning relevant to the proposed Infrastructural Projects as well as the corporate standards that will be taken into account.

In addition to national regulatory requirements of Suriname, the ESIA is guided by relevant standards and guidelines of the Bank.

Suriname is also signatory to a number of international conventions that address environmental issues, which are significant drivers behind the development and implementation of environmental legislation.

In Suriname, responsibility for the management of the environment and natural resources resides within different ministries and government institutions. Some of the ministries have their departments represented within the districts.

All above aspects will be discussed below.

3.2 National Environmental Policy

The Suriname Constitution (S.B. 1987 no.116, as lastly amended by S.B. 1992 no.38) provides the legal basis for development opportunities and the protection of the environment in the country. In accordance with article 6a of the Constitution, the social objectives of the State are "to identify the development opportunities of the natural environment and to increase the capacity thereof". With regards to the protection of the environment, the Constitution specifies (article 6g) that "the State is responsible for the creation and promotion of the conditions necessary for the protection of the environment and the preservation of the ecological balance".

The Policy Development Plan 2017-2021 indicates that the energy policy will (among others) focus on:

- Accessible electricity supply for everyone who lives in the republic of Suriname;
- Promoting energy efficiency;
- Stimulating the use of renewable energy.

The current project fits within this policy.

3.3 National environmental legislation and guidelines

Suriname's environmental regulatory regime is not yet fully developed and there is no legislation dealing specifically with environmental management. Legislation regarding environmental and natural resource management is found dispersed between different pieces of legislation. In 1998, NIMOS was established with a mission to initiate the development of a national legal and institutional framework for environmental policy and management in the interest of sustainable development in the Republic of Suriname. It was in the year 2002 when NIMOS started the process to develop an Environmental Framework Act for Suriname. The legal and regulatory framework for environmental impact assessments in Suriname is governed by NIMOS using the generic Environmental Assessment Guidelines (2009). In October 2018, the Draft Environmental Management Act was submitted to Parliament for discussion. The Environmental Management Act will provide the legal base for the implementation of the Environmental Assessment Guidelines. It has a number of key provisions, among which are the following:

- Give effect within Suriname to many internationally-accepted principles of Environmental Law, including the principle of precaution, the polluter pays principle and the concept of environmental impact assessment;
- Introduce and give effect to the Environmental Impact Assessment Guidelines (see below);
- Enshrine the principles of access to information, participation and legal protection for the Surinamese public.

With respect to the current project, only these two pieces of legislation provide some guidelines for environmental management for the IDB/EBS Infrastructural works project. Other legal requirements include:

Electricity Act 2016 (Electriciteitswet)
This law fosters the availability, affordability and sustainability in the electric supply.

Law Energy Authority Suriname 2016 (Wet Energie Autoriteit Suriname)
This law aims at regulating and supervising the energy sector.

The Hindrance Act (Hinderwet)
(G.B. 1930 no. 64, lastly amended in G.B. 1972 no. 96)
The aim of this act is to prevent the cause of danger, damage or hindrance caused by undertakings (enterprises) to the outside-fence surrounding environment. According to the Hindrance Act, all new undertakings need a written 'Hindrance Act Permit' ('Hinderwetvergunning') issued by the District Commissioner (DC) who has to seek advice from the Bureau for Public Health, the Department of Labor Inspection, the Head of the Fire Department etc. A permit is given on terms which may include environmental requirements. In case of outside-fence hindrance caused by air pollution and noise, soil and water pollution and generation of solid or liquid waste, this act can be enforced. However, the act does not include detailed regulations and/or standards for these components.

This act is applicable for the construction of the transmission and distribution lines, but the ESIA procedure provides better guarantees that no hindrance is caused by the activity. Nonetheless a Hindrance Act Permit is required prior to the start of the activities. In practice, the DC requests advice from NIMOS in order to issue a Hindrance Act permit. If it is the advice of NIMOS to conduct an ESIA, the DC awaits the outcome of such an ESIA.

Building Act (Bouwwet)
G.B. 1956 no. 30, amended by S.B. 2002 no. 72
and Building State Order (Bouwbesluit)
G.B. 1956 no. 108

A building license from the director of the Ministry of Public Works, Transport and Communication is required for the construction (to place, to entirely or partially set up, rebuild, change or extend buildings or other works). All building plans are subject to approval of the ministry and are evaluated in accordance with the rules & regulations specified in the Building State Order.

State Order from 24 February 2010, implementing article 10 paragraph 3 of the Building Act (S.B. 2010 no. 27) (Staatsbesluit van 24 februari 2010, ter uitvoering van artikel 10 lid 3 van de Bouwwet).
This state order expands the scope of the Building legislation. According to article 1, the Building Act and Building State Order are applicable to the whole territory of the Republic of Suriname, with the exception that the customary laws of tribal communities will be respected. The provisions of the Building Act and Building Regulation will be applied if construction works shall have, measured from the exterior, a bigger size than 15 m2 (square meters) and are higher than 2.5 meters.

Furthermore, all activities carried out under the project must be subjected to national safety laws. The following laws and regulations are applicable to the project.

Police Criminal Law (Politiestrafrechtwet)
(G.B. 1915 no. 77 as amended by S.B. 1990 no.24)
This law contains many general environmental provisions with respect to public places, including waste disposal, noise, control of pests, hunting and fishing, water pollution, etc. Article 39a penalizes the disposal of waste in public places. Article 51 penalizes the contamination of a water resource.

Safety Act 1947 (Veiligheidswet)
G.B. 1947 no. 142 last amended by S.B. 1980 no. 116

This act regulates the prevention and limitation of accidents for all entrepreneurs in the areas of the avoidance or limitation of accidents and fires, stimulation of cleanliness, the prevention of damage to the health due to labor etc. In accordance to the act nine safety regulations were approved and three of these safety regulation are applicable to the project activities. Gaps, identified in the national safety regulations, are to be closed by adopting applicable modern international best practice.

Safety Regulation 1, regarding the prevention and limitation of accidents in all enterprises (Veiligheidsvoorschrift 1)
G.B. 1947 no. 168
According to the regulation, parts of machines or power tools (krachtwerktuigen) and instruments or manual tools (werktuigen) must be equipped with the necessary safeguarding to avoid potential dangerous exposure (article 1). When a machine starts up, people should stay away from any moving parts and out of the line of fire of that machine, or any moving parts for instance booms (article 6). Lifting material should be well-maintained and when load is lifted, sudden drop should be prevented, when dropping a load the dropping should be slowed down with brakes (article 13). All workers should have the disposal over appropriate protective equipment and suitable storage places should be made available at land, in the air and on water (article 40).

Safety Regulation 3 to provide first aid (Veiligheidsvoorschrift 3)
G.B. 1948 no. 183
Adequate and effective first-aid must be readily available, in order to be provided in case of accidents in any enterprises in which there is potential for injury from exposure to danger from activities that involve (*among others): hazardous substances, high temperature, driving gears, or implements set in motion by power tools. First aid kits or material should be stored properly in the interest of safety and hygiene (article 1). The first aid person must hold a certificate of competency issued by the Medical Inspector (article 7).

Safety Regulation 7 on Work Conditions (Veiligheidsvoorschrift 7)
S.B. 1981 no. 72
Equipment shall be constructed in such a way that they do not cause harmful or annoying noise or vibration when in operation, unless it is impossible or cannot reasonably be requested (article 21). The performance of work shall be such that it does not cause harmful or annoying noise or other harmful or annoying vibrations, unless it is impossible or cannot reasonably be requested (article 22).

State Order on Driving (Rijbesluit)
G.B. 1960 no 105 last amended by S.B. 2005 no. 17105 last amended by S.B. 2005 no. 17
The State Order on Driving is applicable when it regards transport of construction materials.
According to article 16, the load of a vehicle shall be placed in such a manner that no harm or danger can be caused to others. The load may not reduce the safety of the vehicle. If the road will be occupied more than usually, authorization from the DC, in whose resort the road transport will take place is obliged. With “more than usually” is meant:

- If the load is substantially wider than the distance between the wheels;
- If the speed is so slow that it can lead to traffic congestion;
- If it regards special vehicles, which are not intended for road traffic.

The Minister can prescribe allowable noise standards and carbon monoxide standards for exhaust fumes (article 31c) and the wearing of seat / safety belts is compulsory (article 32).

Finally, the following legislation has relevance for the Commewijne North area of the project.

Ordination Management Area North Commewijne/ Marowijne (Beschikking Beheersgebied Noord Commewijne/ Marowijne)
ARS. 2002 no. 94
Along the coastline of Suriname, economic activities such as shipping and navigation, fisheries, hunting, tourism and recreation take place. South of the mangrove belt, wetlands exist that provide the mangrove belt with the freshwater necessary for its vitality. In that southern area economic activities are increasingly taking place, such as impoundments and oil exploration.
In order to protect the integrity of the estuarine areas, (among others) the proposed North Commewijne-Marowijne Multiple-Use Management Area (MUMA) was approved by Resolution of the Minister of Natural Resources to establish the MUMA dated March 4, 2002 no 253/0085. By this Resolution, all state-owned land of the North Commewijne-Marowijne area was placed at the disposal of the Minister of Natural Resources. Mandate was given to the Nature Conservation Department (NB) of the State Forest Service (LBB) to manage the area as a Special Management Area ("Bijzondere Beheersgebied").

This Ministerial decision is of relevance, because a solar plant will be set up in Alliance, which is located within the boundaries of the North Commewijne/Marowijne MUMA. Further is referred to the **paragraph 5.11** on protected areas.

3.5 International Environmental Agreements

Treaties or conventions (verdragen) are international agreements concluded between States in written form and governed by international law. Suriname is signatory to a number of international environmental treaties. For the implementation of most of these treaties the enactment and enforcement of laws and regulations are also essential.
Although the project has some ground in common with a number of international agreements, none of these is of direct relevance to the project.

3.6 Corporate Environmental Policies and Standards

EBS has an Environmental, Health and safety (EHS) policy in place (see **Annex I**), which mentions that they are fully aware of their activities and the effect it could have on humans and the environment. In brief, the following is stated in the EHS policy:

- EBS will set up management systems in order to execute all their activities according to the national laws and regulations and particularly the Electricity Act.
- All employees should be aware of the EHS policy and put it into practice.
- EBS will continually strive for improvement in order to protect humans and the environment.
- EBS also has EHS requirements for the contractors, which the contractors should comply with (see **Annex I**).

Where national regulations are absent or not applicable, other international standards for transmission projects on health and safety will be considered by EBS. These standards are:

- International Electro Technical Commission (IEC);
- American National Standards Institute (ANSI);
- Institute of Electrical and Electronics Engineers (IEEE);
- International Finance Corporation (IFC) Standards.

Most of above standards refer to international standards reflecting agreements on the technical description of the characteristics to be fulfilled by the product, system, service or object in question, and to occupational health and safety standards.

Relevant for the current study are in particular the IFC Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution (2007), which present specific examples of Best Practice for Electric Power Transmission and Distribution projects.

The project specific IFC Guidelines will be used together with the General EHS Guidelines of IFC (2007).

3.7 International Standards and Guidelines for Project Evaluation

For the current project the Worldbank (WB) Source Book for Environmental Assessment could be used as a guidance document.

The Sourcebook (WB 1999) is a reference document that provides practical guidance for identifying and addressing negative (and positive) environmental impacts of development projects. The Sourcebook aims to collect all of the different WB policies, procedures, guidelines, precedents and best practice that reside in different WB publications into a single source. Included are guidelines for addressing specific ecological, socio-economic and other issues that may arise during an environmental assessment process, sectoral guidelines for environmental assessment and guidelines for the involvement of communities and NGOs in the process. For the current study, chapter 10: Energy and Industry, is of particular importance.

Another publication by the WB Environment Department is the Pollution Prevention and Abatement Handbook that focuses specific attention on pollution control (WB 1998). The handbook among others contains General Environmental Guidelines (GEG) used for general applications, but also sector-related guidelines e.g. for the onshore oil and gas development.

Recently (January April 2012) the International Finance Corporation (IFC), the private sector arm of the WB Group, has updated its Performance Standards (PS) aimed at specific industries or types of projects. These are used by the IFC to monitor a project's performance and set minimal acceptable environmental requirements in the case of IFC financed investment projects. These IFC Performance Standards (see **Table 10**) have become a benchmark for large private sector projects, especially in developing countries.

Table 10: Overview of the IFC Performance Standards and their objectives

Performance Standard	Objectives	Comment
PS 1: Assessment and Management of Environmental and Social Risks and Impacts	To identify and evaluate environmental and social risks and impacts of the project. To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment. To promote improved environmental and social performance of clients through the effective use of management systems. To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately. To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.	An Environmental and Social Impact Assessment was undertaken according to the Guidelines of NIMOS (2009)
PS 2: Labor and Working Conditions	To promote the fair treatment, nondiscrimination, and equal opportunity of workers. To establish, maintain, and improve the worker-management relationship. To promote compliance with national employment and labor laws. To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain. To promote safe and healthy working conditions, and the health of workers. To avoid the use of forced labor.	Basic principles regarding the objectives of this PS are laid down in the Constitution of Suriname. Suriname has ratified 30 conventions of the International Labour Organization (ILO), including conventions dealing with the objectives of this PS. Any health and Safety issues will be included in the HS plan that is to be prepared for the project, and which all parties including contractors involved in the different phases of the project up to and including commissioning and operation, would need to comply with as a minimum.
PS 3: Resource Efficiency and Pollution Prevention	To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities. To promote more sustainable use of resources, including energy and water. To reduce project-related GHG emissions.	Potential negative impacts to the environment, social conditions and human health are elaborated in the impact assessment of this ESIA, and mitigation measures are presented. An ESMP will be developed as required.
PS 4: Community Health, Safety, and Security	To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life, from both routine and non-routine circumstances. To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.	See comment for PS3.

Performance Standard	Objectives	Comment
PS 5: Land Acquisition and Involuntary Resettlement	To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs. To avoid forced eviction. To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) Providing compensation for loss of assets at replacement cost and, (ii) Ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. To improve, or restore, the livelihoods and standards of living of displaced persons. To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.	No land acquisition and involuntary resettlement is foreseen for the project.
PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	To protect and conserve biodiversity. To maintain the benefits from ecosystem services. To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.	Only modified habitats without significant biodiversity present in the project area.
PS 7: Indigenous Peoples	To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples. To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts. To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle. To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present.	No issues with the indigenous people in the project area are foreseen.
PS 8: Cultural Heritage	To protect cultural heritage from the adverse impacts of project activities and support its preservation. To promote the equitable sharing of benefits from the use of cultural heritage.	No cultural heritage has been identified, nor is it expected in the project area

The Performance Standards will be read along with their corresponding EHS Guidelines as published by the IFC. The EHS Guidelines contain the performance levels and measures that are normally acceptable to IFC and are generally considered achievable in new facilities at reasonable costs by existing technology.

4 Description of the Proposed Project

4.1 Site Location and Existing Conditions

4.1.1 Powaka- Zanderij transmission line project

The construction of a 33 kV transmission line from substation Powaka to substation Zanderij: the line will be constructed along the Afobaka Road, via the new road which is still under construction onto the JFK- Highway to substation Zanderij (see **Figure 6**)

The Afobaka Road is the connection road between the coastal plain and the interior (Brokopondo, Saamaka) Going from substation Powaka along the Afobaka Road to the intersection with the new road, wood log storage areas and some waterbodies (mined out sand pits) have been observed. Furthermore, scattered houses are present, with a concentration at Phillipuskondre. No other activities were observed within a radius of 500m. Electricity towers and poles with cables are observed along the west side of the road (161kV, 33 kV transmission line and a 12kV distribution line). On the east side of the road, signs for an underground fiber optical cable were observed. The traffic intensity can be seen as moderate to high.

The new road will form a new connection between Paramaribo and Wanica, and the international J.A. Pengel Airport. The road is expected to be completed in November 20201. A 100-meter-wide Right-of- Way has been cleared to accommodate the road. The road consists of 2 roadways, each having 2 lanes. The road will be 9.5 kilometers (km) long and about 35 meter (m) wide. In the middle there is a median strip with a width of 2 m. The shoulders on both side of the road are 5m each. There are ditches on both side of the road. The road crosses several swamp areas which will be connected through culverts below the road. A bridge of 70 m long is being constructed across the Para creek2. A 12 kV distribution line at the median strip will be used for street lighting. An underground connection will connect this 12 kV distribution line to the 33 kV transmission line. The 33 kV transmission line will be constructed on the south side of the road until the JFK- Highway. The road is uninhabited and vegetation has been observed on both sides of the new road transect. No other significant observations were done along this section.

Figure 6: The Afobaka Road-JFK Highway connection road under construction

[1] http://www.deboodschap.today/nieuwe-highway-wordt-een-feit/
[2] https://suriname-mirror.blogspot.com/2018/11/update-van-werkzaamheden-aanleg-nieuwe.html

After reaching the JFK Highway, the 33 kV transmission line will be further constructed on the east side of this highway till the substation at Zanderij. Along the JFK-Highway several residents, shops, schools and billboards have been observed in the immediate vicinity. Also there are several small access roads connecting villages such as Hanover and Witsanti. Along this part of JFK-Highway an existing 33 kV transmission line is observed (see **Figure 2**).

4.1.2 Koina Kondre project

The Koina Kondre project is projected along the Afobaka Road. A part of this project is in the district of Para and another part in the district of Brokopondo. Along this trajectory there is already a 161 kV and a 33 kV transmission line and a 12 kV distribution line on the west side of the Afobaka Road observed. The distribution line starts at Powaka, goes through Koina Kondre and extends to Marshall Creek. Within this stretch there are also several communities, wood log companies and storage areas, sand mining activities and waterbodies (abandoned sand mine pits) observed (see **Figure 3**). The Afobaka Road is equipped with traffic signs on both sides. On the east side of the road there are signs to indicate the presence of underground cable (fiber optic glass) from Telesur (Telecommunication Company Suriname).

The following pictures illustrate the existing conditions and observations done in the section of the Afobaka Road between substation Powaka and Koina Kondre:

Wood logging storage area along the Afobaka Road

Access road to Eco resort (Kraka) along the Afobaka Road

School along the Afobaka road (OS Afobaka Road)

Football field along the Afobaka road

4.1.3 Commewijne project

The Commewijne project comprises the following components:

- Construction of a new 33 kV overhead double circuit from substation Peperpot towards substation Mariënburg and Plantation Richelieu,
- The installation of a second underwater 12 kV cable from substation Mariënburg to Johanna Margaretha and
- The construction of a 200 kWp solar plant in Alliance.

Construction 33 kV transmission line substation Peperpot along Richelieu to substation Mariënburg

The 8.5 km of transmission line will run along the south side of the Hadj Soemitaweg (Oost-West Verbinding). Along the first 6 kilometers, some housing projects are found, but the section is dominated by forest and open fields. From km 6.0-km 8.5 continuous ribbon building is present, with many houses and some commercial activities. Signs indicate an underground cable (fiber optic glass). Overhead cables and normal traffic signs are also present. The road has a grassed shoulder and drainage canals of about 2.5-3m at both sides.

From there about 8.5 km, the transmission line will turn north and follow the main road of the Richelieu Housing project. After 3 km along this road, the southern boundary of the Mariënburg plantation is met, and from there the route will follow a plantation dam till the southern edge of the Mariënburg community (6.5 km). This section is uninhabited and has forest at both sides across the roadside ditches. The dam is currently is not accessible due to overgrown weed. The exact location of the transmission line still needs to be confirmed, but its final location will be in a similar environment. (see **Figure 4**)

Figure 7: Substation Peperpot

Figure 8: Sign for underground cable of Telesur

Substation Mariënburg:
The proposed substation Mariënburg is located south of the settlement of Mariënburg. It is planned at the end of the main road of Mariënburg. The road is in a good condition. The proposed substation site is currently an open field, with no activities. Between substation Mariënburg and Richelieu no activities are observed.

Installation of an underwater 12 kV cable from substation Mariënburg to Plantation Johanna & Margaretha.
A river crossing underwater cable is planned between the southern bank of the Commewijne River at Mariënburg, and the northern bank at Johanna Margaretha. The exact location of the start and end sites has yet to be determined, but these will be in small (5x5 m) open spots for which adequate options are available. No buildings, except for the water pumping station of SWM, are present in the surroundings of the Mariënburg jetty, where the cable will start. At Plantation Johanna & Margaretha that is located on the other side of the Commewijne River, right across Mariënburg, houses and shops are present near the jetty and along the main entrance, and a suitable location will be. Selected at the east or west of these buildings. Open space is available there (see **Figure 4**)

Construction of a 200 kWP Solar Plant at Alliance
The proposed solar plant is located near a former EBS office plant including generator house in Alliance. Currently, the area for the proposed plant is an open field with low vegetation. There are no residents living within 100 meter from the proposed site. (see **Figure 4**)

4.1.4 Brownsweg Solar Plant project

The solar plant project is projected along the Weg naar Atjoni (extension of the Brownsweg), 200-300 meters away from the check post of Stichting Bosbeheer en Bostoezicht *(Foundation for Forest Management and Production Control)*. The proposed size for the solar plant is 2 hectare (100 meters along the road and 200 meters away from it). See **Figure 5**.

The solar plant is planned at 600-700-meter west side of the Brownsweg community. It is located in an open area with no inhabitation, except for a small shed. There are several small scale mining and sand mining activities in the surrounding area. The road is equipped with traffic signs on both sides. Mostly above-ground cables are observed.

The pictures below give an overview of some of the observations along the Brownsweg:

Police station along the Brownsweg

Telesur underground cable along the Brownsweg

SWM underground transport pipes along the Brownsweg

Football field along the Brownsweg

	
Access road to community along the Brownsweg	**Finamatic and KKF (commercial activities) along the Brownsweg**

4.2 Project Components

The projects consist of the following components which are further described in the sections below.

4.2.1 Planning and preparation

As a first step towards the work, the key stakeholders are identified and contacted. EBS must undertake steps to plan and execute all activities in close cooperation with the relevant government departments for the required permits and 'no objection' statements, because the project will be executed in public space. The following procedures as a minimum are followed (email communication with Mr. Paal, Program Manager EBS):

- Investigation of the status of the land. Depending on this, the land is requested from the government or purchased from the owner or an arrangement is made. In the case of the Powaka area an agreement was signed with the community.
- With regard to the course of the electrical network, EBS avoids building over, or on the terrains of private individuals. The Right of Way for public roads is regulated from the Ministry of Public Works (OWTC).
- The EBS drawing room investigates what is underground for electrical cables and/or pipes and provides the relevant drawings. The utility companies are contacted for drawings of their underground network that relates to the project.
- HSEQ Department contacts NIMOS to comply with the Environmental conditions in accordance with them.
- The necessary permits are requested for, for example Building Permits, and if necessary, for example when building a power plant, the community in the area is informed about the project.

4.2.2 Construction of the transmission and distribution lines

Works will be carried out in a typical sequence of tasks. The first activity is the mobilization of materials, equipment and employment to the project area, followed by the land/vegetation clearance. Vegetation in the right-of-way3 is cleared and debris is removed to a disposal location (also see EBS waste management plan). In practice hardly any vegetation removal is required because the lines run along existing roads with a berm that typically has a grass cover. Incidentally low trees or crops may

[3] Strip of land required to install the transmission line and related equipment

be encountered. Depending upon their location (relative to pole locations) and height these may remain in place.

Sequence of activities, equipment and workforce:

- A hole is drilled into the ground mechanically or manually, depending on the type of pole (wooden/concrete) and type of soil.
- No foundation is necessary if a wooden pole is used, but a concrete pole requires a foundation for stability.
- A reel which consists of cables is placed in a trailer, and unrolled over a certain distance. The cables are lifted to the pole with a crane truck.
- If the cable is placed on the bracket, then it will be attached on the isolator and tied. Each pole consists of minimal 3 cables.
- Equipment that will be used for the works include drilling machine, pole master, flat-bed trucks (material transport), crane truck and wheel backhoe.
- The construction crew consists of EBS and contractor personnel, which depends on the type of project. If it is a turn-key project, the contractor is responsible for the execution of the project under supervision of EBS. If it is a self-execution project, EBS is responsible for the whole project.

The Powaka - Zanderij transmission line project and the Koina Kondre Project are in the same area and have similar construction activities, equipment and work force. The only difference is that for the Koina Kondre Project, the type of masts consists of concrete or galvanized steel poles of the type mono pole for the 12 kV. For the 12 kV the medium voltage XLPE - covered all aluminum alloy conductor SAX-W70, will be used. The distance between the 12 kV OHL masts is approximately 70 meters, while for the Powaka- Zanderij project the distance between the towers is 100m.

For the Commewijne project the type of masts consists of concrete or galvanized steel poles of the type mono pole for the 33 kV transmission lines. For the 33 kV lines the length of the poles is 15.7 meter (approx. 13 meter above ground level). For the 12 kV lines the length of the poles is approx. 12 meter (approx. 10.25 meter above ground level). The material of the conductor types for the 33 kV are Chickadee, Eagle, Panther or Dove. The distance between the 33 kV poles is approximately 100 meters. At this stage of the project, it is not yet determined what type of masts will be used (concrete or galvanized). On the basis of the mast type and soil investigation it can be traced / studied how the masts will be placed. The 12 kV distribution and 33 kV transmission lines will be placed separately.

4.2.3 Construction of underwater cable

For the 12 kV river cable a medium voltage armored XLPE insulated cable - transversally and longitudinally watertight – with 630 mm2 Aluminum conductor will be used. The type of equipment that will be used is horizontal directional drilling (HDD) equipment (see **Figure 10**). The Contractor United Caribbean Contractors (UCC) is appointed for the HDD. According to Mr. Gerard den Dekker of UCC, the underwater river cable will be about 920 meters. For this drilling (approximately 1000 meters) a larger controlled drilling machine will have to be introduced (temporarily). UCC can perform controlled drilling up to approximately 300 meters with their equipment. The drilling mud which is used by UCC is the Bentonite Clay (clay in powder form, mixed with water). Bentonite clay is basic and not harmful for the environment. The duration of the drilling of approximately 1000 meters is about 2 weeks.

The HDD process consists of three phases (see **Figure 9**):
- Pilot drilling
- Cleaning the drilling hole
- Inserting the production pipe/ PE pipe through the borehole

The cables can be pulled through the PE pipe

Figure 9: Phases of the HDD process

Figure 10: HDD Equipment used by UCC

Preference has recently been expressed for another method, namely cable on the river bottom (*Tel con with Mr. Richard Baidjnath-Panday of EBS, on the 10th of July 2019*).

4.2.4 Construction of solar plants

The general description of the activities regarding setting up of the solar plant are: land clearing, transport of equipment's, excavation, mounting structure, installing solar modules, DC cables, combiner box, string inverters etc., foundation, containers to store batteries, AC cables, AC lighting grid etc., testing, commissioning. The PV solar plant Brownsweg will be a grid tied 500 kWp power plant and the solar plant at Alliance 200 kWP. Approximately 2 hectare will be required, including space for energy storage and some capacity expansion (see **Figure 16**).

4.2.5 Schedule

Project	Time Schedule
Powaka-Zanderij transmission line project	The start of the construction of the transmissions line will be in the fourth quarter of 2020 and the duration is expected to be 4 years. The completion of the project is planned for the first quarter of 2024.
Koina Kondre project	
Commewijne project	The start of the construction activities will be in the fourth quarter of 2020 and the duration is expected to be finished in the first quarter of 2024.
Brownsweg Solar Plant project	The start of the construction of the solar plant will be in the second quarter of 2021 and is expected to be finished in the first quarter of 2023.

4.2.6 Operation

Once constructed, minimal maintenance will be required. Periodic inspections are necessary to ensure the reliability of electric service to the public. Any broken-down parts will be replaced, as required, for example the replacement parts that are creating noise hindrance. A general overhaul is not foreseen for the coming 20-25 years (this is an estimate and is significantly impacted by EBS planned maintenance program). Vegetation management may be frequently required in order to ensure adequate clearance between the conductors, the overhead transmission line and vegetation. Vegetation management will be undertaken in cooperation with all relevant institutions such as the Road Authority/Ministry of Public Works. The solar plant may require periodic maintenance.

4.2.7 Decommissioning

After the construction the right-of-way is restored and any project facilities, equipment and materials will be removed from the site if not needed. Operational activities may generate wastes (clearance of vegetation, replacement of broken parts). All waste will be handled according to the projects Waste Management Plan (EBS Waste Management Plan). Transmission lines and solar plants are likely to remain in place for a long time, so demolishing works are not included in the decommissioning.

4.3 Project Alternatives

This section describes the alternatives that have been considered to the proposed project. In the absence of any project specific alternatives, only the "No-Project Alternative" is described.

No-Project Alternative
The no-project alternative describes the consequences in case the proposed projects are canceled. This option would implicate that the reliability and security of electricity supply is not guaranteed which is undesirable. This may prevent an efficient development of the area and the communities, which includes not enough electricity to supply the households and businesses in the future.

5. DESCRIPTION OF THE EXISTING ENVIRONMENT

5.1 The bio-physical environment

5.1.1 Introduction

The current environment represents existing conditions including cumulative changes associated with past and present developments (e.g., forestry, agriculture, mining, transportation, residential and recreational development) and natural factors (e.g., fire). For assessment purposes, the baseline characterization represents as much as possible the conditions in 2019.

5.1.2 Climate

Most of Northern Suriname has a Tropical Rainforest Climate (Af climate in Köppen's classification; Amatali & Naipal 1999).
The average annual rainfall in the central part of northern Suriname predominantly ranges between 2,000 and 2,500 mm.
Like in most parts of Suriname, consistently high temperatures and a high humidity characterize the study area with the main variation being rainfall and the associated cloud cover. The mean annual air temperature at Paramaribo (Cultuurtuin) is 27.8 ºC, with a daily range of 9-13 ºC and an annual range of about 2 ºC.
The weather of Suriname is dictated mainly by the northeast and southeast trade wind system called the Inter-Tropical Convergence Zone ("ITCZ" zone also known as the "Equatorial Trough").
The ITCZ follows the sun in its movement to the north to about 15º latitude and to the south to about 10º latitude south of the Equator. The ITCZ passes over Suriname two times per year bringing heavy rainfall when it is overhead. This results in four seasons based upon rainfall distribution (Scherpenzeel 1977).

- Long Rainy Season End April-Mid August
- Long Dry Season Mid-August-Early December
- Short Rainy Season Early December-Early February
- Short Dry Season Early February-End April

Figure 11 shows the mean monthly rainfall for four selected stations across the project area over a longer period (data from www.meteosur.sr). The stations show annual totals between 2,172 and 2,512 mm.
Highest total average monthly rainfall is recorded during the months May, June and July, which are in the Long Rainy Season, and minimum values are found during the months September to November, which are in the Long Dry Season. All stations have the same seasonal distribution.

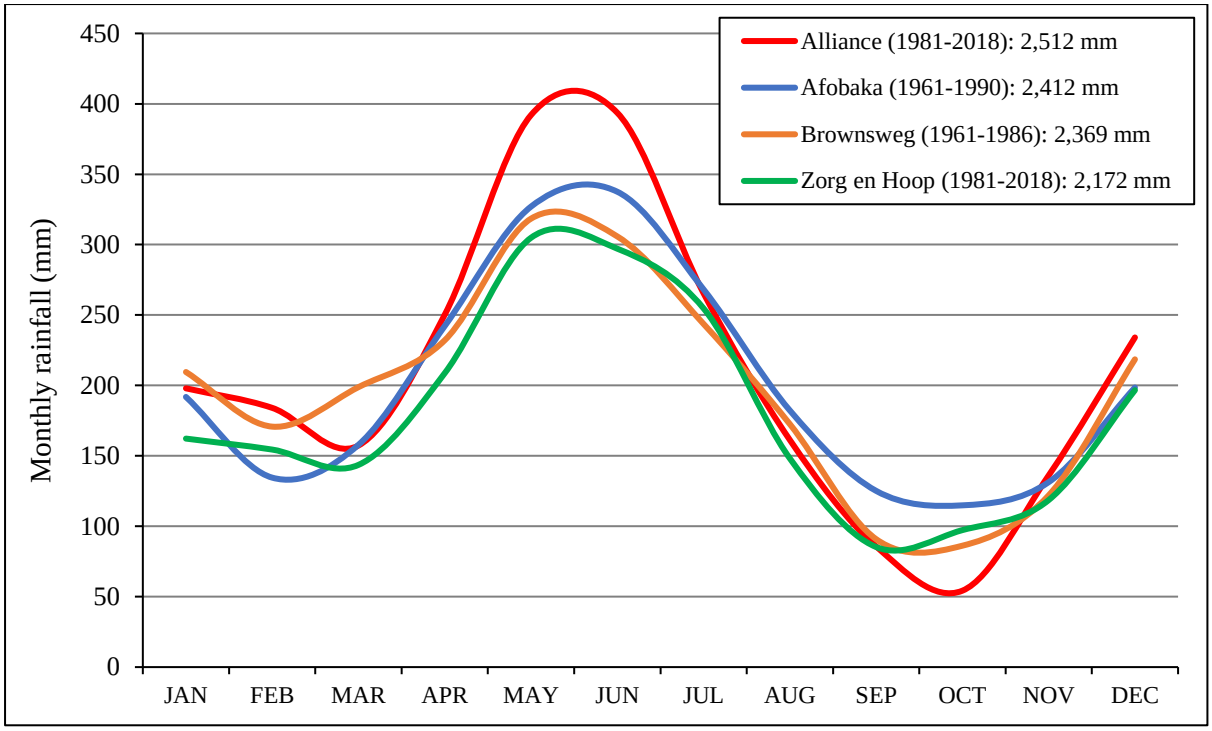

Figure 11: Long-term mean monthly and total annual precipitation for regional stations.

Northern Suriname has a northeast to southeast wind direction, with the first dominating in the February-April and the latter during the July-September period. The other months show directions mostly ranging between northeast and southeast. However, closer to the coast northeastern to eastern winds tend to dominate throughout the year.
Calm winds, i.e. winds with hourly average speeds less than 0.5 m/s, are very frequent. During the night and early morning, it is usually calm. During the day, the wind speed may increase to about 5 m/s, and in some seasons to 5-8 m/s, in particular in the February-April and the September-October periods. In the coastal zone, wind speeds are usually higher than further inland (Scherpenzeel 1977).
Wind speeds of 20-30 m/s have been occasionally recorded during thunderstorms, but only for a very short period (locally known as 'sibibusi'). Suriname is free of hurricanes.

5.1.3 Air quality

Suriname does not have air quality monitoring stations, so no ambient air quality data are available. For the current study a qualitative description and assessment of ambient air quality is made, based on sources of air pollution and climatological conditions in the respective project areas.

The area in which the Powaka-Zanderij, the Koina Kondre and Brownsweg projects are found does not have significant air quality issues, because much of the landscape outside the roads is relatively natural and undisturbed. Sources of air pollution in the area is traffic along the roads and emissions from vehicles and equipment working at sand mines and wood landing areas along these roads, in particular the Afobakaweg. Emissions from road traffic and the working areas are expected to be relatively low, due to the rather low intensity. The main roads are paved, but also unpaved side roads are found. Traffic along these roads will generate dust during dry periods. However, traffic intensity along these roads is very low and dust is quickly settling in the surrounding vegetation. Another source of air pollution are emissions from planes that land or depart from the international airport at Zanderij. But as a result of the dominating (north to south) eastern winds, these emissions are mostly blown away from the study area. And flight intensity is low. Finally, there is incidental and local generation of airborne particles and smoke as a result of burning of vegetation debris as part of the shifting cultivation. Such burning is usually done during the Long Dry Season. There are no industrial air pollution sources in the wider area.

In conclusion it can be stated that there are no major human-made influences on air quality and that air quality in this area is relatively good.

With respect to air quality, similar conditions and sources are present in the area of the Commewijne project. However, traffic intensity along the Oost-West Verbinding is higher than that of the roads in the previous area. But overall, also for the Commewijne study area it is concluded that there are no major human-made influences on air quality and that air quality in this area is relatively good.

5.1.4 Noise

Noise records taken along main roads in Suriname show that daytime LAeq levels range between 56.0 and 70.4 dBA (see **Table 11**). The variation in LAeq levels is mostly the result of traffic intensity and type of vehicle, but also speed and road type will play a role. Overall it can be concluded that all LAeq levels surpass the WHO/IFC daytime standard of 55 dBA for residential sites (IFC, 2007).

Table 11: Results of noise measurements along main roads in Suriname

Road	Daytime LAeq level (dBA)	number of measurements	Source
Afobakaweg (rainy season)	63-68	3	ILACO 2017
Afobakaweg (dry season)	56-66	3	ILACO 2017
Martin Luther Kingweg	65-66	2	ILACO 2018
Wayamboweg	66-71	5	ILACO 2018
Winston Churchillweg	69-70	2	ILACO 2018

It should, however, be noted that measurements were typically done at a distance of 8-10 meter from the road, while most houses are farther away. These will thus be exposed to lower noise levels, depending upon their distance from the road.
The above noise levels are considered to be representative for the baseline levels in transects for most of the proposed transmission line projects. An exception will be formed by the Richelieu-Mariënburg line, which will run through a more rural area. Data for such areas are presented in **Table 12**.

Table 12: Results of daytime noise measurements in rural areas and communities in Suriname

Road	Daytime LAeq level (dBA)	number of measurements	Source
Powaka (small community)	43-44	1	ILACO 2017
Nieuw Nickerie (residential)	46-55	5	ILACO 2015
Ornamibo (rural)	51-53	2	ILACO 2018
Gangaram Pandayweg (rural)	48-55	2	ILACO 2018
Winston Churchillweg (rural)	52-56	2	ILACO 2018

From this table it is clear that noise levels in residential and rural areas and in small communities are much lower than along the main roads. The LAeq levels are almost always below the WHO/IFC daytime standard of 55 dBA for residential sites (IFC, 2007).
Such noise levels are considered to be representative for the daytime baseline levels in the areas where the solar plants and the substation will be constructed.

5.1.5 Land and soil

5.1.5.1 General

Four major geographical zones can be distinguished in Suriname (Noordam, 1993), which are reflected in **Figure 12**.

1. The Precambrian Guiana Shield area, commonly also known as the Interior, the Interior Uplands, or the Hill and Mountain Land.
2. The Zanderij Belt (also known as the Cover or Savanna landscape) formed on Late Tertiary braided river deposits. This belt forms an undulating to rolling lowland plateau, which is characterized by localized patches of savannah forest.
3. The Pleistocene Old Coastal Plain formed on sandy and clayey marine deposits. This plain is low-lying and flat to very gently undulating.
4. The Holocene Young Coastal Plain also formed on sandy and clayey marine deposits. This plain is flat to nearly flat and very low-lying. It is characterized by extensive wetlands.

Proposed projects are found within all four zones.

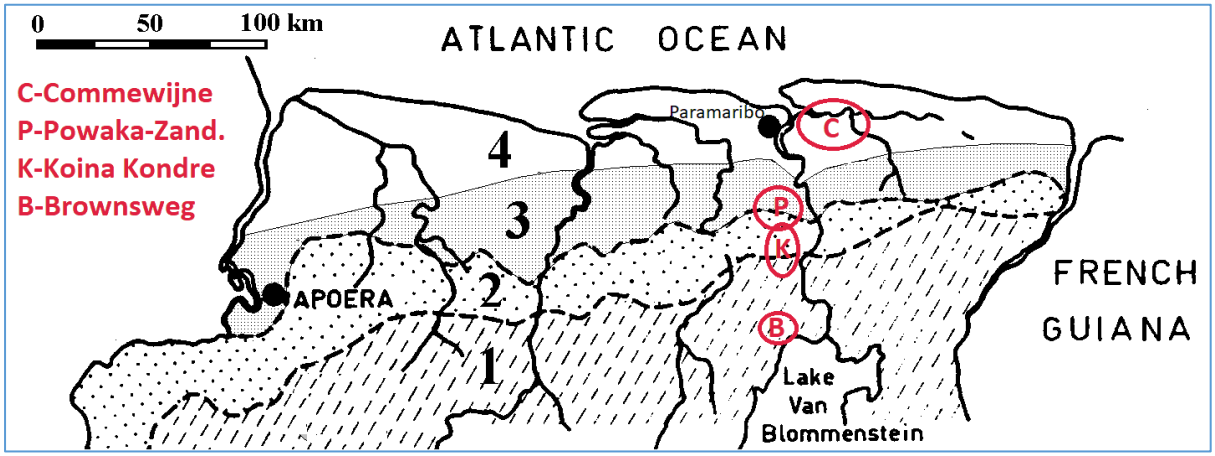

Figure 12: The four major physiographic regions of Northern Suriname

5.1.5.2 Description of the landscapes and their soils

The Young Coastal Plain is a flat and low-lying (0-4 m above mean sea-level) plain along the Atlantic Ocean. It is dominated by marine clay flats with the major part having elevations around 1.0 (± 0.5) m above mean sea-level. These areas are flooded in the rainy seasons, and often also part of the dry seasons, thus forming extensive swamps with peat formation. The heavy clay soils of the Young Coastal Plain are fertile, but they have moderate to poor physical properties, such as low permeability. Locally, the clay flats are alternating with east-west running sand, shell sand or shell ridges (former beaches), which are mostly up to 1-2 meter above the surrounding clay flats.

Parts of the coastal swamps have been developed into polders. In the Commewijne study area such development took place since the 17th century to form plantations for dryland cropping (sugarcane, cacao, coffee, cotton). The Polder Landscape is characterized by water management structures, such as sluices, dams and dikes, canals, ditches and a system of cambered beds and trenches. Plantation clays are usually completely ripened. Peperpot, La Paix, Richelieu, Mariënburg, Johanna Margaretha and Alliance are all old plantations. All planned project activities for the Commewijne project will occur within such old plantations, usually on clay soils, but along the Oost-West Verbinding also sandy ridges are found. Narrow ridges are crossed by the transmission line from Richelieu to Mariënburg.

The Powaka-Zanderij transmission line crosses the River Landscape. This landscape forms a narrow strip along all the Para River. Silting up has occurred till approximately 1 m above mean sea-level. The narrow silty clay levees are only inundated during spring tide. The heavy clay back swamps are

inundated during part of the rainy season, and after spring tide at high river discharge levels. The properties of the soils of this landscape are similar to those of the marine clays.

The Old Coastal Plain forms a discontinuous belt of erosion remnants of a formerly continuous coastal plain at 4 -to 11 m above mean sea-level, separated by deep swampy gullies filled with early Holocene peat and clay (Veen 1970). The Powaka-Zanderij transmission line crosses the *Para or Old Sea Clay Landscape*. The Para Landscape is an almost level landscape at 4 to 7 m above mean sea-level. The landscape is characterized by almost flat, low plateaus, bounded by gullies. The soils of the plateaus comprise imperfectly to poorly drained silts to compact silty clays. Soil fertility is moderate to low, but the compact nature of the silty clays forms a major constraint and only soils with a silty to loamy topsoil have some potential for agricultural use. The soils of the swamp gullies are situated slightly above mean sea-level and filled with Early Holocene peat and soft clay.

Plantations are also found in the Para District, but these were mostly wood logging plantations and no water management system with ditches and canals is present. Excess water in this landscape drains from the higher land into the surrounding swamps. The road connecting the Afobakaweg with the JF Kennedy Highway runs through the Hanover and Mawakabo plantations.

The Zanderij Belt is a gently rolling plateau landscape dipping to the north. Its elevation varies between 10 and 50 m. The landscape is characterized by white sands (podzols), and yellowish brown sands and loams. White sands dominate in the area of the Powaka-Zanderij and the Koina Kondre transmission lines. Most white sands here are excessively drained, but very locally imperfectly drained sands are found, due to the presence of a hardpan (>2 meter depth). The soils of the Zanderij Belt are poor to very poor (white sands).

The Brownsweg solar project is located within the Guiana Shield area, while also the southern tip of the Koina transmission line touches the Shield. This part of the Shield area is characterized as undulating and rolling lowland, with an elevation mostly between 25 and 50 meter above mean sea-level. The selected Brownsweg site is situated in a savanna within the Sabanpasi landscape.

The soils of the Precambrian basement are predominantly developed in the loose regolith that covers the underlying rock. The weathered parent material is already strongly leached and poor in nutrients, and thus the soils that develop from it are mostly poor as well. The physical characteristics of these soils are generally favorable, due to actively burrowing soil fauna and the non-swelling type of clay minerals. Drainage depends on position on the slope and soil texture: soils on higher positions are usually well drained. Imperfectly drained soils occur on plateaus in gently undulating landscapes and at the foot slopes of hills. The soils at the proposed site are characterized as *"Imperfectly drained loamy sand and clay, often gravelly".*

5.1.6 Hydrology

The soils in the study areas in the Young and Old Coastal Plain are mostly imperfectly to poorly drained, with a shallow groundwater level during the rainy seasons. Smaller sections in the Old Coastal Plain are covered by swamps that are flooded during the rainy seasons. Drainage of the land in inhabited zones within the coastal plain occurs through a system of trenches, ditches and canals that carry excess water though sluices or by pumps to the main rivers in the area.

Transmission lines will be constructed along roads in the area. All roads in the coastal plain have roadside ditches at both sides for drainage of excess water from the road. In the Commewijne District these ditches drain into canals and ultimately to the Commewijne or the Suriname River.

In the Para District (Old Coastal Plain) the roadside ditches discharge directly into the Para River or into a nearby swamp area.

The soils in the concerned Zanderij Belt and Guiana Shield areas, are mostly well drained with deep (>1 meter) groundwater. Excess water is drained from the area by groundwater flow towards nearby creeks or swamp areas, and from there to a nearby river. Except for the area west of Brownsweg, which flows through the Mindrineti Creeks towards the Saramacca River, all discharged excess water from the projects in these zones ends up in the Suriname River.

The only major waterways in the project areas are the Para River (20-25 meter wide) that is crossed by the Powaka-Zanderij transmission line, and the Commewijne River (about 1 kilometer wide), below which an underwater cable will be installed. The Commewijne River is a tidal river with strong ebb and flood currents in its lower section where the project is found. The tidal range at its mouth is 1.9 meter.

5.1.7 Water quality

Being close to the Atlantic Ocean, the water quality of the Commewijne River near Mariënburg is strongly influenced by the intrusion of sea water into the river estuary. During high tide the river water is brackish and turbid. During ebb tide the salinity and suspended solids decrease due to dilution with fresh upstream river water.

The water of roadside ditches and canals in the inhabited sections of the Commewijne study area may to some extent be contaminated as a result of discharge of sewage, road and berm runoff water, and littering and waste disposal into the water. No systematic data are available, but – except for locally concentrated solid waste in the water - the degree of contamination is thought to be limited because highest inflow occurs during heavy rainfall events, when dilution and discharge is highest.

The Powaka-Zanderij transmission line will be built along a new road. This road is currently under construction and no houses are yet found here. But it is to be expected that building will start soon after opening of the road. In combination with the developing traffic streams, it is expected that water quality conditions will become similar to those in the Commewijne study area. However, overall contamination here is expected to be even less, because population density and activity levels will be lower.

The road sections with a transmission line that cross the Zanderij Belt are predominantly found on the watershed between the main creek catchments and no major creek are being crossed. No significant open water is found near the road, except for some shallow abandoned mine pits.

The proposed Brownsweg solar plant site is located about 1 kilometer to the west of the village. Many creeks in the surroundings of Brownsweg are already severely contaminated as a result of uncontrolled small-scale goldmining. Such creeks have a high turbidity, while some contamination with mercury is likely. Mines are present within 2 kilometer of the proposed solar plant site.

5.1.8 Vegetation

All transmission lines for this project will be constructed at the shoulders of roads. These shoulders are covered with a low grass and herbs vegetation (see **Figure 13**).

Figure 13: Low grass and herbs vegetation along the Afobaka Road

The proposed site for the Alliance solar plant (see **Figure 14**), as well as the proposed substation site at Mariënburg (see **Figure 15**) and the riser pole sites for the underwater cable, are located in abandoned agricultural land with a low vegetation of mainly grasses and herbs, and scattered bushes and shrubs.

Figure 14: Alliance solar plant proposed site

Figure 15: Mariënburg substation proposed site

The Brownsweg solar plant is situated in a savanna area (see also below) of the Sabanpasi landscape (see **Figure 16**). Savannas do not naturally occur in the Tropical Rainforest Climate of Suriname. The savannas in Suriname are the result of regular burning of poor (xerophytic) vegetation types on soils with adverse conditions (like extremely poor soils, soils with strong alternation of dry and wet conditions and/or very compact soils). Fires are usually started by human, but also lightning is known to start bush fires.

Figure 16: Brownsweg solar plant proposed site

In conclusion it can be stated that no natural or old secondary vegetation is found within the footprint of the project.

5.1.9 Ecosystems

The ecosystems/habitats along the transmission line trajectories and around the solar plants could be affected by project activities. Therefore, the ecosystems till 100 meter from the project sites is described.

5.1.9.1 Commewijne project

The ecosystems map by Teunissen (1978) shows only *"Ecosystems of urban areas, farmland, livestock meadows, forest plantations, mining areas and abandoned fields"* for the Commewijne project study area. The abandoned fields in the study area refer to abandoned plantations. Forested sections are presented in **Figure 17**. Forest is still encountered along about half of the transmission line between Peperpot and Mariënburg. Most of this forest is found at the abandoned plantations Peperpot and Mariënburg. These plantations have been abandoned for about 20-25 years. Peperpot was a coffee and cocoa plantation and at Mariënburg sugarcane was cultivated. At both locations old secondary marsh forest is found on imperfectly to poorly drained clay soils. Marsh forest in Suriname is known as *"drasbos"*. Marsh forest is the climax forest on imperfectly drained soils which have a high water table in the rainy season and which do not desiccate during the dry season; and Swamp Forest is the climax forest on poorly and very poorly drained soils, almost permanently submerged, and with a water-saturated peat layer during dry seasons. The dominating species at Peperpot is Kofimama (*Erythrina glauca*), still with coffee and cocoa in the sub growth. Kofimama was used as a shade tree for the latter crops. At the other forested locations Mira Udu (*Ant tree; Virola surinamensis*), a pioneer species for this type of forest, is dominating.

At Alliance riverside mangrove forms the natural vegetation along the Matapica Creek. It is growing outside the dam that protects the plantation from flooding. Its closest point is at 50 meters from the proposed solar plant site.

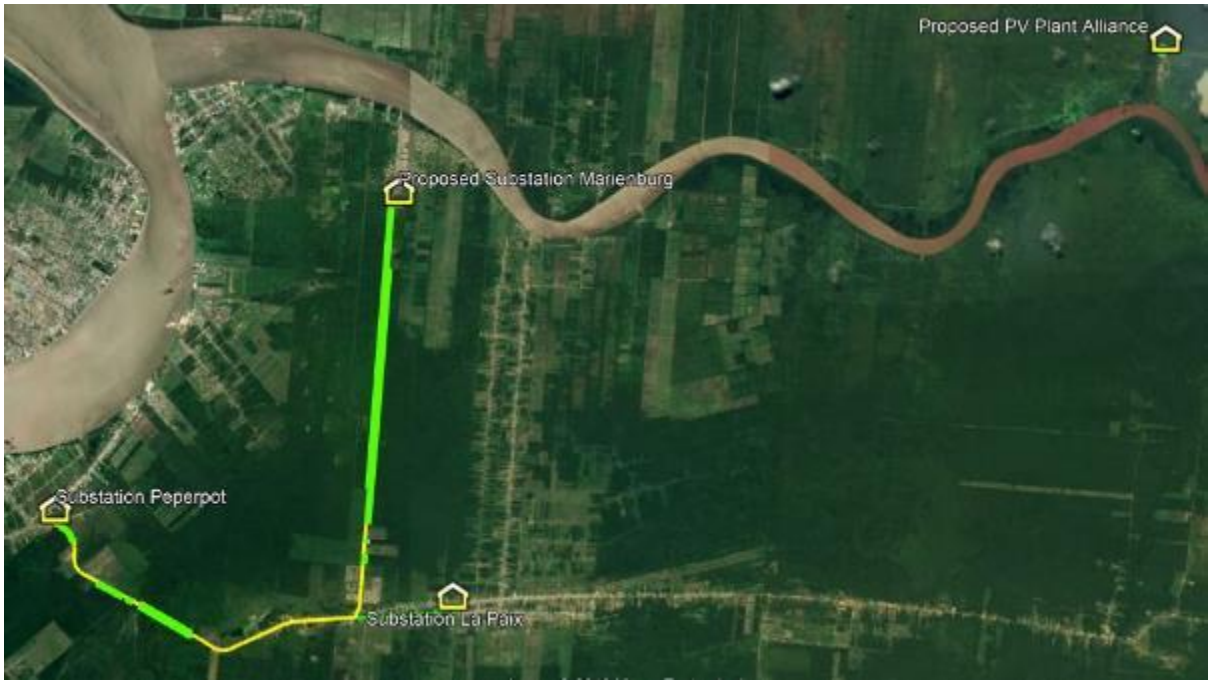

Figure 17: Forested stretches (green lines) along the transmission lines of the Commewijne project

5.1.9.2 Powaka-Zanderij transmission line

Part of the ecosystem map of Teunissen (1978) is shown in **Figure 18**.
Starting at the Powaka substation, the first 2.0 kilometer runs through the Zanderij Belt, with forest directly along the road corridor (units 56 and 60). For the legend is referred to **Table 13**. Forest is still present on recent Google imagery (September 4th 2016), but signs of sand mining can also be observed in this stretch.

From about kilometer 2, the transmission line runs for about 8.5 kilometer through the Old Coastal Plain. The higher parts of this plain are here covered by *"Mixed mesophytic dryland and marsh forest"* (unit 39). Based on information from Google (image September 4th 2016) it is concluded that within this stretch, a secondary type of this forest is also found on unit 66, *"Ecosystems of urban areas, farmland, livestock meadows, forest plantations, mining areas and abandoned fields"*. Shifting cultivation fields are present around the small community of Philipus Kondre.

About 2.2 kilometer of the road connecting the Afobakaweg with the JF Kennedy Highway crosses through swamps, of which about half is covered by swamp forest or swamp wood, and the remaining distance with open grass swamps (see **Table 14**). Swamp forest is the climax forest on poorly and very poorly drained soils, almost permanently submerged, and with a water-saturated peat layer during dry seasons.

The last 2.4 kilometer of the connection road runs again through the Zanderij Belt, with open savannas (unit 58) and dryland forest (unit 60). See **Table 13** for legend. Some shifting cultivation is observed in the forest zone.

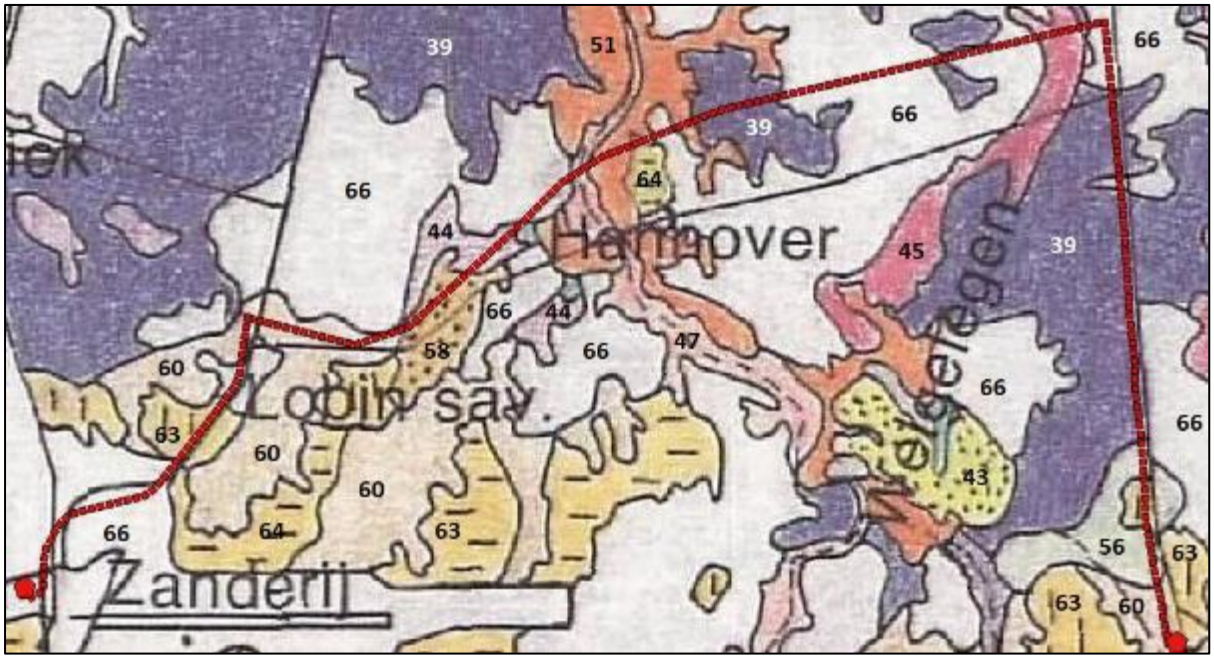

Figure 18: Ecosystem map for the Powaka – Zanderij transmission line (after Teunissen 1978); legend see Table 13

Table 13: Ecosystems of the plateaus and slopes of the Zanderij Belt (Teunissen 1978)

56.	Predominantly mixed mesophytic dryland forest, in W.Suriname locally dominated by *Aspidosperma excelsum*, *Mora gonggrijpii* or *Ocotea rodiaei*
58.	Dry brown sand savannas: short grass savannas with scattered gnarled treelets and bushes
60.	Predominantly mixed xerophytic dry- and marshland forest, locally dominated by *Eperua falcata*, *Dimorphandra conjugata* or *Swartzia bannia*
61.	Xerophytic dryland forest, dominated by *Dimorphandra conjugata*

62.	Xerophytic dryland- and marshland wood, locally dominated by *Dimorphandra conjugata*, *Swartzia bannia*, *Clusia fockeana* a.o.
63.	Dry white sand savannas of Cassipora type: short grass savannas with scattered scrub and bushes
64.	Marshy white sand savannas of Zanderij type: short grass savannas with scattered scrub and *Mauritia flexuosa*-palm galleries

Table 14: Ecosystems of the swamps of the Old Coastal Plain (Teunissen 1978)

44.	Hydrophytic swamp forest with Virola surinamensis, Symphonia globulifera (and Euterpe oleracea)
45.	Hydrophytic swamp wood, dominated by *Pterocarpus officinalis*
47.	Xerophytic swamp forest and wood, with *Crudia glaberrima* and *Macrolobium acaciifolium*
51.	Grass swamps, mostly dominated by Lagenocarpus guianensis / Rhynchospora gigantea or Eleocharis interstincta; also fern swamps, dominated by Blechnum indicum

The last 3 kilometers of the Powaka-Zanderij transmission line runs along the JF Kennedy Highway towards Zanderij. Natural ecosystems are indicated in **Figure 18**, but most has been cleared over the past 40 years to make room for community development (Google image September 4th, 2016).

5.1.9.3 Koina Kondre transmission line

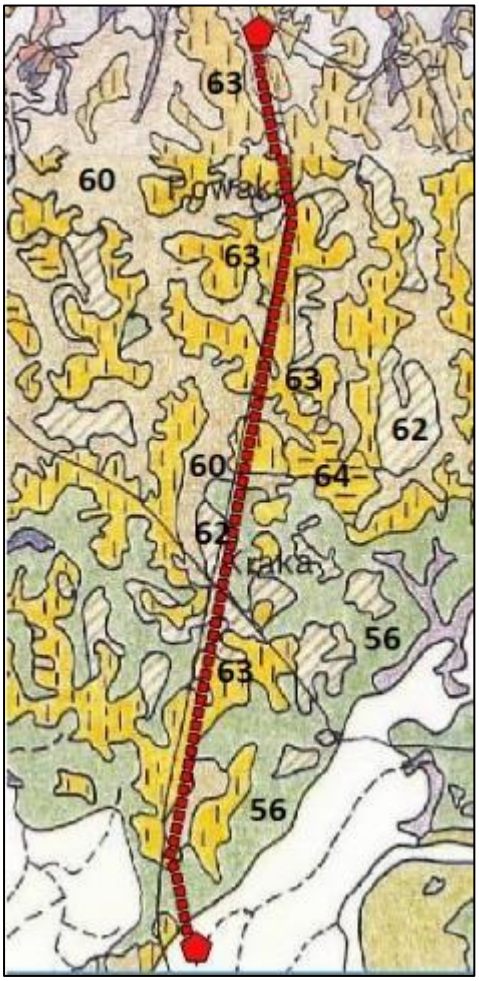

Figure 19: Ecosystem map for the Koina Kondre transmission line (Teunissen 1978)

Except for the last 500 meter, the Koina Kondre transmission line runs through the Zanderij Belt. The great majority of ecosystems comprises of dry savannas (unit 63), with minor sections crossing dryland forest (unit 56) or savanna forest (unit 62) (see **Figure 19**). Dryland forest is the climax forest on well to moderately well-drained soils, as well as on imperfectly drained slope soils. Soils are never saturated during rainy seasons and never desiccate during dry seasons. Savanna Forest (xerophytic forest, associated with the presence of savannas) is the climax forest on excessively drained or impermeable soils which desiccate during dry seasons. In the section from the Powaka substation to Kraka many sand mines have been established to mine the white sand that is used as fill sand. Abandoned mines are characterized by a criss- cross landscape with sand heaps, dams and shallow ponds.

In the section between Kraka and Koina Kondre many houses have been built with shifting cultivation fields nearby (Google image September 4th, 2016).

5.1.9.4 Brownsweg solar plant

There are no existing ecosystem maps for the Brownsweg area. Therefore, the ecosystems were determined from Google interpretation and a field check.

The results for a 200-meter radius around the center of the proposed site is presented in **Figure 20.** The site is located in an open savanna with scattered shrubs and Morisi *(Mauritia flexuosa)* palms along wet zones, including a smaller area with a low to moderately high savanna forest.

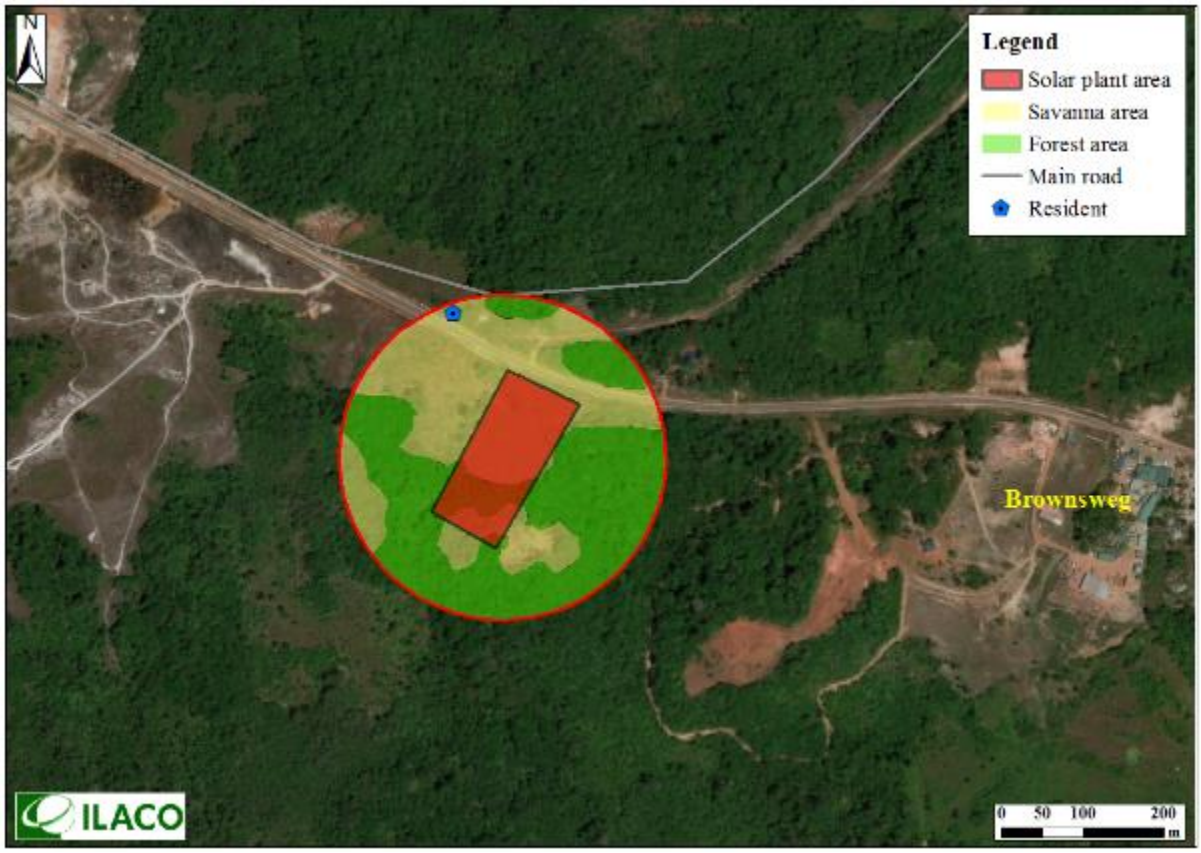

Figure 20: Ecosystems around the proposed solar plant site near Brownsweg

5.1.9.5 Conclusion

With the exception of the *"Dry brown sand savannas: short grass savannas with scattered gnarled treelets and bushes"* (unit 58) all of above discussed ecosystems are very common in northern Suriname. The savanna of unit 58, known as the Lobin Savanna, has only three counterpart areas in Suriname, covering a combined area of 30 sq. km. One site with this ecosystem is protected in the Coesewijne Nature Reserve (see below: protected areas). The Lobin Savanna is already under pressure by human activities, like agriculture, cattle grazing and rally events. Also all other above described ecosystems are present in one or more of the established lowland or upland nature reserves.

5.1.10 Wildlife

5.1.10.1 Terrestrial and amphibian animals

The fauna in the project area is expected to be typical for man-made and man-affected ecosystems, with animal species that are adapted to/tolerating, or able to cope with the presence of men in general, forest clearing, bush fires (habitat destruction), noise, road kills, hunting and fishing pressure, and trapping.

Many of the larger terrestrial mammals are hunted throughout Suriname (such as monkeys, tapir, deer, peccaries and large rodents). In northern Suriname, hunting, as well as live animal collecting, typically occurs along important access routes, such as all-weather roads, rivers and larger streams. The more densely populated and urbanized areas tend to lack large mammals, due to past and current hunting and current scarcity of suitable habitats.

But as soon as some degree of protection is in place, many animals can be observed. For instance, at the Peperpot Nature Park (see below: Protected areas) in addition to many birds (see below: Birds), visitors can encounter monkeys (common squirrel monkey and brown capuchin), the giant anteater and

the common tegu, while trapping cameras have captured jaguars, ocelots and a puma. In addition, observations comprise agoutis, deer and tapirs.

Animals that are commonly encountered near inhabited zones are several species of reptiles (snakes, lizards, toads, frogs and caimans), sloths and opossums.

The focus will here be on large terrestrial mammals that are endangered, threatened, or vulnerable (listed as such by IUCN and/or listed on CITES Appendix I). Such mammals should be considered most vulnerable, and impacts of the project on their populations should be voided, prevented or compensated for.

For Suriname, 192 mammals are known (Lim et al. 2005), of which 37 can be considered large terrestrial mammals (average live body mass of at least 2 kg).

Species of concern are those large terrestrial mammals known to occur in the area likely to be affected by the project that are considered endangered, threatened, or vulnerable by IUCN (see IUCN Red List) or are listed on CITES Appendix 1. These species are shortlisted in **Table 15**, which also provides details on their IUCN and CITES status.

Table 15: Endangered, threatened and vulnerable large terrestrial animals that are known to occur in the wider area that will possibly be affected by the project (based on IUCN and CITES listing).

Scientific name	English vernacular name	IUCN	CITES
Lontra longicaudis enudris	Neotropical (Guiana) Otter	NT - Near Threatened	Appendix I
Panthera onca	Jaguar	NT – Near Threatened	Appendix I
Leopardus tigrinus	Oncilla	VU – Vulnerable	Appendix I
Tapirus terrestris	Lowland Tapir	VU – Vulnerable	Appendix I
Ateles paniscus	Guiana Spider Monkey	VU – Vulnerable	Appendix II
Myrmecophaga tridactyla	Giant Anteater	VU - Vulnerable	Appendix II
Leopardus pardalis	Ocelot	LC – Least Concern	Appendix I
Caiman crocodilus	Spectacled caiman	LC - Least Concern	Appendix II
Cebus apella	Brown Capuchin		Appendix II
Tupinambis nigropunctatus	Common Tegu		Appendix II

It should be noted that there is not necessarily a considerable threat to the survival of these species in Suriname. Quite to the contrary, most of them face only limited threats in Suriname and neighboring Guiana Shield territories, fundamentally because of low overall human population size. However, in the coastal zone of Suriname, especially in areas that are converted and have high human population densities, species are under some pressure.

5.1.10.2 Birds

By the end of April 2018, the total number of species of birds for Suriname is standing at 752 (http://www.surinamebirds.nl/, accessed July 6, 2019). According to BirdLife International (2019) there are 587 land birds, 19 sea birds and 106 water birds. About 50 species are endemic to the Guiana Shield, but none to Suriname. There are 202 migratory species of birds.

Two species in Suriname are endangered according to the IUCN Redlist. These species are not encountered in manmade areas. Another 9 species are listed as vulnerable, but these species are usually found outside of manmade zones, while some are still common in Suriname. Some may enter manmade zones, but are not depending upon this.

Birdwatcher's hotspots in the study area are the Peperpot Nature Park (see below: Protected areas) with 305 spotted bird species and the Hanover (or Lobin) Savanna. The connection road between the

Afobakaweg-JF Kennedy Highway under construction crosses this savanna area and will already have some impact to bird life in the area.

The estuarine zone (mudflats, mangroves and lagoons) along the Surinamese coast may be considered as one of the principal South American wintering grounds for southern and northern migratory shorebirds. The southern boundary of the estuarine zone in Commewijne is at least 7 kilometers away from the nearest transmission line to be constructed. During the spring, the migratory birds remigrate to their breeding grounds, and by the end of the summer they return, later followed by their young, to Suriname.

Numbers of shorebirds vary greatly throughout the year, with peak numbers during the southbound (July–November) and northbound (February–May) migration periods. Many species, however, are also present in relatively high numbers during the northern winter and summer periods. Some migratory paths may cross with projected transmission lines, but flying height of the migratory birds is far above the surface.

5.1.10.3 Conclusion

Given the location of the transmission routes, the solar plants and the substation site in inhabited zones, along main roads and/or in zones with active land use, no threatened, endangered, or vulnerable plant or animal species are to be expected within or adjacent to the project area. An exception could be there for an occasional jaguar, for which it is known that they venture into rural areas every now and then.

5.1.11 Protected areas

Since 1966 fifteen protected areas have been established in Suriname, in total covering approx.13% of the land surface of Suriname. The protected areas comprise 11 Nature Reserves (NR's) and 4 Multiple-use Management Areas (MUMA's). In addition, there is also a Nature Park (Brownsberg) (see **Table 16**). In the Interior Uplands large areas with tropical rainforest and some savanna areas have been reserved as nature reserves or park. In the Young and Old Coastal Plain protected areas cover an area of over 2,500 sq. km.

Along the coast the main purpose of these nature reserves is to protect the enormous numbers of migratory and resident waterfowl, and to protect the major sea turtle nesting beaches. Elsewhere in the Coastal Plain the conservation of special ecosystems and vulnerable species is the main motive for protection. As it was recognized that protection of a small part of the coast was not adequate to meet the overall goals, the concept of "Multiple Use Management Areas" (MUMA's) has been adopted. MUMA's are defined as areas where special management by or on behalf of the Government is needed for a rational use of the natural resources, which includes the protection of vulnerable ecosystems and species.

Figure 22 presents an overview of all protected areas in Suriname.

Alliance is situated within the MUMA zone, but MUMA's officially cover only free domain land, and domain land that has been issued after this Ministerial order came into effect (2002 for North Commewijne-Marowijne MUMA). That means that domain land that had been issued before this Ministerial Order came into effect, is not a part of the MUMA. The latter applies also for Alliance and all other plantations along the right bank of the Commewijne River.

The Peperpot Nature Park is a privately owned nature park (not shown in below figure) under the management of the Peperpot Nature Forest Foundation (see **Figure 21**).

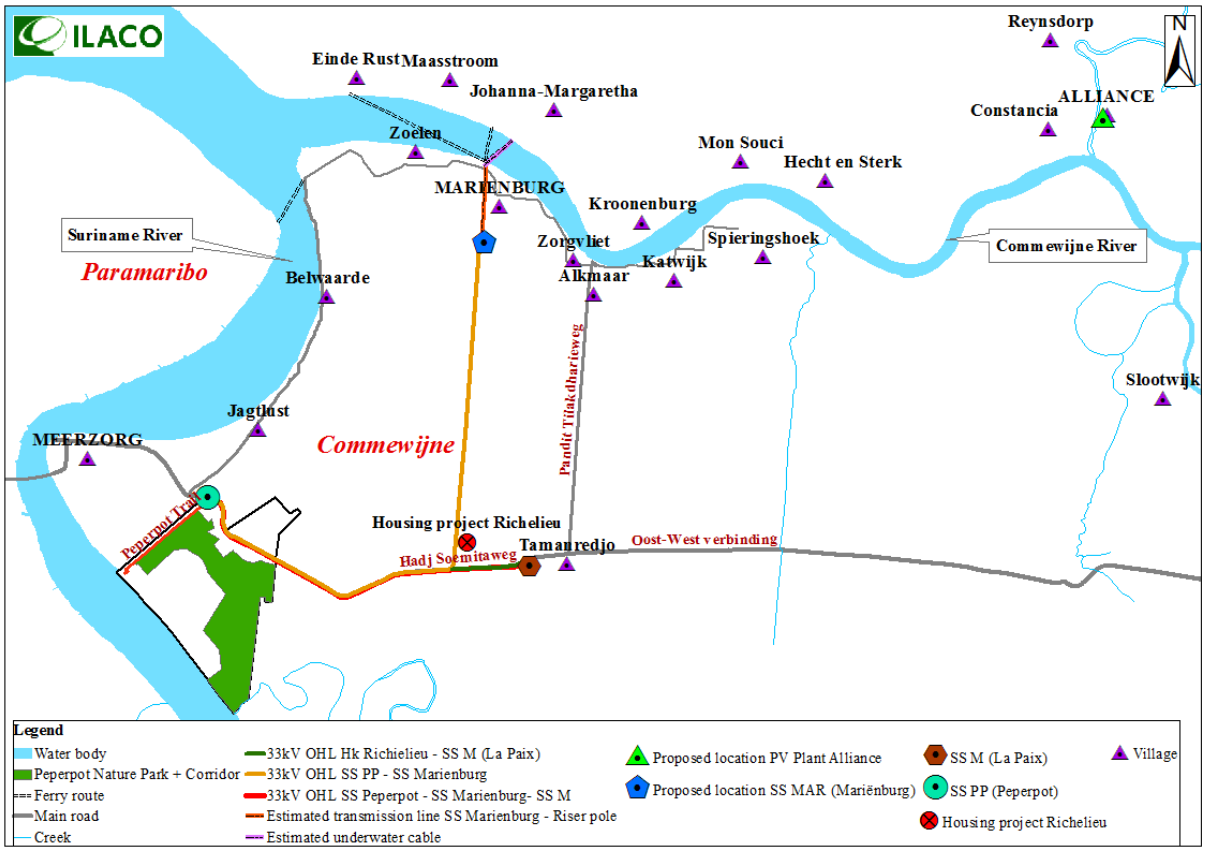

Figure 21: The Peperpot Nature Park in Commewijne.

In the north it bounds to the Oost-West Verbinding, separated from it by a 200-meter-wide buffer zone and a canal.
The park is accessible along a trail in the center of the park, with its northern entrance next to the Peperpot substation. Apart from tourism it is important for nature education, while also nature research is supported.
None of the proposed project activities will take place within the boundaries of a protected area.

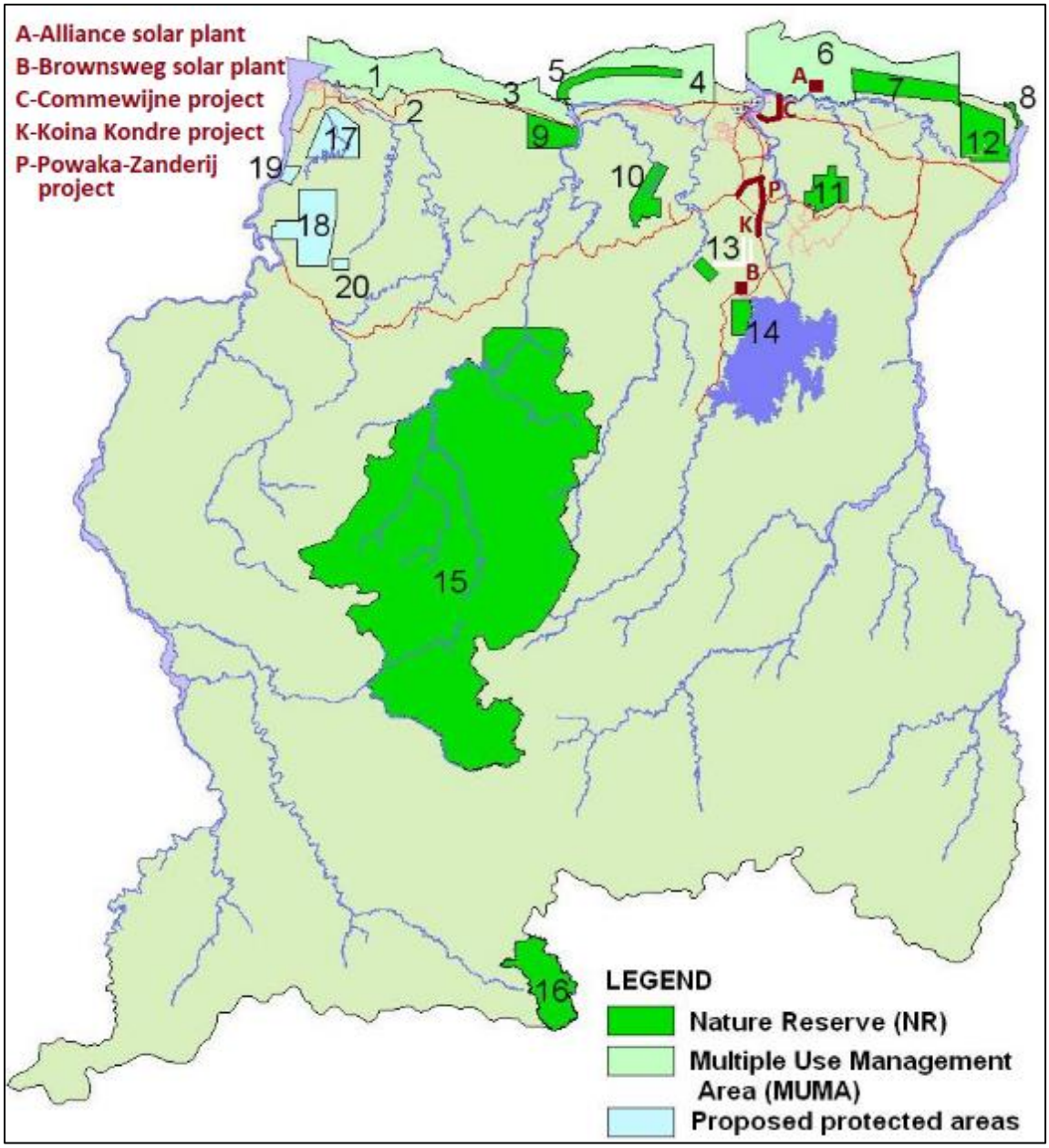

Figure 22: Protected areas in Suriname

Table 16: Protected areas in Suriname

	Name Protected Area	Area in sq. km		Name Protected Area	Area in sq. km
1	Bigi Pan MUMA	67 9	9	Peruvia NR	310
2	Hertenrits NR	1	10	Boven-Coesewijne NR	270
3	North Coronie MUMA	272	11	Copi NR	280
4	North Saramacca MUMA	884	12	Wanekreek NR	450
5	Coppenamemonding NR	120	13	Brinckheuvel NR	60
6	North Commewijne-Marowijne MUMA	615	14	Brownsberg Nature Park	120
7	Wia-Wia NR	360	15	Central Suriname NR	15,920
8	Galibi NR	4 0	16	Sipaliwini NR	1,000

5.2 The Socio-economic Environment

5.2.1 Area and Population Description

5.2.1.1 Powaka-Zanderij Transmission Line Project

Table 17. Transmission line area key indicators

Population	Part of this land is claimed by descendants of the former plantations Hannover4 and Mawakabo. Permanent inhabitants along Afobaka Road (Philipus Kondre), in Powaka and along the J.F. Kennedy Road (Wit Santi).
Population characteristics	Descendants of the former plantation of Hannover-Mawakabo are both people who are assumed to have a direct bloodline with the former plantation owners ("nazaten"), and the descendants of former plantation slaves ("afstammelingen"). Both groups are people of (mixed) African descent. Powaka and Philipus Kondre: Lokono Indigenous. Wit Santi: Mainly Kalina Indigenous
Indigenous populations	Philipus Kondre, Powaka and Witsanti. The extent to which these populations must be included in the SIA study will be verified in consultation meeting organised by EBS. No impact either negative or positive is foreseen.
Educational facilities	Not present in most affected area
Electricity supply	Wit Santi, Philipus Kondre and Powakka connected to EPAR network. Hannover-Mawakabo no electricity.
Clients pay for electricity.	Yes
Running water	Wit Santi connected to SWM network. Philipus Kondre has about 23 hand pumps, which are connected to wells. Powakka features a stand-alone water system, which was installed by the Service for Water Provision (Dienst Watervoorziening, DWV). Hannover-Mawakabo: Pump system provided by Surinam Water Supply Company (SWM), only operational if coupled to electricity motor (privately owned by residents and connected during weekends/holidays).
Accessibility	Connection road between the Afobaka Road (Highway) and the road to Zanderij (J.F. Kennedy Road). Village of Hannover accessible via a side road of the Afobaka Road. Access road in poor condition.
Distance to Paramaribo	50-60 Km

A new 33 kV transmission line will connect the substation (S/S) in the Powaka area (POW) with the S/S G (Zanderij area). The new transmission line will be installed in the right of way of a new road (9.5 km), which is currently under construction by the Ministry of Civil Works, to connect both areas (Map in **Annex III**). The project affected persons of the Powaka Zanderij project area are the rights holders of the Hannover-Mawakabo plantations. Their situation is explained below.

[4] The name of the plantation and village are spelled in two different ways. We will use Hannover, as this is used by the Association Plantation Hannover – Mawakabo, but we will copy Hanover when this spelling is used in cited text and in names of organisations etc.

5.2.1.1.1 History of the Hannover and Mawakabo (Mawacabo) Plantations

The lands of plantation Hannover, formerly named Copimawabo (until ~1750), were awarded to different Dutch colonial plantation owners in the early 1700s. By 1733, the lands of the later plantation Hannover were joined as one plantation with an area of 2200 acres. In 1750, the plantation was renamed Hannover. It initially operated as a small sugar plantation with 115 enslaved people, and later (~1770) became a coffee plantation. After decline of the plantation economy, the planter's family left.

By the early 1800s, under new Dutch ownership, the plantation Hannover annexed the wood lands ("De Vreede", "Welgelegen" and "De Eendragt"). Now 3636 acres large, Hannover became an indigo *(Indigofera suffruticosa)* plantation with 136 enslaved persons, a number that grew to 170 slaves in 1843. The remains of the old indigo *(blauwsel)* factory can still be found on the plantation lands.

The neighbouring wood plantation Mawakabo was 1309 acres large in 1737, but had been extended to 1500 acres in 1819. By the mid-1800s, the plantations "Mawakabo" and "De Nieuwe Hoop" also were part of Hannover. Mawakabo is currently perceived as a separate plantation, but falls under the same plantation board (*Plantage Bestuur*).

At the abolition of slavery, on 1 July 1863, the plantation hosted 246 enslaved persons. In 1882, the plantation was bought by seven formerly enslaved: Ambel, Clydesdale, Fer, Frets, Klas, Mijnals, and Renfrum. The sale included the annexed lands of plantations De Vrede, Welgelegen, and Mawakabo. Subsequently, the plantation no longer served as a large land holding, but rather as a collective of small farmers, producing tubers (i.e. cassava, sweet potato), rice and timber.

In the 1900s, up to about 1970, Hannover served as the center for neighboring plantations. There was a government school (~20 pupils in 1908) and a protestant church. In subsequent years though, many people left the plantation. The last inhabitant left Hannover plantation in 1980.

5.2.1.1.2 Current population and community structure

Hannover plantation features an old town center with about 17 wooden houses along the only road, which leads to the Para River. The majority of houses is habitable (13) (personal observation Social Solutions, July 2019) (see **Figure 23**). Sixteen houses are made of wood, one of metal plates. The village of Hannover is at a distance of approx. 300 meters from the new road that is now being constructed. At the moment there is no connection with the village, however, a path has been cut open to reach the new road on foot. At the moment it is unclear if there are more houses in the project area that could be influenced by the project. A preparatory meeting with stakeholders (in preparation by EBS) should give more information.

Figure 23: Abandoned houses at Hannover plantation (Source: Social Solutions, 2019)

A study by the Foundation of Hanover Youth (*Stichting Jongeren Hanover, 2015*) estimates there are approximately 900 persons who may be recognized as descendants of Hannover. In 2013, the Foundation reported that Mawakabo and Hannover are slowly re-populated, even though most descendants still live elsewhere. With an allotment project with 150 lots, the board aims to speed up re-population of the former plantation lands.
According to a consulted member of the plantation board, there are no permanent inhabitants at Hannover, but there are a couple of inhabited houses at the edge of Mawakabo plantation (see

Figure 24). During observation there was one person present in the village of Hannover. He confirmed that during weekends and holiday's people come back to the village. The village includes a water system, installed by SWM eight years ago. When people come to visit the village they bring a pump to connect to the system. Also creek water from the nearby Para Creek is used. Goal is to rebuild the village and to remigrate. The main obstacles are the lack of electricity and the poor condition of the access road (Mr. Clydesdale, villager, pers. com. 5 July 2019).

Figure 24: Entrance sign 'Welcome to Plantage Hannover, own property, prohibited area for unauthorized persons' and entrance road (Source: Social Solutions, 2019)

Throughout the year, descendants of the plantation regularly visit in weekends and holidays for different purposes. They come for leisure and parties such as birthdays, but also for spiritual-cultural rituals such as winti prey5and libation, or simply maintaining contact with other descendants.

The two plantations are governed by one plantation board, which is elected every four years.

The descendants of the former plantation owners (*erfgenamen*) and former enslaved people (*nazaten*) are organized in different community organizations:

- *Vereniging Plantage Hannover- Mawakabo* (Association Plantation Hannover – Mawakabo) with the plantation governance structure (*plantage bestuur*).
- *Stichting Jongeren Hanover* (Foundation Youth Hanover).
- *Wi Anofru* (Our Hannover).
- *Comité Hanover Vooruit* (Commission Hanover forward).

5.2.1.1.3 Proposed/planned near future developments

The Government of Suriname (GoS) plans to build a modern educational and sports facility on a 15 ha plot of land between the plantations Hannover and Mawakabo, with funding from the Islamic Development Bank. The educational facility will have room for three continued education schools, including a technical school with 12 labs (NATIN). The plans include boarding school facilities for some hundreds of children from Brokopondo and Sipaliwini who have completed elementary school and have no options for continued education near their home villages (Mr. Ahmadali, project designer, pers. com. 5 July 2019).

According to planning, the sports complex will feature sports fields and a swimming pool, which should enable children from villages and settlements in the area to follow swimming lessons. Other proposed developments on this land are a shopping mall and a first aid clinic with ambulance.

If this development project will indeed be executed, it could result in local population growth, and subsequent growth in energy demand.

[5] Ceremony that is part of the Afro-Surinamese traditional religion and involves ancestor veneration, spiritual possession and traditional Afro-Surinamese music and dance.

Several stakeholders including the District Commissioner and a member of the Association Plantation Hannover – Mawakabo stated the government has promised compensation for the expropriation of land for the transmission project (**see paragraph 5.1.1.1 for more detail**).

According to the director of EBS the construction of a distribution line is scheduled and the village of Hannover will be connected to the EPAR electricity network by May 25, 2020 (elections) in the latest (Mr. Eindhoven, director EBS, pers. com. 9 July 2019). See **Annex IIG**.

5.2.1.2 Commewijne project

Table 18. Commewijne key indicators

Population	31.420 (2012)
Population characteristics	Largest population segment is of Javanese ethnic descent (47%), followed by Hindustani (30%) and smaller numbers of Creoles, Maroons and others.
Indigenous populations	None
Educational facilities	There are several elementary schools. Continued education (middle school, high school and/or vocational education) can be followed in Nw. Amsterdam, Meerzorg and Tamanredjo.
Electricity supply	Most locations
Clients pay for electricity?	Yes
Running water	Most locations
Accessibility	By boat or car from Paramaribo city
Distance to Paramaribo	Neighbouring district

5.2.1.2.1 Commewijne district

Commewijne district (2353 km2) is located along the coast, just across the Suriname River from Paramaribo City. The capital of Commewijne is Nieuw Amsterdam. Other population centres are Tamanredjo, Meerzorg, Alkmaar, Johanna Margaretha, and Bakkie. Commewijne houses about 6 percent of the Suriname national population. Outside of the main population centres, populated areas are characterized by ribbon development

In recent years, the population has consistently been growing as a more affordable and quiet place to live for people working in Paramaribo. Several public and private allotment projects are being developed in alignment with this trend. It may be expected that demand for electricity will grow in line with these developments.

Main economic activities in the district are agriculture, animal husbandry, fishing and fish processing, forestry, tourism and trade.

With regard to sensitive receptors, it is worth mentioning that a mosque and a child care facility are located along the road between La Paix and Richelieu (see map). It is not expected that these places will be adversely affected by the Project.

5.2.1.2.2 Alliance

The plantation lands of Alliance started as a sugar plantation at the mouth of the Matapica creek. In 1953, the plantation is sold to the government, which, in 1973, establishes the State firm Alliance with the aim of commercial citrus production – an addition to some other crops. Initially citrus was planted for export, but nowadays everything is for the Suriname market. Alliance cannot be reached by car; and all transportation – including of the EBS service team – is per moped. The plantation can be reached by boat in about half an hour from the landing of Alkmaar on the left bank of the Commewijne River. However, as most neighbouring plantations are now (virtually) abandoned, there is not much boat traffic

anymore (Mr. W. Sarmo, EBS staff Alliance, pers. com. 13 June 2019). A ferry service from the National Transportation Service (*Nationaal Vervoers Bedrijf* – NVB) travels once a day between Bakkie and Leliëndaal, and back, with Alliance as a fixed stop. A ticket is SRD 5.50 (~USD 0.70).

In 1988, 95 persons worked at the Alliance state firm, and 303 persons lived on the plantation. Due to the poor performance of the state firm, as well as the rather isolated nature of the location, people have been migrating away from Alliance – a trend that appears to be continuing. One problem is that there is no nearby option for continued education after completion of elementary school. As a result, school children have to move to family or boarding school in Paramaribo for further study. This situation has motivated several families to move with their children. The plantation manager lamented the lack of young labourers, as youth who have left the plantation do not return (Mr. R. Kromosadjah, plantation manager, pers. com. 13 June 2019). At present, about 25 families live on Alliance (~100 inhabitants), and the state firm employs 27 persons. Most inhabitants are of Javanese descent.

The elementary school at Alliance currently teaches about 15 children, a figure that includes children from the plantation settlements of Bakkie (~30 persons) and Constancia (~7 households). There also is an office of the Central bureau for Citizens Affairs (for civil registration), and a clinic from the Regional Health Service. The settlement houses one mosque, and one Apostolic Church. It is not expected that these places will be adversely affected by the Project.

All economically active persons at Alliance work public jobs; either at the state firm (run by the Ministry of Agriculture, Animal Husbandry and Fishing – LVV), or with the Ministry of Education, Science and Culture (MinOWC), the Regional Health Service (RGD), the Central Bureau for Citizens Affairs (*Centraal Bureau voor Burgerzaken*, CBB) and EBS.

Alliance frequently experiences power outages. It is expected that the new under water cable and the solar park will alleviate this inconvenience.

5.2.1.3 Koina Kondre Project

Table 19. Koina Kondre and surrounding settlements key indicators

Population	Approx. 85 households in the village of Koina Kondre. Various houses and settlements on both sides of Afobaka Road. Village of Rama approx. 30 households. In total approximately 260 households between Powaka substation and bridge over Marchall Creek.
Population characteristics	Saamaka Maroons, living according to traditional social, political and cultural customs
Indigenous populations	Maroons are considered as Indigenous and Tribal Peoples by GoS, UN, and World Bank standards
Educational facilities	Elementary school along Afobaka Road, Phedra and Marchallkreek; for continued education children travel to Brokopondo Centrum (38 km)
Electricity supply	Most households in Koina Kondre receive 3 hours a day electricity, provided by DEV (rural electrification department of the Ministry of Natural Resources, Dienst Elektriciteit Voorziening), using diesel generator. In Rama electricity 5 hours a day, at the moment of consultation no electricity at all. Some of the households along the Afobaka Road do not have any electricity supply at all.
Clients pay for electricity?	No
Running water	No. In Koina Kondre village taps only running when generator is active, no drinking water.
Accessibility	Throughout the year, along the Afobaka Road
Distance to Paramaribo	60 km

The Koina Kondre project area runs from the Powaka substation up to the bridge across the Marchall Creek. Two villages, Koina Kondra and Rama, and a large number of individual and clustered houses

are scattered on both sides along the Afobaka Road. The Foundation for Forest Management and Forest Control (*Stichting voor Bosbeheer en Bostoezicht, SBB*) indicated that there are 11 wood landings in the project area (Ms. Waterberg, SBB secretary, pers. com. 28 June 2019). In addition, there is an allotment project (including four tourist resorts) and two separate tourist/event locations.

5.2.1.3.1 Koina Kondre

The village of Koina Kondre includes approx. 85 households (200 people). Approximately 80 houses are located on the east side of the Afobaka Road, another 5 houses on the west side. Traditional authority consists of one male *kapitein* and a female *basia.* The village was originally a 'traditional' village (not Christianized) but in recent years the Catholic Church has developed strongly. In addition, a mosque called An Nur, is located on the border of the village. A small number of village inhabitants has been converted to Islam. Small items such as cigarettes and soft drinks can be bought in the village, a small supermarket is located in the nearby village Obelikondre.

Villagers use rain and creek water. A *Dienst Water Voorziening* project in 2010 resulted in 8 village taps in the Koina Kondre village. However, taps only work when there is electricity and water is not drinkable. There used to be a village organization name *Stichting Werkgroep Oe Sa Dow* but they have not been active in recent years. On paper their goal is to achieve social and economic resilience of the area.

There is no school in the village. Elementary school is offered at OS Afobakaweg. There are also children that visit the schools of Phedra and Marchallkreek. For healthcare people make use of the clinic of *Stichting Medische Zending Suriname* (Medical Mission Primary Health Care Suriname[6]) in Klaaskreek a village 14 km south of Koina Kondre.

The village is provided with a generator by the DEV (rural electrification department of the Ministry of Natural Resources) and provides electricity from 7-10 pm. Depending on the quantity of diesel that is provided by the government the time of operation is adjusted. The generator supplies power to all connected homes in a radius of 500 meters (see **Figure 25**). Villagers on the west side of the Afobaka Road are not connected to the generator. Koina Resort, a tourist resort and event location, is located on the border of the village. Koina Resort is the only resort in the project area[7] that is registered at the *Commissariaat* of Brokopondo and has been approved as a safe tourism resort (Ms. Mendelzoon, Commissariaat Brokopondo, pers. com. 27 June 2019). The resort owns a private generator for own use (110KvA). According to the owner of the resort three quarters of the village is connect to his generator, free of charge (Mr. Mando, owner Koina Resort, pers. comm. 25 June, 2019). The Koina Resort generator runs during weekends and when there are guests and/or activities.

[6] Popularly abbreviated as MZ
[7] The part of the project area that is located in the Brokopondo district.

Figure 25. Impression of Koina Kondre with lamppost and electric wires.

5.2.1.3.2 Rama

The small village of Rama is located at 200 meters distance from the Afobaka Road and counts approximately 30 houses, not all are inhabited. According to the BO 20 adults live in the village (Ms. Fedries, pers. comm. 25 June 2019). The village has no traditional authority. Children visit the elementary schools of OS Afobakaweg or Marchallkreek and VOJ Brokopondo for secondary education. Just like in Koina Kondre the MZ health clinic in Klaaskreek is the most nearby location for health care. This is also the village where people can buy groceries. Few people have a formal job, the majority does small-scale agriculture on their own plot or is active in logging. Two people in the village work for the government; these are the BO and the person who operates the generator on behalf of the DEV (rural electrification department of the Ministry of Natural Resources). According to the BO, the operator of the generator has recently had an accident and is hospitalized. For this reason, the generator is currently out of service. Normally the generator provides power from 6.30 till 12 pm. There is no water pipe in the village. People make use of rain- and creek water. There is a lack of water during the dry season (Ms. Fedries, BO Rama, pers.com. 24 June 2019).

5.2.1.3.3 Allotment project – Snowhills incl. tourist resorts

Snowhills is a project of Suribo NV located opposite mast 43 on the east side of the Afobaka Road. A map of the project is presented in **Annex IV**. According to the director of the company, Mr. Mungra, four resorts are situated in the project area[8]:

- Kimberly Pretpark (only groups by appointment, no individual visits) (see **Figure 26**)
- Anish and Arush Jungle Camp
- Mauritius Garden
- Ivonne's Garden

In addition, there are 15-20 private houses and a number of plots for sale. Mr. Mungra indicates that he expects 80 requests for a connection to the network, partly commercial connections (Mr. Mungra, pers. comm. 25 June 2019). People are currently using generators and solar panels to generate power. According to the owner of Kimberly Pretpark his resort includes AC, hot water and Wi-Fi connection for which power is obtained from a generator (Mr. Matta, Director, pers. comm. 25 June 2019).

[8] According to the Para secretariat there are no resorts registered in the part of the project area that is situated in the Para district (Ms. Paujali, Commissariaat Para, pers. com. 27 June 2019).

Figure 26: Entrance signs Snowhill resort (l), Kimberly Pretpark (m) and Anish & Arush Jungle Camp (r) opposite from Mast 43.

5.2.1.3.4 Manini Resort

In addition to the resort in Koina Kondre and the resorts in the Snowhill allotment project, the project area has one other resort, Manini. Manini resort is located opposite from Mast 38, directly along the Afobaka Road.

5.2.1.3.5 Wood landings

The project area has 11 wood landings owned by local and international owners. These landings now use large generators to generate electricity.

5.2.1.4 Brownsweg solar plant project

Table 20. Brownsweg key indicators

Population	3.775 (2013)
Population characteristics	Saamaka Maroons, living according to traditional social, political and cultural customs
Indigenous populations	Maroons are considered as Indigenous and Tribal Peoples by GoS, UN, and World Bank standards
Educational facilities	3 elementary schools; for continued education children travel to Brokopondo Centrum (38 km)
Electricity supply	Brownsweg village is supplied by a 25 km single circuit overhead line of 12 kV, connected to the Substation Berg & Dal.
Clients pay for electricity?	No
Running water	Yes, but poor quality. Villagers prefer rain water during rainy season.
Accessibility	Throughout the year through a network of paved and unpaved roads
Distance to Paramaribo	100 km

Brownsweg consists of a cluster of seven Saamaka Maroon communities. This settlement was built in 1964 as a transmigration village for the inhabitants of villages that flooded due to construction of the Prof. Dr. Ir. J. W. van Blommensteinstuwmeer (Hydropower Lake). The different neighbourhoods in Brownsweg still represent these original villages: Bierhoedoematoe, Ganzee, Makambi, Kadjoe,

Djankakondre, and Wakibasu 1 and 2. More recently, two neighbourhoods with public housing projects –Wakibasu 3 and Maleiakondre- were added. Each neighbourhood is inhabited by one or two clans (*lo*[9]). The *lo* members claim customary land rights to the land of this neighbourhood, as well as to defined areas around the villages where they go to plant, hunt and collect forest products.

Traditional leadership in Brownsweg exists of a head captain (*hoofdkapitein*), 17 *kapiteins* (16 male, 1 female) who represent the different *lo* that live in the village. They are assisted by 67 *basias*. According to BO Finisie the location where the power plant is planned is not served by a captain (Ms. Finisie, BO Brownsweg, pers. com. 10 July 2019). See Figure 5.

The community of Brownsweg features three elementary schools; the Catholic Pater van der Pluym school in Wakibasu II; the Ds. R.M. Schmidt school of the Evangelical Brotherhood (*Evangelische Broeder Gemeente Suriname* – EBGS) in Nieuw Ganze, and the public school O.S. Brownsweg in Bierhoedoematoe. In total, these schools teach approximately 1100-1200 children. None of the schools is near proposed location.

For continued education, children have to go to Brokopondo Centrum, which features a Lower Vocational Education (*Lager Beroepsonderwijs* – LBO) school and a middle school (*Meer Uitgebreid Lager Onderwijs* – MULO). Health care is provided by a clinic of MZ in Bierhoedoematoe.

[9] A lo is composed of the matrilineal descendants of an original band of escaped enslaved people, who typically are said to have run away from the same plantation

5.2.2 Vulnerable populations, all projects

Observations and stakeholder interviews revealed that several vulnerable groups can be identified in or near the Area of Impact of the different electrification projects

5.2.2.1. Indigenous peoples and Maroons

The IDB defines indigenous peoples as "those who meet the following three criteria:

1. They are descendants from populations inhabiting Latin America and the Caribbean at the time of the conquest or colonization;
2. Irrespective of their legal status or current residence, they retain some or all of their own social, economic, political, linguistic and cultural institutions and practices; and
3. They recognize themselves as belonging to indigenous or pre-colonial cultures or peoples." (IDB OP-712).

By this definition, there are three indigenous communities in the project area of the **Powaka – Zanderij transmission line project:** Powaka, Wit Santi (approx. 92 households) and the living area of Philipus Kondre (approx. 56 housholds). The **Koina Kondre project** includes the living area of Powaka (approx. 246 households). The new transmission line will be installed in the right of way of a new road. Only the village of Wit Santi is living on both sites of the road. The communities will not be affected by this project.

Powaka is a Lokono community and by far the largest of the Indigenous communities of East Para. Indigenous peoples have populated the place from more than 300 years (Rijsdijk in Social Solutions, 2017). Philipus Kondre, previously named "Klein (small) Powaka", was established in 1964. The village was initially a satellite village of Powaka, and governed by the Powaka traditional authorities. In 2013, Philipus Kondre obtained the mandate from Powaka to become "independent" and to have its own traditional authority structure (Social Solutions, 2017). Wit Santi is situated along the J.F. Kennedy Road on both sides of the new constructed road. The community consists mainly of Kalina indigenous people. The villages counts approximately 92 households.

By the IDB definition, Maroons are not Indigenous Peoples, as they are not the descendants of populations who inhabited Latin America and the Caribbean at the time of conquest. On the other hand, other than *Caboclos* and other African-descent rural peoples in Latin America and the Caribbean, Maroons do fit the other criteria. Suriname Maroon groups have retained most of their own social, economic, political, linguistic and cultural institutions and practices. Each one of the six Maroon groups in Suriname speaks an own language, which is distinct from the national language of education (Dutch) and the national creole Sranantongo. Like pre-Columbian Indigenous groups, Maroon groups are organized according to elaborate social structures and rules; are governed by their own political structures with a paramount chief (*Gaanman*) and village chiefs (*Kapitein*); and they practice their own distinct religion and rituals. Maroon groups have strong, traditional ties to the lands they traditionally live on and use for their livelihood, and each tribal group, clan, and family knows exactly what piece of land is theirs by customary law. Furthermore, the various Maroon groups recognize themselves as belonging to tribal peoples who are distinct from mainstream Suriname society.

It also is worth considering that the Government of Suriname (GoS), the World Bank and the UN, in their projects, have applied the same rules and policies to pre-Columbian Indigenous peoples and to Maroons in Suriname.

Even if IDB decides that Maroons do not fit the IDB definition for indigenous peoples, and IDB OP-712 is not triggered, it is still advisable that general safeguards for working with Indigenous and tribal peoples will be followed. Specific guidelines for the Suriname context are described in the "Community Engagement Strategy for the Government" (*Community Engagement Strategie voor de Overheid* version 1.1, 2016), which was developed by the Association for indigenous Village Leaders in Suriname (VIDS) and the Association of Saamaka Authorities (*Vereniging van Saramakaanse Gezagsdragers-*

VSG). The steps that must be followed for community engagement are summarized in this document as such:

- Prior to entering the community, make an appointment with the traditional authorities
- Prior to start of the project, share all relevant information in a way that is understandable to local people
- Offer sufficient time (and resources) for decision-making in a culturally appropriate manner.
- Plan for joint monitoring, evaluation, verification and validation.
- Agree on a mechanism for redress of complaints and disagreements

Saamaka Maroons dominate the population in the AoI of the **Koina Kondre project** and the **Brownsweg power plant project**.

5.2.2.2 People with disabilities

None will be adversely affected by the proposed EBS projects.

5.2.2.3 Low-income families

Inhabitants of the AoI of the Koina Kondre project and the Brownsweg power plant project are mostly low-income families. These families typically combine subsistence activities (planting, hunting) with informal income generating activities (gold mining, logging) and low-paying wage labor jobs – often with the government. Particularly the families who will be connected to the EBS power grid through the Koina Kondre project will benefit from the proposed project, by changing from receiving no or a temporary energy supply (3-4 hr./day), to receiving 24/7 electricity. The families in Brownsweg will benefit from a more reliable power supply.

One issue to consider is that the largest share of low income families living in small clusters of houses along the 24 km stretch of the Afobaka Road between the substation of Powaka and the bridge across the Marchall Creek currently receive electricity free of charge from the DEV (rural electrification department of the Ministry of Natural Resources). The remaining households do not receive electricity at all – though some have their own private generator. Once they will be connected to the NPS and equipped with smart meters, these families will be charged for the consumed electricity.

A consulted EBS staff member indicated that in comparable locations (e.g. Atjoni/Pokigron), switching households to paid 24/7 electricity supply has not been a problem (Mr. M. Malone, EBS staff, pers. com. 11 June 2019). Area inhabitants were informed by the EBS in advance, and there is general awareness that access to reliable electricity comes at a price. Also in practice, there have not been specific problems with bill payment, and no clients from this area have been permanently disconnected. Consulted inhabitants of Koina Kondre confirmed that they did not foresee problems with bill payment. If certain households do not want to be connected, that is also an option.

With regard to bill payment, the nearest location (in time by bus) to pay the electricity bill is Paramaribo city (Saramaccastraat). Most inhabitants do not have their own transportation, so they would have to rely on public transportation to travel to Paramaribo and back, which would take at least half a day, if not more. One option to facilitate payment is the option used in Powaka, where EBS travels biweekly to collect bill payment. EBS could consider combining these visits to Powaka with one or two stops in the Koina Kondre/Rama strip of households. As yet another option, a payment station could be established in a central location, for example Klaaskreek, which people from Koina Kondre and Rama visit regularly to visit the clinic and the supermarket.

5.2.3 Economic conditions

5.2.3.1 Businesses

The businesses that were encountered in the AoI that may be (mostly positively) affected by the project are listed in **Table 21**.

No businesses are located in the area of direct impact of the Brownsweg solar plant project. Hence no direct or indirect project impacts on businesses are expected as a result of this project.
Not many businesses are located in the area of direct impact of the Powaka- Zanderij Transmission line project area. There is a tourism resort (Mawacabo Private Resort) in the area, and sand mining takes place in the surroundings of Mawakabo. Because the 33 kV transmission line is not designed for distribution of electricity to surrounding households and businesses, no impacts on businesses are expected.

The area covered by the Koina Kondre project houses several businesses; mainly tourist lodges, wood landings, and an allotment project. These businesses will be positively impacted by the Koina Kondre project, which will provide connection to the EPAR network. As a result, electricity supply will be more reliable and cheaper (as compared to using a fossil fuel run generator).

Along the roads in Commewijne, where the Commewijne Project activities will take place, many businesses are located (see **Figure 27**). It is not foreseen that any of these businesses will experience negative project impacts. There are also approximately 30 informal fruit and vegetable stalls located on the public maintenance strip along the road. These stalls have often been placed without a permit, or with permission from the District Commissioner. It is not expected that these stalls will be affected by the project, either negatively or positively.

Table 21. Businesses in the Area of Impact

Business name	Type of business	Location
Powaka – Zanderij Transmission line project		
Mawakabo Private Resort	Tourism Resort	Plantation Mawakabo
Unknown	Sand Mining	Plantation Mawakabo
Commewijne Project		
Alliance	LVV citrus plantation	Alliance plantation
Businesses along the main roads, incl. eateries, supermarkets, gas stations, etc. (see **Figure 27**)	Various	Along main roads between Peperpot, La Paix, Richelieu, & Mariënburg
Informal fruits and vegetable stalls	29 fruits and vegetables stalls.	On maintenance strips along main roads.
Koina Kondre project		
Koina Resort	Tourism resort	Afobaka Road, Mast 70
Snowhill resort by Suribo NV	Allotment Project	Afobaka Road Mast 43
Kimberly Pretpark	Tourism resort	Afobaka Road Mast 43
A&A Jungle Camp	Tourism resort	Afobaka Road Mast 43
Manini Resort	Tourism resort	Afobaka Road Mast 38
Timber landings (N=11)	Storage and processing of logs	Various
Brownsweg Solar Plant Project		
None in or near project area.		

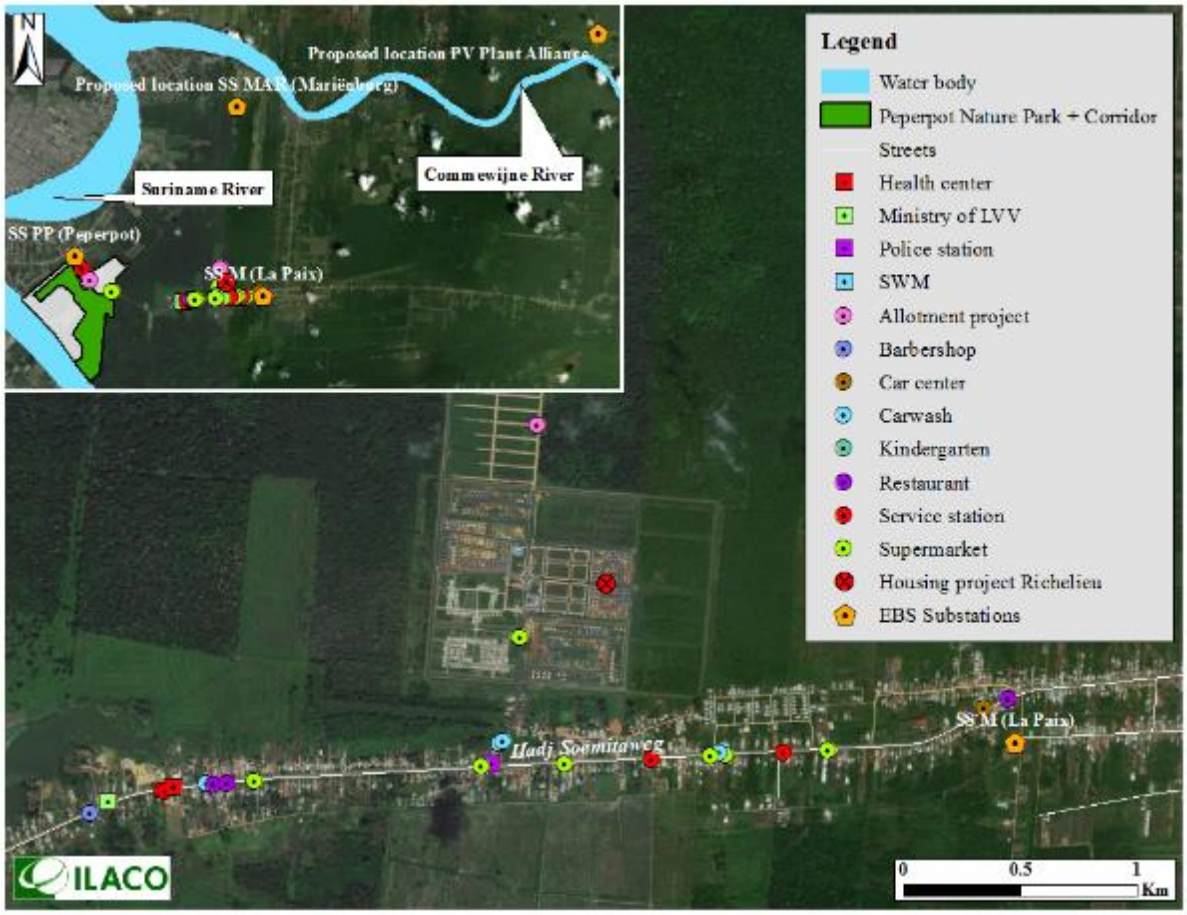

Figure 27: Businesses located in the Commewijne right bank project area

5.2.3.2 Job opportunities

A small number of local temporary jobs will likely be generated:

- EBS or contractors might hire local people for low profile jobs (e.g. security, transportation of materials).
- For the Commewijne project, some boatman's might be hired to transport goods, materials and people.

It is planned that EBS will use concrete or galvanized poles, so no labour is required for the production of wood poles.
No jobs will be lost as a result of the project.

5.2.4 Land tenure and claims

5.2.4.1 Powaka - Zanderij transmission line project

The projected 33 kV transmission line will run along a new road that is being constructed by the Ministry of Public Works, Transport and Communication (OWTC) and on the road side of the Afobaka Road and the J.F. Kennedy Road. Neither the Ministry of OWTC not the contractor for the new road, China Dalian International Group (Dalian), performed an ESIA study.

The new road and the projected transmission line run through the old plantations of Hannover and Mawakabo. No meeting could be arranged as of yet with the plantation board, a consultation meeting with stakeholders is in preparation by EBS. Existing written sources suggest that the descendants of the former plantation owners and descendants of enslaved persons who worked on the plantation most

likely have a tenure title to the land known as "allodial ownership and inheritable property"[10] (*Allodiaal Eigendom en Erfelijk Bezit*, AEEB)[11].
The working group Infrastructure of the Cabinet of the President has negotiated with the plantation board and, according to a resource person in the Ministry of OWTC, the board ultimately agreed to the road (Mr. Mohan, director at OWTC. pers. com. 3 July 2019). A member of the plantation board mentioned that the Government used a procedure known as "*nadering*" to expropriate the part of the plantation lands needed for the road (Ms. Kassels, member of plantation board. pers. com (phone) 2 July 2019). Most (but not all) allodial titles include a provision in which the Government reserves the right to reclaim the land by a simple procedure if the land is required for public interest (*nadering*). The enforcement of *nadering* is very simple: it only requires a statement of the President (Resolution) that in the public interest, the land is being reclaimed in the domain. With the registration of this Resolution in the Public Registers the *nadering* is realized. Although there are different opinions amongst lawyers in Suriname about the legal meaning of the allodial tenure title, the State several times has made use of the provision of the *nadering*.

A member of the plantation board mentioned that the plantation owners are very discontent with the situation, because to date they have not been compensated for the expropriation of land (ibid.). Negotiations with the government are ongoing. In addition to monetary compensation, the government promised to improve the access road to the plantation (now ongoing) and to bring public services (electricity, drinking water) to the plantations. This was confirmed by a source at the ministry of OWTC. No written agreement has been made available to the consultant by the parties[12].
This situation may create a risk to the EBS project. If the government fails to meet expectations with regard to financial compensation and public services, the plantation descendants may get very frustrated if the EBS uses their land to construct a transmission line that does not connect their places of interest. Such a situation could lead to (violent) protest.
As long as the power lines will not divert from the route of the road, no involuntary resettlement is foreseen in the context of this project.

5.2.4.2 Commewijne project

The additional electricity poles that need to be placed along existing roads as part of this project will be placed on the public maintenance strip. In these locations, it is not foreseen that any private lands are needed to place poles. It is possible that some of the support cables (*zijschoor*) must be placed on private property. The EBS has standard procedures to deal with these issues.

The dam through the forested land between SS Mariënburg and the Richelieu Housing project is not populated. The District Commissioner of Commewijne has confirmed to EBS that this land is government land (F. Graanoogst, EBS. pers. com. 5 July 2019).

The plantation Alliance is entirely government land, and also at the proposed location of the solar power plant there are no land tenure claims of third parties.
No involuntary resettlement is foreseen in the context of this project.

5.2.4.3 Koina Kondre project

The lands along the Afobaka Road on which the communities of Koina Kondre and Rama and multiple smaller settlements have been established, are government domain. The inhabitants of this area are

[10] This must be verified with the plantation board.
[11] Allodial property is a land tenure title typical for Suriname. This title was issued during the colonial period under the conditions that the land would be developed and kept in cultivation. The owner also had the responsibility to contribute to other services that would promote the welfare of the nation, including security. Land not cultivated could be returned to the domain of the State. In practice today, the Suriname legal structures treat AEEB as the equivalent of absolute ownership, even though this may not be legally accurate
[12] Despite repeated attempts to get more information from the government, this has not yet succeeded. No information was available at the Districts Commissioner of Para, and from persons to whom the consultant was referred (incl. Ministry OW).

primarily Saamaka Maroons, but the various population clusters are not traditional villages of this tribal group, and the land is not part of the lands to which the Saamaka claim customary land rights.

No involuntary resettlement is foreseen in the context of this project.

5.2.4.4 Brownsweg solar plant project

Based on the provided GPS coordinates of the project location it could be possible that the proposed project area overlaps with a land request from a local area inhabitant. The applicant, Ms. Dahl, requested land tenure for this location in 2011 (Ms. Dahl, pers. com. 8 July 2019). She would like to live at the location and raise poultry. The land tenure request was approved by the District Commissioner and the local Government Manager (*Bestuursopzichter* – BO). Along the edge of her requested land area she built a small hut. During fieldwork the exact project location was not yet available.

According to the Forestry Concession map[13], the proposed project area falls within the community forest concession in name of *kapitein* (village chief) Van der Kamp, for the benefit of the Maroon village of Djanka Kondre (2175 ha) (see **Figure 28**). Accurate procedures must be followed to inform the rights holder and obtain the land for the benefit of the solar plant project. These procedures must involve the Foundation for Forest Management and Production Control (*Stichting Bosbeheer en Bostoezicht*-SBB). In the cases of the solar plant at Atjoni and the power station at Powaka, community land was acquired by means of negotiation between the EBS board, the relevant *kapitein* and the District Commissioner. An agreement was signed between the parties to obtain the land for the EBS project.

It is as of yet unclear if the Brownsweg solar plant project requires involuntary resettlement.

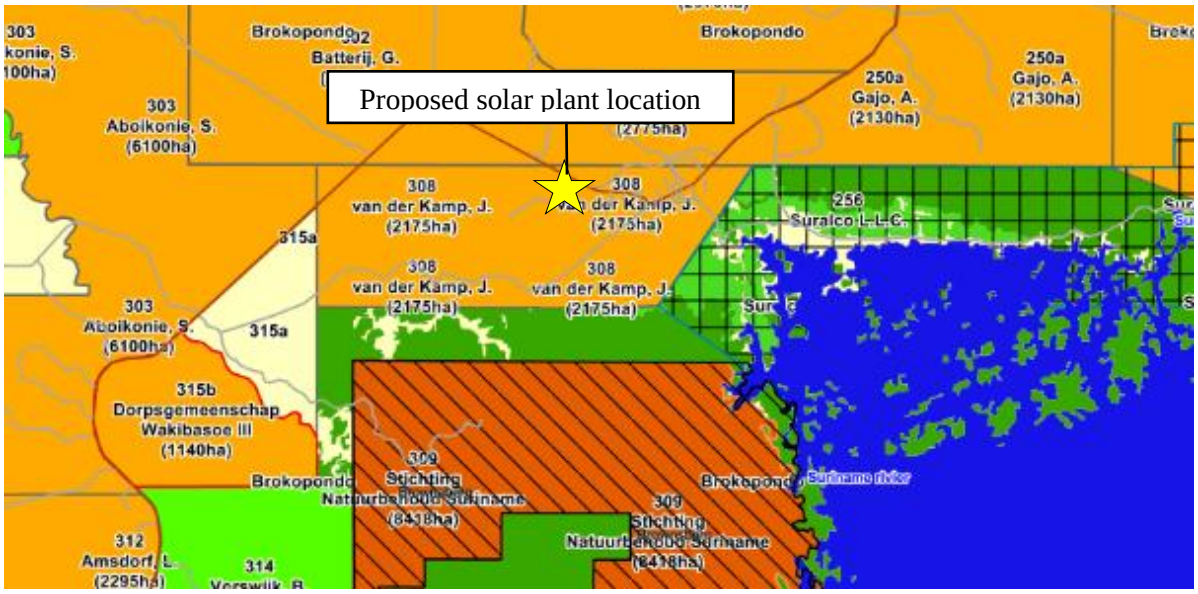

Figure 28: Exert from the forestry concession map (Bosbouw legger) with approximate location of the proposed power plant (yellow star) - Source: Gonini geoportal, consulted 08/07/2019

[13] Governmental geoportal for land use, GONINI system; www.gonini.org

5.2.5 Archaeological Resources, Tangible Heritage, and other Places of Cultural Significance

The area of influence feature various structures and locations that belong to tangible heritage. Tangible cultural heritage includes both archaeological sites and other places of cultural significance such as places of worship, sacred places, monuments and buildings. These include objects significant to the archaeology, architecture, science or technology of a specific culture.

5.2.5.1 Cultural heritage sites

5.2.5.1.1 Maroon cultural places (Brownsweg and Koina Kondre projects)

In traditional Maroon culture, inhabitants commonly participate in rituals and ceremonies for the ancestors and Deities. Even though many households in Brownsweg and the Koina Kondre project settlements are Christian, traditional worship places continue to be in use and are important elements of cultural heritage.

No specific cultural, sacred or worship places are located at or near the proposed location of the solar plant project in Brownsweg.

The Koina Kondre project area includes at least three cultural worship and healing locations (*fanowdu presi*) where people from the area, but also people from abroad, come visit for cultural/spiritual baths and healing: Semkondre, Laizang Kondre, and a location opposite from Bigi Batra. If EBS poles are to be placed at or near these locations, or if any other project activities need to be performed at said locations, it is advised that local people are consulted on specifics with regard to how and where project activities can be performed.

5.2.5.1.2 Cultural / Spiritual places at the plantations (Powaka-Zanderij trajectory)

Also at the old plantations Hannover and Mawakabo, there is a strong tradition of practicing Winti (Afro-Surinamese religion). Inhabitants, descendants but also people from outside come to these locations to take part in Winti ceremonies and rituals. There are several cultural-spiritual/sacred places in the plantations including a 'Winti kampu' in Mawakabo, where descendants or third parties can perform spiritual/cultural activities (Foundation Hanover Youth, 2015). Two Winti houses are located in the village of Hannover.

If EBS poles are to be placed at or near these locations, or if any other project activities need to be performed at said locations, it is advised that local people are consulted on specifics with regard to how and where project activities can be performed.

5.2.5.1.3 Commewijne Project

No sites of specific cultural or spiritual significance will be affected by the project.

5.2.5.2 Archaeological sites

The national register of archaeological sites (Versteeg, 2003) documents known pre-Columbian archaeological sites in Suriname. The archaeological registry has two important limitations. In the first place, most known archaeological sites are situated in areas of relative easy access; along roads and water ways. It is likely that also beyond these areas, previously unrecorded archaeological sites are present in areas with archaeological probability. Secondly, the archaeological registry only records pre-Columbian sites, but remains of later Indigenous settlements, of early Maroon settlements and of plantations are not part of this registry.

5.2.5.2.1 Powaka – Zanderij transmission line project

A pre-Columbian archaeological site has been identified at Powaka (Versteeg, 2003; Sur–56), and two sites have been identified in the surroundings of Zanderij (Sur-17, Hannover; and Sur-311, Berlijn).

The sites at Powaka and Hannover contain remains of settlements of the Koriabo culture. The settlement remains at Berlijn have not been associated with a specific culture. Given these finds, it is likely that the general project area was inhabited by pre-Columbian indigenous cultures.

Given the plantation history (**paragraph 5.2.1.1.1**), it is also possible that more recent (17^{th} – 20^{th} century) archaeological remains are encountered during excavation activities. Given that the poles for this project will be placed a newly created road, no additional impacts on potential archaeological sites are expected to result from this project.

5.2.5.2.2 Commewijne Project

A pre-Columbian archaeological site has been identified at Jagtlust (Versteeg, 2003; Sur–76). This site features a pre-Columbian settlement with graves, from an unknown culture. The planned works will not take place near this site, and hence it is not expected that this site will be disturbed by the project.

5.2.5.2.3 Koina Kondre project

No archaeological sites have been recorded in this area. Given that this project will involve very limited excavation works, if any, no impacts are expected on potential archaeological sites.

5.2.5.2.4 Brownsweg solar plant project

Four known archaeological sites are located in this area, named Brownsweg-1 (Sur-9), Brownsweg-2 (Sur-243), Brownsweg-4 (Sur-245) and Brownsweg 5 (Sur 246) (Versteeg, 2003). All sites are remains of settlements of a pre-Columbian indigenous groups referred to as the Brownsweg culture. Given that this project will involve very limited excavation works, if any, no impacts are expected on potential archaeological sites.

Given that very limited digging will take place in project locations, foreseen impacts on archaeological sites will likely be small or negligible. Nevertheless, in the case of chance finds, adequate procedures must be followed. Given the absence of Suriname national guidelines in the case of archaeological finds, such procedures should be consistent with internationally recognized good practice as described in the ICOMOS (1990) Charter for the Protection and Management of the Archaeological Heritage. In addition, Project stakeholders must comply with the Government of Suriname (GoS) Monument Law of 2002 for immoveable archaeological resources found during the course of the project.

Article 20.1 stipulates that monuments found in excavations and on which no one can prove the right of ownership are owned by the state. 2. The owner of the land in which the monuments have been dug up is required to transfer the found monuments to the State and is entitled to a reimbursement amounting to half the value of those monuments. 3. Monuments found in an investigation…may be transferred to a place suitable for their custody on the instructions of the Minister [of Education, Science and Culture].

Article 21. States that the finder…, within thirty working days after the discovery must indicate the exact location, time, monument and particulars of the discovery to the District Commissioner (DC) of the district in which the discovery has been made who shall immediately notify the Minister.
National guidelines are still in review phase by the government Directorate of Culture of the MINOWC and are not available for distribution.

6. Potential Impacts and Proposed Mitigation Measures

6.1 Bio-physical impacts and mitigation measures

6.1.2 Introduction

Table 22 and **Table 23** summarize the kind of environmental impacts that can result from the construction and operation of the EBS infrastructure projects. Only negative potential impacts have been identified. In the context of these potential impacts, the bio-physical conditions were assessed to determine the potential risks for the projects. The impact assessment methodology is included in **paragraph 2.3**.
Mitigation measures are presented for all impacts that are at least minor. In addition to this, recommendations may be given for some negligible impacts.

6.1.3 Discussion

6.1.3.1 Construction

Almost all potential impacts to the physical environment (visual, air, noise, water, land) are negligible. This is due to the fact that the magnitude of the impacts here is usually low, while the duration is short and the scale small. All impacts occur in manmade/man affected environments. Moreover, at most locations there are few or no permanent receptors. Proper maintenance of vehicles and equipment will further limit noise and air quality impacts. During dry periods care should be taken to prevent dust emissions from the project. Soil works along surface waters should take the risks of erosion into consideration.

Minor potential impacts during construction are identified for:

1. Visual and aesthetics as a result of poor waste management and untidy storage of materials at working locations. Its magnitude is considered to be medium, but it is expected to be of small-scale and possibly medium-time. Given the working practices of EBS and its contractors, the likelihood of such happening is considered low. It is recommended to have a waste management in place and to properly and neatly store materials.
2. Land take for the Mariënburg substation, and the solar plants at Alliance and Brownsweg. Small pieces (up to 2 ha) of land are required for the construction of these facilities. This land is no longer available for other purposes. However, at the moment all three locations are unused (abandoned plantation land at Alliance and Mariënburg and poor manmade savanna land near Brownsweg). The impact of land take at all three locations is of a low magnitude and long-term. The impact is inherent to the project and cannot be further mitigated during the duration of the project

Also for the biological environment most potential impacts during construction are **negligible**. There are no endangered plant and animal species present in the manmade and man affected environments in which the projects are undertaken. And no protected areas are within the potential impact zone of the project. Nearest privately protected area is the Peperpot Nature Park of which the northern boundary is at 200-300 meter from the Oost-West Verbinding, along which the Peperpot-Richelieu transmission line is planned to be constructed. Impacts here are already present from road traffic and existing construction activities. Any noise or air quality impacts from the project to wildlife will be short-term and localized; and these are expected to be small compared to the already existing impacts.

Table 22: Potential bio-physical impacts during the construction phase of the EBS energy infrastructure projects, their source and mitigation

Affected Environmental Aspect	Impact Description	Impact Likelihood	Impact Characteristics and Magnitude	Impact Significance	Mitigation Measures (proposed or recommended)	Residual Impact
Visual and Aesthetics	Transportation and handling of materials: storage	High	Direct, short term, small-scale. Very few receptors. Magnitude: Low	Negligible		Negligible
	Improper waste management and poor material storage result in untidy environment around project sites	Low	Direct, medium-term, small-scale. Often already littering and waste disposal by third parties. Magnitude: Medium	Minor	Have proper material storage and have waste management in place; monitor compliance	Negligible
Air quality	Construction traffic and equipment at project site, and other project traffic: exhaust gasses and dust from traffic.	High	Direct, short term, small-scale. Few or no receptors. Magnitude: Negligible	Negligible	Proper maintenance of vehicles and equipment	Negligible
	Construction activities at project sites: dust from soil works and handling of materials.	Medium	Direct, short term. Few or no receptors. Magnitude: Negligible	Negligible	Prevent dust emissions by covering and/or wetting of dust generating materials during construction or by placing dust screens.	
Noise	Increased noise levels at project sites and along project transport routes: project traffic and construction activities on-site.	High	Direct, short term, small-scale. Few or no receptors. Magnitude: Low	Negligible	Proper maintenance of vehicles and equipment	Negligible
Land and soil	Land take for transmission lines.	High	Land already in use. Magnitude: Negligible.	Negligible		Negligible
	Land take for solar plants and substation	High	Direct, long-term, small-scale. No high value land and no scarcity for land. Magnitude: Low	Minor	Cannot be mitigated, inherent to project	Minor
Water quality	Increased turbidity of road side ditches and canals due to erosion of road sides during works	Medium	Direct, short term; small-scale. Already existing process. Magnitude: Low	Negligible	Prevent soil piling to the minimum. Compact loose surfaces as soon as possible	Negligible

Affected Environmental Aspect	Impact Description	Impact Likelihood	Impact Characteristics and Magnitude	Impact Significance	Mitigation Measures (proposed or recommended)	Residual Impact
	Increased turbidity of the Commewijne River as a result of cable placement at the bottom	High	Direct, short-term, small-scale. River already turbid. Magnitude: Negligible	Negligible		Negligible
Vegetation	Habitat destruction due to vegetation clearance for transmission lines	High	No vegetation removal required. All lines within Right-of-Way of existing or planned roads.	Negligible		Negligible
	Habitat destruction due to vegetation clearance for solar plants and Mariënburg substation, riser pole locations	High	Direct, long-term, small-scale. Low, secondary vegetation in human affected environment. Magnitude: Low	Minor	Limit vegetation clearing to the minimum.	Minor
Flora and fauna	Loss of endangered, threatened or vulnerable plant or animal species due to habitat loss or disturbance during project activities	Low	Direct, short-term, small-scale. Project activities in an already human made/affected environment. Magnitude: Negligible	Negligible		Negligible
Protected areas	Disturbance or damage to protected areas	Low	No protected areas within project footprint. Activities will not have an additional impact to the nearby Peperpot Nature Park which boundary zone is already affected by current impacts	Negligible		Negligible

Table 23: Potential bio-physical impacts during the operation phase of the EBS energy infrastructure projects, their source and mitigation

Affected Environmental Aspect	Impact Description	Impact Likelihood	Impact Characteristics and Magnitude	Impact Significance	Mitigation Measures (proposed or recommended)	Residual Impact
Visual and Aesthetics	Physical presence of transmission lines and plants/ substation	High	Direct, long term, large-scale. Few receptors. In already transformed environment and few receptors. Magnitude: Low	Minor	Establish low vegetation barrier around solar plants and substation Mariënburg	Minor (transmission lines) Negligible (others)
	Improper waste management results in dirty environment around project sites	Low	Direct, short-term, small-scale. Often already littering and waste disposal by third parties. Magnitude: Negligible	Negligible	Have waste management in place and monitor compliance	Negligible
Noise	Elevated noise level near the proposed Mariënburg substation	Medium	Direct, long term, small-scale. No nearby receptors. Magnitude: Low	Minor	Do not allow residential development in the area directly around the substation.	Negligible
Flora and fauna	Interference by transmission lines with bird flight paths and increased potential for bird collisions	Low	Direct, short-term, small-scale. Magnitude: Medium	Negligible		Negligible
	Animal electrocutions by transmission lines	High	Direct, short-term, small-scale. Magnitude: Medium	Minor	Prevent pole climbing by placing a small barrier	Negligible

The only minor potential impact to biological resources refers to vegetation clearing, with loss of habitat, for the solar plants at Brownsweg and Alliance, the substation at Mariënburg and the rise pole sites for the underwater cable. This impact will be permanent for the duration of the projects, but only small to very small areas are cleared. Because it concerns low secondary vegetation, the magnitude is considered to be low. No mitigation is possible, but vegetation clearing should still be restricted to the minimum.

6.1.3.2 Operation

A visual and aesthetic impact may occur at all project locations as a result of littering and waste generated during maintenance. This impact is, however, considered **negligible**, given the low frequency and short duration of localized maintenance activities.

The presence of structures (transmission lines, building construction) could have a **minor** impact to visual and aesthetic aspects due to the interference with the natural view. However, at most locations the natural view is already affected by other manmade structures. And at other locations there are hardly any receptors (Alliance, Mariënburg substation). Establishment of a low vegetation strip along the road could be considered as a mitigation measure for the Brownsweg solar plant site.

A **minor** noise impact is possible at the Mariënburg substation, once operational. At this moment there are, however, no nearby receptors at the site. But future housing projects could be developed near the site. In that case, the developer should not build too close to the substation (actual distance to be determined by on-site noise measurements).

Other **minor** potential impacts could arise from bird strikes and electrocution of certain wildlife species by transmission lines.

The presence of overhead cables creates increased hazards along local and migratory bird flight paths. Collision of certain large local bird species with the proposed transmission line is a possibility, but unlikely because they tend to fly above the tree line, which is higher than the transmission line. Smaller birds are usually flexible enough to avoid collisions with lines. No specific flight paths of low-flying migratory birds are known for the projects areas.

Only few bird collisions are reported by EBS. The potential impact of transmission lines on bird strikes is considered **negligible**, because it occurs incidentally and at a small scale.

Apart from bird strikes, also bird electrocutions can occur due to transmission lines when a short circuit is made between the earth and live component of the line. Electrocution is possible, especially with large raptors and vultures. In addition to birds, also other animals may be electrocuted, when they climb into the power lines. Electrocutions on transmission lines and distribution lines are rather commonly observed by EBS (Mr. Hellings from the EBS Maintenance Department). On the low voltage lines (12 kV- 10-12 m height from the ground), struck animals could comprise of:

1. Opossum
2. Birds (nesting behind transformers)
3. Snakes
4. Monkeys
5. Sloths

High voltage lines (33 kV) are struck incidentally because they are placed on greater height. Birds occasionally get struck but this, but this is only rarely the case. The potential impact of transmission lines on animal execution is **minor**, being of medium magnitude, small-scale and short-lived (no effect on the total population of concerned animals); the likelihood is high. As a mitigation measure, EBS already places a small metal construction at the lower end of the pole in order to prevent, or at least

reduce climbing of animals. This measure is also recommended for the transmission lines in the current project.
Summarizing it can be stated that there are no significant potential bio-physical impacts from the EBS Energy projects.

6.2 Socio-economic assessment

The results of above already addressed impact issues are summarized in the following. This table also presents the projected residual impacts, that is, the net impacts after implementation of mitigation measures.

Table 24: Potential social impacts of the EBS energy infrastructure projects, their source and mitigation

Affected Social Aspect	Impact Description	Impact Likelihood	Impact Characteristics and Magnitude	Impact Significance	Mitigation Measures (proposed or recommended)	Residual Impact
General						
Improved energy supply	Redundancy in power supply; fewer power outages; potential for population growth and economic development	High	Direct; long-term, medium scale, reversible. Magnitude: High	Moderate Positive	Anticipate new requests for connections to the grid.	Moderate Positive
Livelihood	Small number of temporary employment opportunities in construction phase; digging, boat transportation.	Low	Direct; short-term, small-scale, reversible. Magnitude: Low	Minor Positive	As much as possible, hire local field hands for temporary jobs.	Minor Positive
Cultural Heritage	Disturbance of archeological and other cultural heritage sites	Low	Direct; long-term, small-scale, irreversible. Magnitude: High	Moderate	Discuss location of cultural sites with plantation population and Koina Kondre. Follow international best practice as described in this ESIA	Negligible
Powaka-Zanderij transmission line						
False expectations	People from Hannover may get impression that transmission line will provide them with electricity. They may get upset when this is not the case, especially given recent government promises that they will be connected to the grid. Frustration may lead to protest	Medium	Indirect; medium-term; medium-scale; reversible. Magnitude: Medium	Moderate	Clear and transparent communication with local stakeholders, including descendants of plantations Hannover and Mawakabo, about the current EBS project. Emphasize that the road project and related GoS promises are unrelated to the transmission line project. Avoid use of the project for political party campaigning.	Negligible
	Damage to reputation IDB if people believe that EBS/IDB promised them electricity	Low	Indirect; short-term; medium-scale; reversible. Magnitude: Medium	Minor		Negligible
Koina Kondre project						

Affected Social Aspect	Impact Description	Impact Likelihood	Impact Characteristics and Magnitude	Impact Significance	Mitigation Measures (proposed or recommended)	Residual Impact
False expectations	During the information meeting, the Min. of Natural Resources and District Commissioner, in presence of the director of EBS, promised the local stakeholders a new, larger energy generator and extension of the net before May 2020. People may get upset when this commitment is not met. The community is already frustrated about earlier unmet promises of electricity, and has barricaded the road before.	Medium	Indirect; medium term, small-scale. Reversible. Magnitude: Medium	Moderate	ASAP, have another meeting with inhabitants of the Koina Kondre project area, to explain what the EBS project is, and emphasize that a generator is not part of it. During validation meeting, make sure that the meeting is a-political. Avoid participation of political figureheads and avoid use of this project for political party campaigning. Transparent and honest communication about the project and its timeline. No false promises. Ensure that it is clear who will be connected to the EPAR system – also with regard to distance from the road.	Negligible
	During the information meeting, no time line was presented to the community. People probably expect to be connected to the grid within a year, and may get frustrated when nothing happens soon.	High	Indirect; medium term, small-scale. Reversible. Magnitude: Low	Minor		Negligible
Switch to paid electricity	Reduced household budget	Medium	Indirect; long term; small-scale. Irreversible. Magnitude: Medium	Minor	Follow communication model of Atjoni/Pokigron and Powaka Transparent and honest communication about payment. Awareness session on what people can expect.	Negligible
	If people fail to pay they will be disconnected. A fee must be paid to get reconnected.	Medium	Direct; long term; small-scale. Irreversible. Magnitude: Low	Minor		Negligible

Affected Social Aspect	Impact Description	Impact Likelihood	Impact Characteristics and Magnitude	Impact Significance	Mitigation Measures (proposed or recommended)	Residual Impact
	Cost in time and money to pay bills in Paramaribo or other EBS payment station.	High	Direct; long term; small-scale. Reversible. Magnitude: Low	Minor	Send EBS team to collect payment when fees are collected in Powaka. Establish new, nearby payment location (e.g. Klaaskreek)	Negligible
24/7 power supply	The people of the various Koina Kondre settlements currently have no electricity at all, or unreliable electricity for a few hours a day. The project will provide them with 24/7 electricity, which will allow people to run a freezer, have radio and TV, charge cell phones, make homework in the evening, etc.	High	Direct, long-tem, small-scale, reversible. Magnitude: High.	Major Positive	Ensure that EBS connects all relevant houses and businesses; i.e. that none are "forgotten".	Major Positive
	Students/children can read and study in evenings	High				
Livelihood	24/7 access to electricity may open up small business opportunities for local area inhabitants, such as the sale of bush meat or fish, and wood processing.	Low	Indirect; long-term; small-scale; reversible. Magnitude: Low	Minor Positive	Additional measures could be promoted by the government or NGO's, but this is not part of the project.	Minor Positive
	Existing businesses, including tourism resorts and wood landings, may reduce energy expenses. '	Medium	Direct; long-term; small-scale; reversible. Magnitude: Medium	Minor Positive	Timely discussion with firms beyond 300m from the road about options for connection.	Minor Positive
	Loss of activities for DEV staff (2 persons). As public workers, they will continue to be employed. Possible relocation, or other job in the same community. '	High	Direct, long-tem, small-scale, irreversible. Magnitude; Low.	Minor	Ensure that new job does not require moving away. Hire previous DEV staff as local EBS staff, and train accordingly.	Negligible

Affected Social Aspect	Impact Description	Impact Likelihood	Impact Characteristics and Magnitude	Impact Significance	Mitigation Measures (proposed or recommended)	Residual Impact
Brownsweg						
Land tenure issues	The proposed area is part of community forest concession of the community of Djanka Kondre, in name of Kapitein v/d Kamp. Need for negotiation.	High	Direct, Short-term, small-scale; reversible. Magnitude: Low	Minor	Obtain clarity about land tenure status and possible land request (ongoing). Negotiation with Project Affected Persons, DC (and SBB) about suitable solution. If applicable, compensation measures.	Negligible
	Lack of clarity about possible land request from an area inhabitant (filed since 2011). If the areas overlap; need for negotiation.	Medium	Direct, Short-term, small-scale; reversible. Magnitude: Low	Minor		Negligible
Commewijne / Alliance						
Suboptimal use/loss of project resources	Alliance has a very small and declining population, and there are no signs that this trend will reverse. The remaining inhabitants have electricity, and the problem with power outings will be reduced with the underwater cable. No convincing justification for the solar project investment.	Medium	Indirect; long-term; small-scale; irreversible. Magnitude: High	Moderate	Perform cost/benefit analysis of solar plant at Alliance. In case that costs outweigh benefits: Identify suitable other location with higher need and more inhabitants.	Moderate Positive
Land tenure	Anchor lines of electricity poles may have to be anchored in private plots.	Low	Direct; long-term; small-scale; reversible. Magnitude: Low	Minor	Use standard EBS procedures to deal with land owners on whose lands lines may need to be anchored.	Negligible

The proposed Project will deliver significant positive effects to different rural communities. Among the most significant positive impacts is that several EBS service areas will get more reliable electricity supply. The different projects will connect various substations, so that power supply can be guaranteed in the larger service area in the case of a power outing in one specific location. Moreover, the Project will reduce pressure on the net in the case of anticipated population growth.

Particularly in Koina Kondre, the connection to the EPAR network will have an important local impact. At this moment, the estimated 260 households, 11 wood landings, four tourism resorts, allotment project and one school in this area either receive electricity for only a couple of hours a day, or do not have access to public electricity at all. Moreover, also those with theoretical electricity supply through the village generator, often have no electricity at all when government fuel is not delivered. Having access to 24/7 electricity means that local area inhabitants will be able to store food supplies for a longer time, that they will be able to charge cell phones, and have radio and TV to follow daily news. Moreover, children and students will be able to study and read in the evening hours. In order to maximize these and other benefits, it is important that EBS carefully maps all houses and businesses in the project area, including those somewhat removed from the main road. Households/businesses in these relatively more distant locations must be informed about possible connection expenses. Furthermore, given that these new EBS clients will have to pay for electricity after being connected to EPAR, clear and transparent communication about electricity expenses, payment methods, and consequences of failure to pay must be communicated. Given the easy transfer to paid electricity in comparable locations (Powaka, Atjoni), no major problems are expected in this regard.

Significant potential negative impacts directly related to project activities are in particular ‘false expectations’ in the Koina Kondre project area and the Powaka-Zanderij project area. These false expectations can be managed with mitigation and prevention measures so that low impacts remain.

Mitigation of potential negative impacts requires foremost timely, transparent and complete communication about the project activities with the various stakeholders. One of the most important lessons from earlier projects is that local stakeholders must be informed not only about the general activities, but also about the projected timeline (when will project be delivered) and possible positive and negative project impacts. Moreover, local stakeholders must be informed about exact dates of the activities at least two weeks in advance. When the dates change due to unforeseen circumstances, these various stakeholders must be informed about such changes.

At this moment, Suriname is preparing for the upcoming elections (May 2020), and the various political parties have started their election campaigns. It is important to separate IDB projects from any political activities and to avoid use of the project for political party campaigning.

7. Public Consultation

Public consultation is a key component that runs throughout the ESIA process.

The study started on May 11th of 2019, with the official Contract Signing. A kick-off meeting with the IDB and the EBS was held on the 23rd of May 2019. Minutes of meeting are included in **Annex IIB**.

Initial meetings were held with the District Government of Brokopondo, Commewijne and Para. In all the initial meetings, the projects with preliminary ESIA findings (potential issues and impacts the proposed project may have) were discussed. All minutes of meetings are included in respectively **Annex IIC**, **Annex IID** and **Annex IIE.**

In order to further identify potential issues and impacts stakeholder meetings were held in the communities of Brownsweg and Koina Kondre respectively on the 17th and 20th of June 2019. The minutes of meetings of Brownsweg is included in **Annex IIF**.

As project insights developed during the assessment, the need for an initial meeting for the Powaka-Zanderij Transmission Line Project (with the owners and descendants of plantations Hanover-Mawakabo) was identified. This meeting still needs to be arranged. The outcome of this meeting will be processed in the Final ESIA Report.

Finally, validation meetings will be held in the communities of Alliance, Koina Kondre, Brownsweg and Hanover. These are currently planned for the period of August 2019. In these meetings the Environmental and Social Baseline conditions together with the Impacts Assessment of the proposed projected from this document will be presented to the stakeholders. The comments of the stakeholders will then be processed to complete the Final ESIA Report.

8. Conclusion and Recommendations

No significant potential bio-physical impacts have been determined. There are no impacts with a score of major or moderate. All impacts are negative and most of the impacts have a score that is negligible. Most of the impacts that are scored minor are reduced to negligible after implementation of the mitigation measures. However, a few of the impacts that are scored minor cannot be reduced because they are project inherited. These impacts are related to the environmental aspects: land and soil (land take for solar plants and substation locations), vegetation (clearing for solar plants and riser pole locations) and visual and aesthetics (permanent presence of transmission lines).
Few significant potential socio-economic impacts have been determined. Two negative moderate potential impacts are identified with respect to "false expectations". Such impacts can only be solved by clear and transparent communication with local stakeholders during the planning and preparation phases. Procedures for this are already in place at EBS and should be applied.

Another negative moderate potential impact is identified for the possibility that an archaeological site is being disturbed or destroyed by project activities. Procedures to prevent or mitigate such impact procedures should be consistent with internationally recognized good practice as described in the ICOMOS (1990) Charter for the Protection and Management of the Archaeological Heritage. In addition, Project stakeholders must comply with the Government of Suriname (GoS) Monument Law of 2002 for immoveable archaeological resources found during the course of the project.

Finally, a moderate negative potential impact is identified for the investment in the Alliance solar plant. Given the small and decreasing population and the fact that electricity is already available (though not very reliable), it is doubted whether an investment like a solar plant at that location is justified. It is given in consideration that another location with better prospects is selected for this solar plant. Such decision is, however, not part of the ESIA.

Besides negative potential impacts, also some positive socio-economic impacts were identified.
All other potential socio-economic impacts are minor or negligible.

All of the other impacts are minor; after implementation of the (recommended) mitigation measures, these are all reduced to negligible

References

Amatali, M.A. and Naipal, S. 1999. Country Study Climate Change Suriname. Water Resources Profile. Technical Report no.4a. Ministry of Public Works, Suriname and Institute for Environmental Studies, Free University of Amsterdam. Paramaribo, Suriname 77 p.

BirdLife International (2019). Country profile: Suriname. Available from http://www.birdlife.org/datazone/country/suriname. Checked: 2019-07-06.

Dikland, Philip, 2012. Indigo- en houtgrond Hanover aan de Para-kreek. Unpublished paper. 2012, 1st version 2005

International Finance Corporation / World Bank Group, 2007. Environmental, Health, and Safety (EHS) Guidelines. General EHS Guidelines: Introduction. p 53.

ILACO Suriname, 2017. Noise Baseline Study Sabajo Project ESHIA Final Report. p 17-19.

ILACO Suriname, 2018. Consulting Services for the Design and Assessment of the BAT-BEP Demonstration Project- Baseline Noise Report. p 13.

ILACO Suriname, 2018. Updated Environmental and Social Impact Assessment (ESIA) for the Uitkijk Appraisal Drilling Program (ADP). p 17-18.

ILACO Suriname, 2018. Environmental and Social Impact Assessment (ESIA) for the KPF Waste Management Plant- Draft Baseline Noise Report. p 14.

ILACO Suriname, 2015. Limited Environmental and Social Impact Assessment for the Wageningen High Voltage Transmission Line Project in Suriname. p 55.

Nationaal Instituut voor Milieu en Ontwikkeling in Suriname. Suriname. 2017 Guidance Note NIMOS Environmental Assessment Process. Supplemental to the EA guidelines NIMOS 2009.

Noordam, D. 1993. The geographical outline. In: P.E. Ouboter (Ed). The freshwater ecosystems of Suriname. Kluwer Academic Publishers. p 13-28

Scherpenzeel, C.W. 1977. Klimaat. In: C.F.A. Bruijning en J. Voorhoeve, eds. Encyclopedie van Suriname, p 338-347.

Social Solutions 2017 Socioeconomic and Cultural Resources Survey. For the communities of Powaka, Philipusdorp (Kl. Powaka), Redi Doti, Cassipora, and Pierre Kondre Kumbasi. Produced as part of the Newmont Sabajo ESIA. Available from: https://www.newmontgoldcorp.com/wp-content/uploads/2019/06/Sabajo-Baseline-Study-Cultural-Resources-Survey-Carolina-Communities.pdf. Checked: June 2019.

Stichting Jongeren Hanover (2015). Visie Hanover/Mawakabo. Available from: http://www.federatieparaplantages.org/pdf/De%20plantages%20Hannover%20voor%20FPP%20WEBSITE.pdf. Checked: June 2019.

Teunissen, P.A. 1978. Reconnaissance map of Suriname Lowland Ecosystems, scale 1:200.000.
Veen, A.W.L. 1970. On geogenesis and pedogenesis in the Old Coastal Plain of Surinam (South America). PhD Thesis, Amsterdam.
Versteeg, A. (2003). Suriname Before Columbus. Paramaribo: Stichting Surinaams Museum.

VIDS & VSG. 2016. Community Engagement Strategie voor de Overheid (versie 1.1.). Paramaribo, Conservation International Suriname.

Annexes