Addendum

Environmental and Social Impact Assessment (ESIA)

for the

Energy Infrastructure Project Commewijne

Prepared for:

NV Energie Bedrijven Suriname (N.V. EBS)

Paramaribo, 21 February 2022

ILACO

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Contents

List of Figures

List of Tables

Abbreviation

ATV	All-terrain vehicle
CR	Community Relations Policy
EBS	N.V. Energie Bedrijven Suriname
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
HSE	Health, Safety and Environment
IDB	Inter-American Development Bank
IFC	International Finance Cooperation
ILACO	ILACO Suriname NV
kV	kilo Volt
MAS	Maritieme Autoriteit Suriname
MNH	Ministry of Natural Resources
ROC	Right Bank of the Commewijne River
RoW	Right-of-Way
UTV	Utility Task Vehicle

Executive Summary

This document presents the results of the addendum Environmental and Social Impact Assessment (ESIA) of the Energy Infrastructural Project Commewijne, under the operation of the IDB SU-L1055 Loan: Consolidating a Sustainable Energy Sector. This addendum ESIA entails the following aspects of the Commewijne project:

- Extending the existing12 kilo Volt (kV) network at Richelieu towards Mariënburg/ Ellen;
- Installing an underwater 12 kV cable from Ellen to plantation Johanna & Margareta, and
- Rehabilitation and partial re-routing of the existing distribution line at the Right Bank of the Commewijne River (ROC).

The addendum ESIA has been carried out in compliance with the relevant standards and guidelines of the Inter-American Development Bank (IDB), the IDB's Operational Policy (OP) on Environmental and Safeguards Compliance Policy (IDB OP-703). 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.

The current study has predominantly been conducted as a desk study, supplemented by limited field reconnaissance and stakeholder consultation. The reason for the limited amount of field work is related to the fact that only revising/updating of the existing ESIA report (ILACO, 2019) is required for which already much data has been collected.

EBS has identified the necessity to set up a distribution infrastructure in the Right Bank of the Commewijne River (ROC) in order to create a redundancy in the grid. In order to create a redundancy at the right bank of the Commewijne River, EBS plans to create several alternate paths for the flow of electricity in case outages occur. EBS proposes (1) to expand the existing 12 kV distribution grid (instead of the previously proposed 33/12kV substation) from plantation Richelieu towards Mariënburg/ Ellen, (2) to place an underwater cable from Ellen to plantation Johanna & Margareta and (3) rehabilitation and partial re-routing of the existing distribution line between Johanna & Margareta and Reijnsdorp in the ROC area.

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: vegetation (clearing for riser pole locations, clearance for Right-of-Way re-routing (ROC)) and visual and aesthetics (permanent presence of distribution lines).

The main potential positive social impact of this project is that the population in the ROC will experience fewer power outages. The magnitude of this change is considered low, because the present annual number and duration of outages is not very high, and the number of potential Project beneficiaries is small and declining. With mitigation measures, the residual impact can be increased to moderate. Other potential positive social impacts include temporary labor provision via contractors, and more permanent jobs for maintenance of the bicycle path.

Possible negative social impacts include disturbance of cultural heritage sites and land tenure issues, which are respectively moderate and minor impacts. In addition, during the construction phase local area inhabitants may be hindered by noise and traffic obstructions (land and water). With mitigation measures, residual impacts of these negative impacts can be reduced to negligible.

1. Introduction

1.1 Purpose of this document

This document presents the results of the addendum Environmental and Social Impact Assessment (ESIA) of the Energy Infrastructural Project Commewijne, under the operation of the IDB SU-L1055 Loan: Consolidating a Sustainable Energy Sector.

This addendum ESIA entails the following aspects of the Commewijne project:

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The addendum ESIA has been carried out in compliance with the relevant standards and guidelines of the Inter-American Development Bank (IDB), the IDB's Operational Policy (OP) on Environmental and Safeguards Compliance Policy (IDB OP-703). 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.

Based on the findings of the addendum ESIA, 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. These recommendations have been included in the updated Environmental and Social Management Plan (ESMP) of the Energy Infrastructural Project Commewijne.

1.2 Background and scope

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.

In September 2019 ILACO completed an ESIA study for four (4) Energy Infrastructural Projects under the operation of the IDB SU-L1055 Loan: Consolidating a Sustainable Energy Sector (ILACO, 2019), namely:

- Powaka- Zanderij transmission line project;
- Koina Kondre project;
- "Upgrade critical infrastructure Commewijne including solar plant Alliance", hereafter referred to as the Commewijne Project and
- Brownsweg solar plant project.

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The Commewijne Project (**Figure 1)** entailed the following (ILACO, 2019):

1. Construction of a new 33 kV double-circuit transmission line from substation Peperpot towards Plantation Richelieu;
2. Furthermore, a new 33 kV single-circuit transmission line from Plantation Richelieu towards substation Mariënburg and from Plantation Richelieu towards substation La Paix (OSM);

3. Construction of a substation at Mariënburg;
4. The installation of a second underwater 12 kV cable from substation Mariënburg to Johanna Margaretha, and
5. The construction of a 200 kWp solar plant in Alliance.

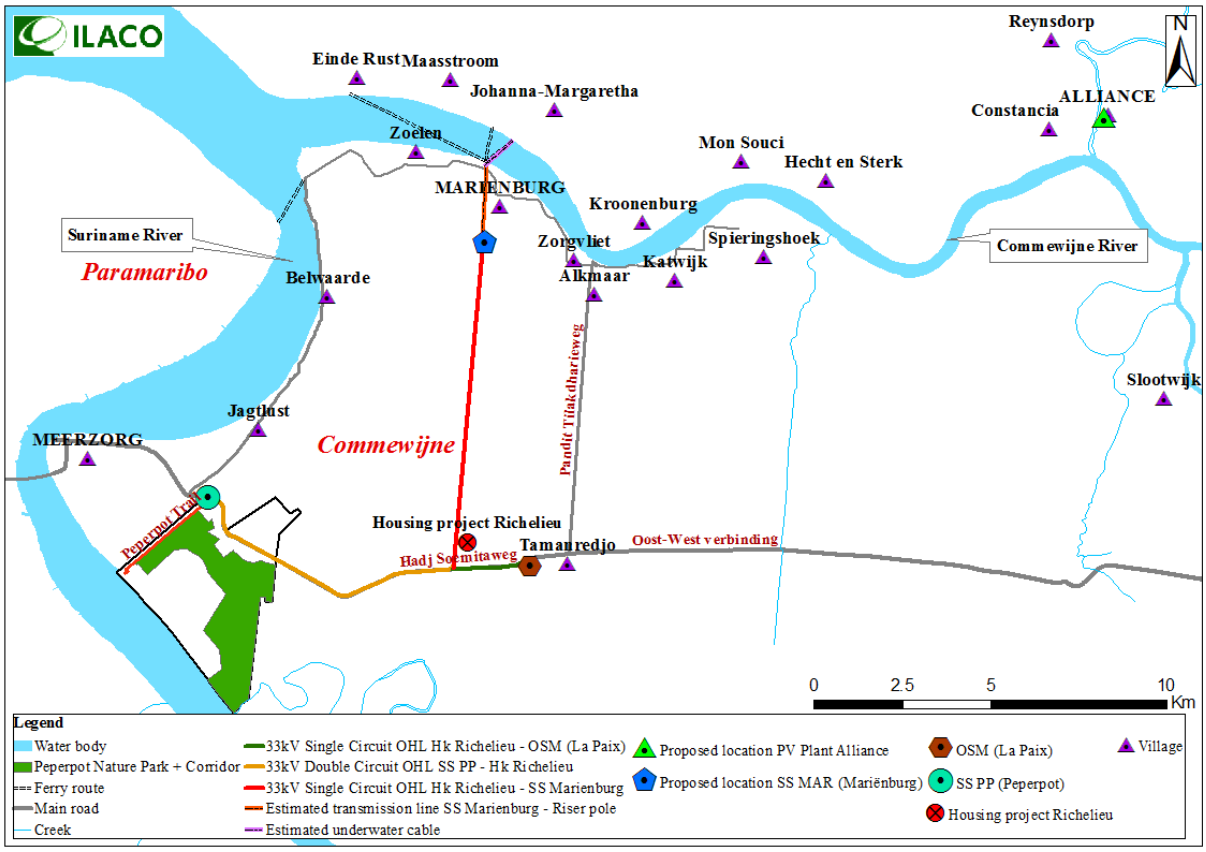


Figure 1: Overview of previous Commewijne project

An addendum ESIA is required for the Commewijne Project as the scope has been adjusted. The most important changes in the scope are:

- A 12 kV line will be constructed from Plantation Richelieu to Mariënburg /Ellen instead of the previously planned 33kV line, and a different route will be followed;
- Cancellation of the construction of the Mariënburg substation;
- Introduction of an alternative route for the 12 kV line at the Right Bank of the Commewijne River (ROC) area, and
- A different method for the placement of the underwater cable.

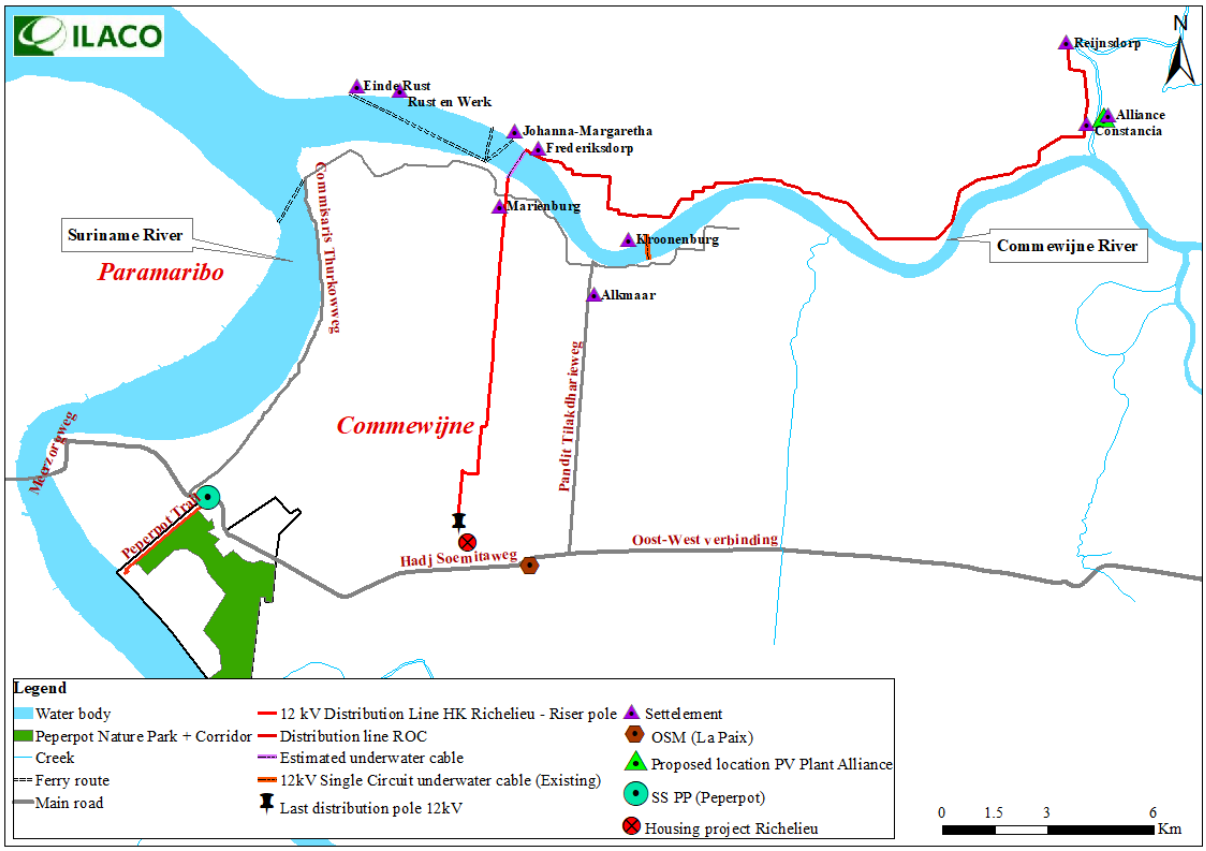


Figure 2: Overview of the current Commewijne project

The scope of works of the current additional review and update of the ESIA includes:

- To present the additional project activities.
- To identify and consult new and already known stakeholders about the current activities.
- To check whether the previous impact assessments also apply to the additional project activities, and if not so, to make additional assessments.
- To validate that the existing ESMP is also applicable for the current and additional activities, and if necessary to modify or include additional issues.

1.3 Project motivation and study area

EBS has identified the necessity to set up a distribution infrastructure at the Right Bank of the Commewijne River (ROC) in order to create a redundancy in the grid. The ROC area (comprising a number of still inhabited plantations, such as Rust en Werk, Alliance, Reijnsdorp, Johanna Margaretha, and Kroonenburg) is currently supplied with electrical energy with a 12 kV line from substation La Paix (OSM) and a 12 kV underwater cable across the Commewijne River to Kroonenburg (see **Figure 2**). In case of a single outage in the transmission line La Paix (OSM) – Kroonenburg 12kV single-circuit, all customers (± 410) in the ROC coverage area would experience a power outage. Furthermore, the current 12 kV line does not have the capacity to take on additional loads to the ROC area. In order to connect new customers in the ROC area as well as around Mariënburg, an upgrade of the distribution infrastructure necessary.

In order to create a redundancy at the right bank of the Commewijne River, EBS plans to create alternate paths for the flow of electricity in case outages occur. EBS proposes (1) to expand the existing 12 kV distribution grid (instead of the previously proposed 33 kV) from plantation Richelieu towards Mariënburg/ Ellen, (2) to place an underwater cable from Ellen to plantation Johanna & Margareta and (3) rehabilitation and partial re-routing of the existing distribution line between Johanna & Margareta and Reijnsdorp in the ROC area (see **Figure 2**). Furthermore, EBS proposes to build a 200 kWp solar

plant in Alliance in order to increase the reliability of the supply in the area, as already described and assessed in the ESIA of 2019.

The purpose of proposed Commewijne project is thus to:

- Create redundancy in the ROC area in order to:
    - Improve the quality and insurance of the energy supply, and
    - Increase system flexibility, allowing EBS to perform preventative or corrective maintenance of the system without disconnecting the load of any substation.
- Increase service coverage and allowing EBS to meet growing demand in subsequent years.

1.4 Methodology

The current study has predominantly been conducted as a desk study, supplemented by limited field reconnaissance visits and a social baseline & impact assessment. The impact assessment methodology is presented in **Annex 1**. The reason for the limited amount of field work is related to the fact that only revising/updating of the existing ESIA report (ILACO, 2019) is required, for which already much data has been collected.

1.5 Team of experts

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

Shareen KOENJBIHARIE, B.Sc.	Project Leader/ Environmental Specialist
Marieke HEEMSKERK, Ph.D.	Social Expert
Ir. Dirk NOORDAM	Sr. ESIA Specialist/ Q&A

2. Project Description

2.1 Site Location and Existing Conditions

The current Commewijne project comprises the following components:

- Expansion of the existing12 kV network from Richelieu towards Mariënburg/ Ellen;
- Installing an underwater 12 kV cable from Ellen to Johanna Margaretha, and
- Rehabilitation and partial re-routing of the existing distribution line at the Right Bank of the Commewijne River (ROC).

Expansion of the existing 12 kV network from Richelieu towards Ellen

The existing 12 kV network at Richelieu will be extended towards a riser pole that will be placed in Ellen. From the riser pole, the distribution line will be placed underground toward the south bank of the Commewijne River (on the east site of an old jetty) and then on the riverbed towards Plantation Johanna & Margaretha.

For the construction of the distribution line from Richelieu to Ellen, EBS made a selection out of two possible routes (**Figure 3**). **The final selected route (red line in Figure 3)** follows an existing dam that is currently partly inaccessible due to weeds, bushes and shrubs, but compared to the previous option **(green in Figure 3 line)** it is less overgrown. The selected rout has a length of 10.7 km and the previous considered route has a length of 10.6 km. At some part of the selected distribution route, existing distribution lines are present. In those parts, the new distribution line will be constructed along the opposite site of the existing distribution line. The proposed location for the riser pole in Ellen is at the end of the Bamistraat. The exact location of the riser pole has yet to be determined, but this will be in a small (5x5 m) open spot for which adequate options are available. Towards the river bank Parwa vegetation is observed.

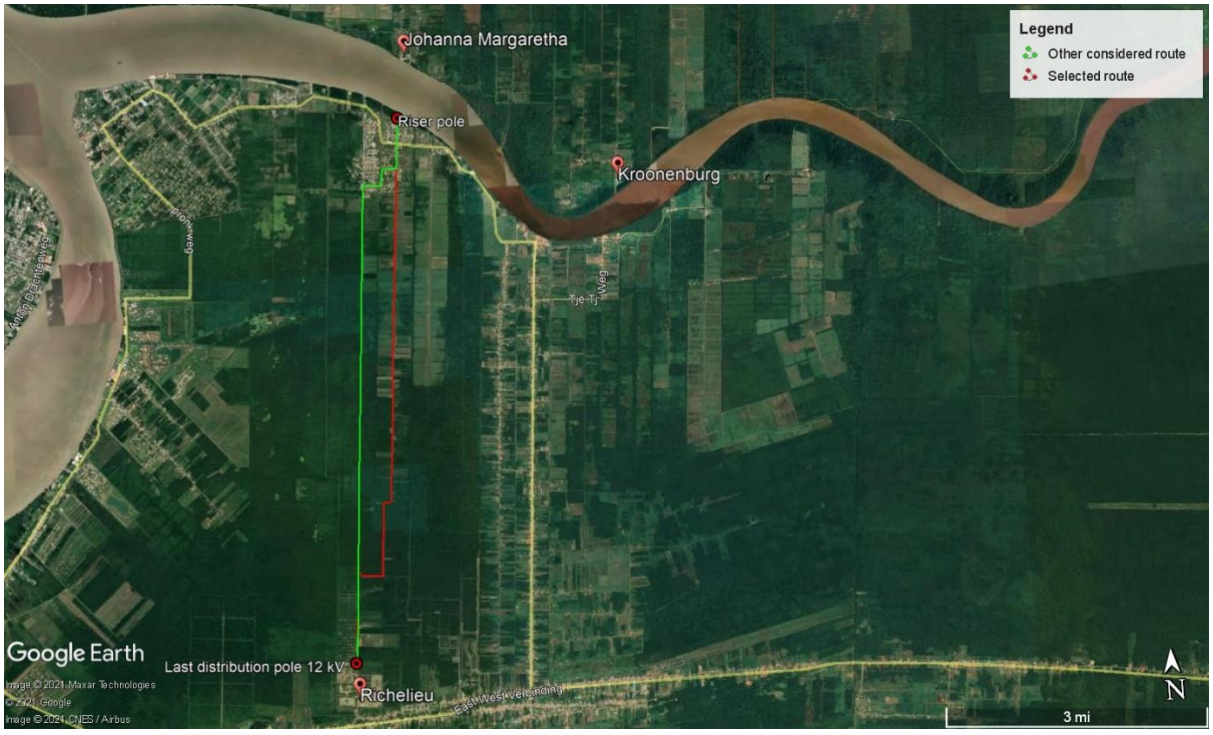


Figure 3: Selected route (redline) and previous considered route (green line)

Installation of an underwater 12 kV cable from Ellen to Plantation Johanna & Margaretha.

The river crossing underwater cable is planned between the southern bank of the Commewijne River at Ellen, and the northern bank at Plantation Johanna Margaretha. At Johanna Margaretha a riser pole will also be placed, where the river cable will be connected to. At Plantation Johanna & Margaretha, houses

and shops are present near the jetty and along the main entrance. The proposed location of the riser pole at Johanna Margaretha is at the open space area to the east of these buildings.

Rehabilitation and partial re-routing the existing distribution line at ROC.
The current distribution line is placed along the bicycle path along the right bank of the river and will be replaced by a new line. At some location where riverbank erosion is taking place, near plantation Mon Souci and Hecht en Sterk, the new distribution line will be shifted inland. The landowner of these locations is determined during the stakeholder consultation (Annex 5). The existing distribution line of ROC will be dismantled after the new distribution line has been commissioned.


No. 1: Proposed location for the riser pole, at the end of the Bamistraat.


No. 2: Proposed location for riser pole at Johanna & Margareta

See **Annex 2** for the Field Orientation Report with overview of existing situation.

2.2 Project Components

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

2.2.1 Planning and preparation

As a first step towards the construction 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 procedures as described in ESIA 2019 will be followed.

2.2.2 Construction phase

Construction of underwater cable

For the construction of the river cable, galvanized riser poles will be constructed on both sides. The cable will then be laid on the bottom of the river with the use of weight. The river profile (cross section) of the Commewijne River at the planned location is already obtained from the Maritieme Autoriteit Suriname (MAS).

Construction of the 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-Way (RoW)[1] will be cleared and debris be removed to a disposal location. The EBS waste management plan for this project will be in place during the construction phase. Vegetation removal will be required at new route locations and along existing route were incidentally

[1] Strip of land required to install the distribution line and related equipment

low trees, shrubs or crops may be encountered. Depending upon their location (relative to pole locations) and height these will to be removed or can 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, and a larger hole is needed.
- 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.
- Once the cable is placed on the bracket, it will be attached on the isolator and tied. Each pole consists of minimal 3 cables.

For the 12 kV lines the length of the poles is approx. 12 meters (approx. 10.25 meter above ground level). For the ROC area Bruinhart (wooden) poles will be used as experience from the EBS shows that the galvanic masts rust after a while, especially with the ROC area being close to the sea and thus the salinity probably being higher (speeds up the rusting process). On the basis of the soil investigation it will be determined how the masts will be placed.

To prevent animals from climbing into the poles, a barrier is placed on it (**Figure 4**).

Figure 4: Barrier for preventing animals climbing into poles

The partial re-routing of the existing distribution line at the ROC, at plantations Mon Souci and Hecht en Sterk will cross through marshland some of which is also occasionally flooded during high tide in the river. The vegetation along the selected transects will be cleared over a width of 15-20 meters. At every pole location (approximately 70 meters apart) within this transect, a mound of approximately 2x2 meters will be constructed to accommodate the poles. In areas with occasional flooding, the works will only be undertaken when the land has fallen dry. Deployment of special equipment, like an UTV (Utility Task Vehicle) and/or swamp excavator may be necessary here. The mounds will be high enough (between 50 and 100 cm) not to be flooded during the highest water level, with a safety limit of 50 cm.

Workforce, Equipment and Time schedule

The Commewijne project will be a turn-key project where the construction of the 12 kV distribution line will be done by a contractor. EBS will commission the line and upon approval the line will be energized and handed over to the EBS. The expected number of workers to execute this part of the project is between 10 and 15.

To execute this part of the project the following equipment will be used:

1. Drilling machine;
2. Excavator; swamp type if necessary;
3. Bucket truck;
4. ATV or UTV, if required;
5. Flat-back truck;
6. Pole master;
7. Crane truck.

The project will start in August 2021 with the preparation of required documents such as the technical document and tender document for turnkey delivery of a 12 kV distribution line. After submitting these documents and receiving Non-Objection from the Bank, the tender documents will be published online. Companies will be able to submit their bid proposal which will be reviewed by an evaluating committee.

One company or a joint venture of companies will be awarded for this project. After signing of the contract with the awarded company the expected mobilization of the goods will start in August 2022. The expected construction of the distribution line will start in December 2022 and the works are planned to be finished in August 2023, after it has been commissioned (see **Figure 5)**.

Turnkey contract 12 kV distribution grid Right Bank Commewijne river	**Fri 8/27/21**	**Mon 3/18/24**
Precontractual Process (ICB)	**Fri 8/27/21**	**Thu 6/23/22**
Prepare Bidding Documents Package	**Fri 8/27/21**	Thu 11/4/21
Obtain IDB NO Objection to Bidding Documents Package	Fri 11/5/21	Thu 12/2/21
Publish Specific Procurement Notice (IDB, UNDB & other portals)	Fri 12/3/21	Thu 12/16/21
Pre bid site visit	Fri 12/17/21	Thu 12/23/21
Elaborate bid proposals	Fri 12/24/21	Thu 3/17/22
Public bid opening	Thu 3/17/22	Thu 3/17/22
Prepare and send for NO Evaluation Report & Draft Contract	Fri 3/18/22	Thu 4/28/22
Obtain IDB NO to Evaluation Report & Reccomendation to Award Contract	Fri 4/29/22	Thu 5/19/22
Contract negotations	Fri 5/20/22	Thu 6/9/22
Contract signing	Fri 6/10/22	Thu 6/16/22
Register the contract with IDB *PRISM	Fri 6/17/22	Thu 6/23/22
Contract execution	**Fri 6/17/22**	**Mon 3/18/24**
Final design	Fri 6/17/22	Thu 8/25/22
Supply of goods	**Fri 8/26/22**	**Thu 12/22/22**
Material preparation/Transport from warehouse to customs	Fri 8/26/22	Thu 10/6/22
Transport from custom to Surinam	Fri 10/7/22	Thu 11/3/22
Custom clearence	Fri 11/4/22	Thu 11/17/22
Transport from customs to area	Fri 11/18/22	Thu 11/24/22
Acceptance of goods	Fri 11/25/22	Thu 12/22/22
12 kV distribution grid Right Bank Commewijne river installation	**Fri 12/23/22**	Thu 5/11/23

Figure 5: Overview of time schedule construction phase

2.2.3 Operation phase

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 of parts that are generating noise hindrance.
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 Ministry of Public Works/ Ministry of Regional Development and Sport. 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).
EBS will be responsible for vegetation maintenance of the re-routing transects.
Routine management comprises:

- General maintenance using tractors and ATV, and
- Major maintenance (every 5 years) using an excavator.

2.2.4 Decommissioning

After construction is completed, the Right-of-Way is restored and any project facilities, equipment and materials will be removed from the site if not further 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).

2.2.5 Waste Management

A waste management permit for construction activities is not required in Suriname and there are no specific written procedures on this matter, therefore it is recommended that the EBS guidelines and procedures are followed. The EBS has prepared general environment, health and safety (EHS) and waste management requirements for contractors based on the waste hierarchy system. The contractor must submit a waste management plan that complies with these requirements during all project phases, and which must include the following at a minimum:

- General waste such as non-hazardous waste such as domestic waste should be disposed properly at the public landfill if not re-usable or recyclable.
- Construction (demolition waste) will be removed from the project sites and also disposed at the public landfill if not re-usable or recyclable.
- Removal of hazardous and toxic wastes (such as batteries) should be according to the national guidelines, IFC procedures and ratified conventions. This type of waste should be kept separate and processed by a certified contractor or incinerated.
- Recyclables (such as plastic, paper, and e-waste) should be sent to a recycling company.

3. Updated information

In 2019, a baseline study consisting of an environmental and social baseline, was prepared as part of the Environmental and Social Impact Assessment (ESIA) for the EBS Energy Infrastructure Projects (ILACO, 2019). As part of that study also the conditions in the Commewijne project area are presented, which cover most of the components of the bio-physical environment of the current study area. Social baseline data for the right bank of the Commewijne River were also presented with special attention paid to Alliance.

The updated biophysical and social environment are described in the sub paragraphs below.

3.1 The bio-physical baseline

3.1.1 Introduction

For the present baseline description, the existing baseline description is reviewed, and updates and additions are made where necessary. The 2019 bio-physical baseline description is annexed (**Annex 3**) for reference. Below reporting of the components of the bio-physical environment of the ROC are restricted to the validation of the existing baseline report and the presentation of updates or additions, as required. For assessment purposes, the baseline characterization represents as much as possible the conditions in 2021.

3.1.2 Climate

The 2019 ILACO (2019) description is still valid for the ROC area.

3.1.3 Air quality

The 2019 description for the more remote areas without significant traffic along roads, is valid for the ROC and it can be stated that there are no major human-made influences on air quality so that air quality in the area is good.

3.1.4 Noise

The noise levels in the ROC area are comparable to those along the Richelieu-Mariënburg line, which will run through a rural area. Noise levels in rural areas and in small communities are much lower than along main roads. The LAeq levels are almost always below the WHO/IFC daytime standard of 55 dBA for residential sites (IFC, 2007) and the noise climate in the ROC can be characterized as quiet.

3.1.5 Land and soil

The ROC is situated in the Holocene Young Coastal Plain, which is formed on sandy and clayey marine deposits. This plain is flat to nearly flat and very low-lying. It is characterized by extensive wetlands. The current project area is dominated by clay soils at former plantations as described for the Alliance and the Mariënburg area in ILACO (2019). Within the ROC, the sluices of some plantations have fallen into disrepair, so that river water may enter the plantation at high tide. Lower portions of these plantations are occasionally flooded during springtide. This is, among others, the case at plantation Frederiksburg, the western neighbor of plantation Hecht en Sterk, but also Hecht en Sterk is affected by it.

3.1.6 Hydrology

Relevant sections for hydrology in ILACO (2019) for the Commewijne project deal with the drainage of plantations. This description is also valid for the current study. The same holds for the description of the Commewijne River in this section. For the current study information of the river depth at the location of the underwater cable (from the MAS) has become available. This is presented in **Figure 6**.

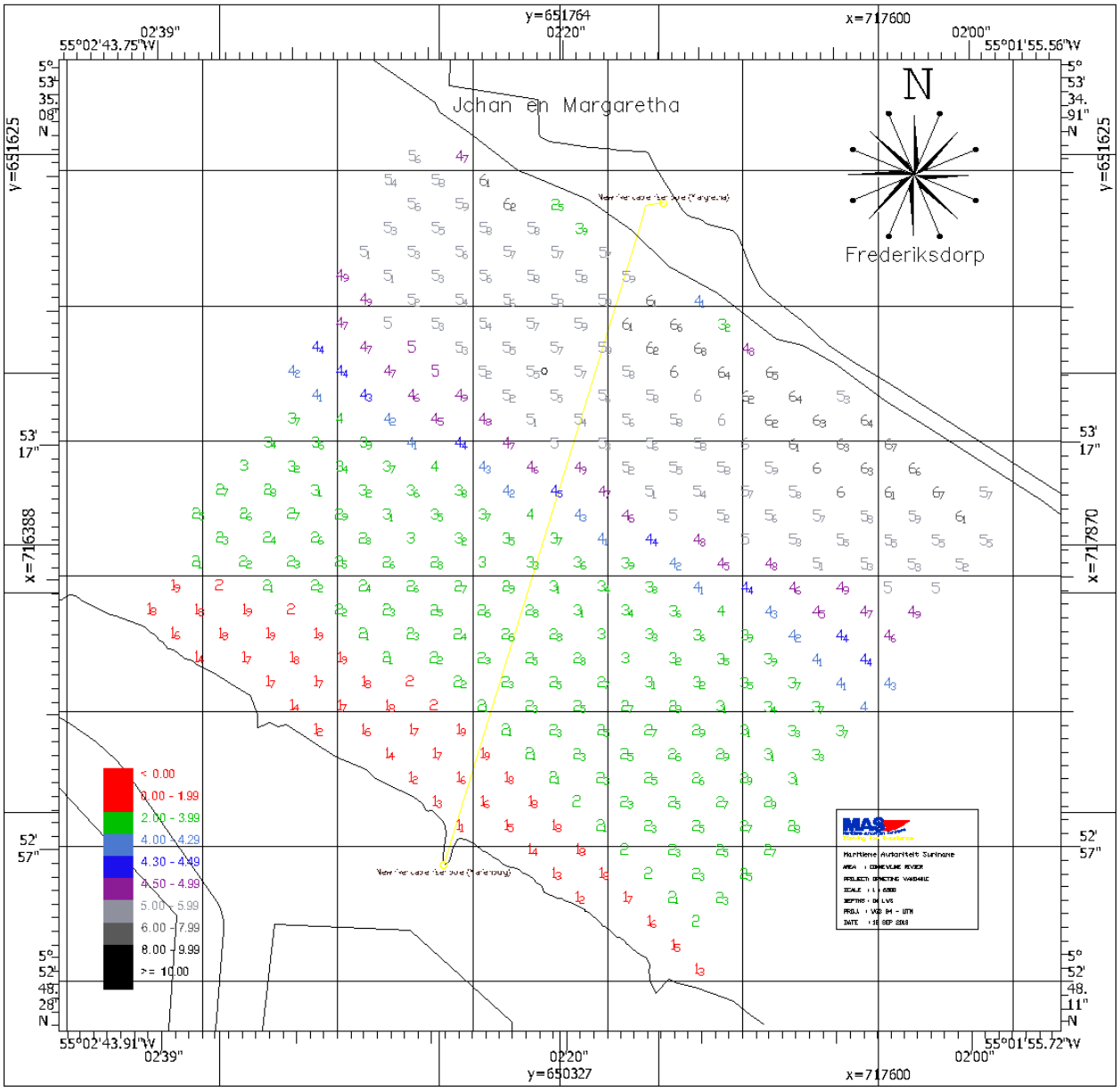


Figure 6: Overview of river depth of Commewijne River

3.1.7 Water quality

The 2019 description of the water quality of the Commewijne River, and of the road side ditches and canals is also valid for the current study. Further, SRK (2007) sampled a location in the Commewijne River, 3 km downstream of the proposed cable site. Total Suspended Solids (TSS) was 755 mg/L in October 2006 and 3240 mg/L in February 2007. This indicates a high turbidity, which is caused by the intruding tide from the Atlantic Ocean that brings in mud laden water from the Brown zone off the Suriname coast. This is a natural process.

The nature of turbidity impacts associated with cable laying in the Commewijne Estuary will be temporary, localized and short-term, while natural mitigating features such as the high natural background concentration of suspended solids, and large hydrodynamic conditions (mixing, dilution) will further mitigate against any potential impacts from increased turbidity.

Control of turbidity during laying the proposed cable e.g. by silt screens is not necessary, and even if such should be recommended, it would be virtually impossible to meet any turbidity mitigation given the complex hydrodynamic conditions and high flow velocity at the project site.

3.1.8 Vegetation

The distribution lines for this project will be constructed at the shoulders of roads, dams or paths. These shoulders are covered with a low grass and herbs vegetation. The selected route from Richelieu to Mariënburg / Ellen and previous considered route are in a similar environment (old secondary marsh forest found on imperfectly to poorly drained clay soils). The 2019 description of the vegetation of Mariënburg area is also valid for the current study.

Within the ROC area, usually a low to moderately high secondary marsh vegetation is found along the planned route, often separated from it by a roadside ditch. However, to the south of the bike path along the Commewijne River riverside mangrove is present. Especially along the narrower routes, trees and palms may be overshadowing the bike path. Any re-routing away from the current route will have to cross through the secondary marsh vegetation, which may be a low to moderately high marsh forest, or an open marsh vegetation with shrubs and bushes.

Project activities will only be carried out along the north side of the bicycle path, or (in case of re-routing) to the north of it through secondary vegetation. The re-routing transects are presented in **Figure 7**. There is no need to clear any mangrove trees, because they do not pose a risk to the distribution infrastructure. For re-routing a strip of 15-20 meters needs to be cleared through secondary vegetation. For Mon Souci this vegetation comprises open grass and herbs with scattered shrubs and bushes, and low marsh forest (50-50%). For Hecht en Sterk the re-routing transect is predominantly open low vegetation with some shrubs and bushes, and only a small section with low marsh forest (75-25%). These vegetation types are very common on fallow and abandoned plantations in the coastal plain of Suriname. The clearing of such vegetation will be of low intensity. An estimated total area of 3-4 ha will be cleared, which is insignificant when compared with the total abandoned plantation area with similar vegetation as found along the involved section of the ROC (approx. 7000 ha; clearing comprises 0.05% of this). Details of the vegetation types within the projected re-routing sections are presented in **Figures 8** and **9**. Some pictures are presented to illustrate the vegetation (**Table 2**).

Figure 7: Re-routing transects at Mon Souci and Hecht en Sterk

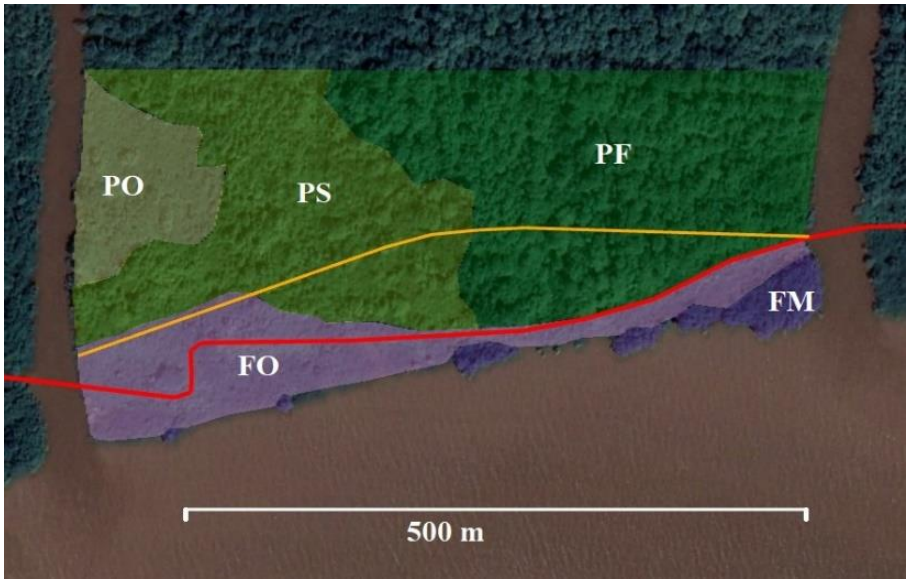


Figure 8: Vegetation in the re-routing section of Mon Souci (for legend see Table 1).

In red the existing bicycle path and in orange the planned re-routing. The river side here has been strongly eroded.

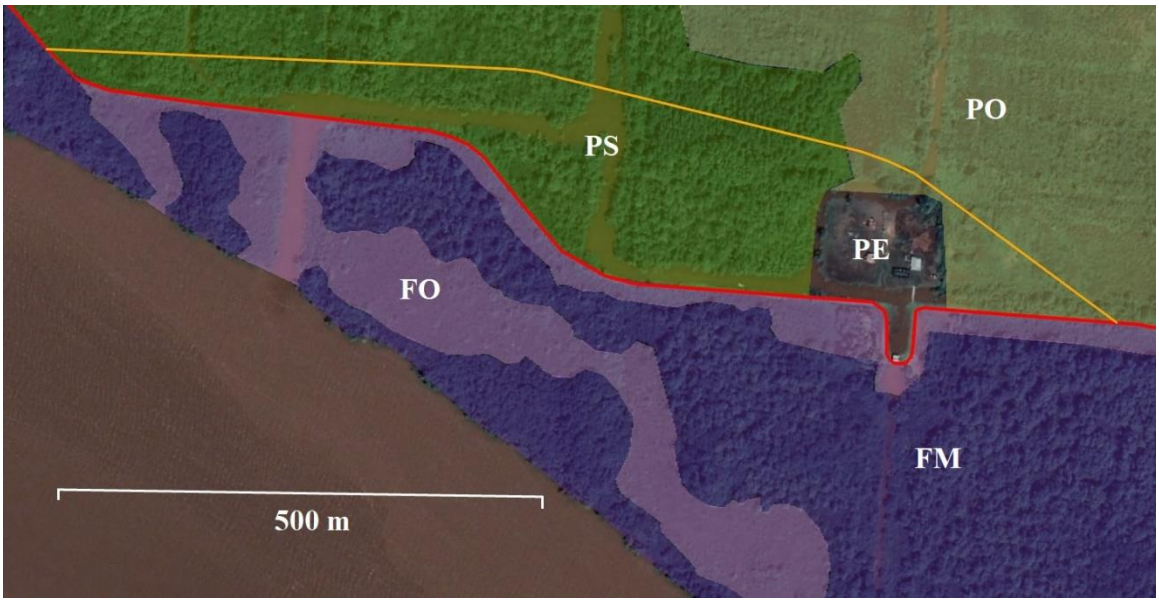


Figure 9: Vegetation in the re-routing section of Hecht en Sterk (for legend in Table 1).

Table 1: Vegetation types of the re-routing sections

ID	Description
FM	Foreland mangrove forest on intertidal land
FO	Foreland with bare land and low brackish vegetation
PO	Abandoned plantation land with low marsh vegetation
PS	Abandoned plantation land with marsh vegetation of shrubs, bushes and small trees
PF	Abandoned plantation land with marsh forest
PE	Emplacement with house and other buildings

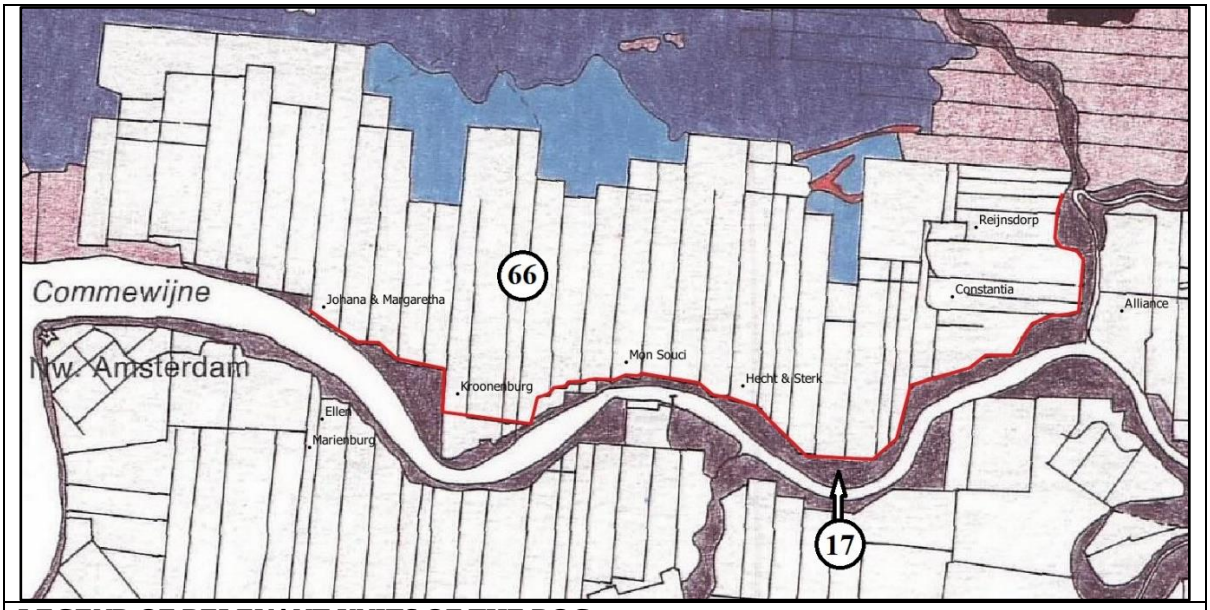
Table 2: Pictures of vegetation types

	
No. 1: Riverside mangrove	**No. 2: Foreland mangrove forest**
	
No. 3: Low foreland vegetation	**No. 4: Foreland with bare spot and low brackish vegetation**
	
No. 5: Marsh vegetation of shrubs and bushes	**No. 6: Marsh vegetation of shrubs, bushes and trees**

3.1.9 Ecosystems

The ecosystems/habitats along the distribution line trajectories could be affected by project activities. Therefore, the ecosystems till 100 meters from the project sites have been described in ILACO (2019). The description for the Commewijne project in this report is also valid for the current project. The ecosystems map by Teunissen (1978) (**Figure 10**) shows two units for the ROC route. Unit 17 is found on the soft sediments along the river, and to south of the bicycle path. The unit is dominated by Rhizophora mangle, also known as Red Mangrove (SL: Mangro). Red Mangrove is the mangrove species that occurs along the brackish river estuaries in Suriname, but along the seaside it is far less common. Here Black Mangrove (Avicennia germinans; SL: Parwa) is the dominating mangrove species.

Unit 66 are (eco) systems ranging from areas in use by man, to abandoned lands with young to old secondary growth. The unit is found inland (to the north) of the bicycle path. For the current ROC study area, most of this comprises former plantations that were abandoned decades ago, while active agricultural land is only found at Johanna Margaretha, Kroonenburg, Reijnsdorp and Alliance. When abandoned, several stages of secondary brackish to freshwater wetland vegetation develop as well as several stages of marshland and dryland vegetation. In many abandoned plantations, sluices are damaged or lacking and the river water flows in and out.



LEGEND OF RELEVANT UNITS OF THE ROC

Ecosystems of estuary floodplains

17. Brackish to fresh water mangrove forest, dominated by *Rhizophora mangle*.

Other lowland ecosystems

66. Ecosystems of urban areas, farmland, livestock meadows, forest plantations, mining areas and abandoned fields.

Figure 10: Part of the ecosystems map of Teunissen (1978) showing the ROC area

It is concluded that all of discussed ecosystems for the Commewijne project are very common in northern Suriname.

3.1.10 Wildlife

The description of the wildlife in ILACO (2019) concludes the following: "Given the location of the distribution routes 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." This is also valid for the current project.

In addition to this, it can be added that electrocutions on transmission lines and distribution lines are observed by EBS (as reported for the HV Wageningen transmission line project by ILACO, 2015). On the low voltage lines (12 kV- 10-12 m height from the ground), struck animals comprise of:

- Opossum (Awari)
- Birds (nesting behind the transformers)
- Snakes
- Monkeys
- Sloths

Measures are in place to limit these incidents to the minimum, by placement of an animal barrier at the poles to prevent in climbing and by proper vegetation maintenance.
Bird strikes at these lines are very rare, but cannot be prevented.

3.1.11 Protected areas

There are no protected areas in the ROC project area as can be concluded from (ILACO (2019).

3.2 The social baseline

Given the availability of recent baseline data, data collection for the present social baseline for the ROC was limited to an orientation visit to the area, a visit to the district government, a field visit to the ROC area, which included a stakeholder consultation, and communication with the EBS Project Manager & Environmental Specialist of this project. Minutes of meetings are presented in **Annex 4**.

The updated social baseline for the ROC area is presented in **Annex 5**. The ROC area, located in the district Commewijne, consist entirely of former plantations. The Area of Impact for this Social Impact Assessment (SIA) is between Elizabethshoop in the west, and Alliance in the east. The SIA primarily focusses on the populated plantation lands in this area, and on infrastructure and services used by the people in the ROC (see **Figure 11**). The main livelihood activities in the ROC are working at cattle farms, agriculture, fishing and tourism.

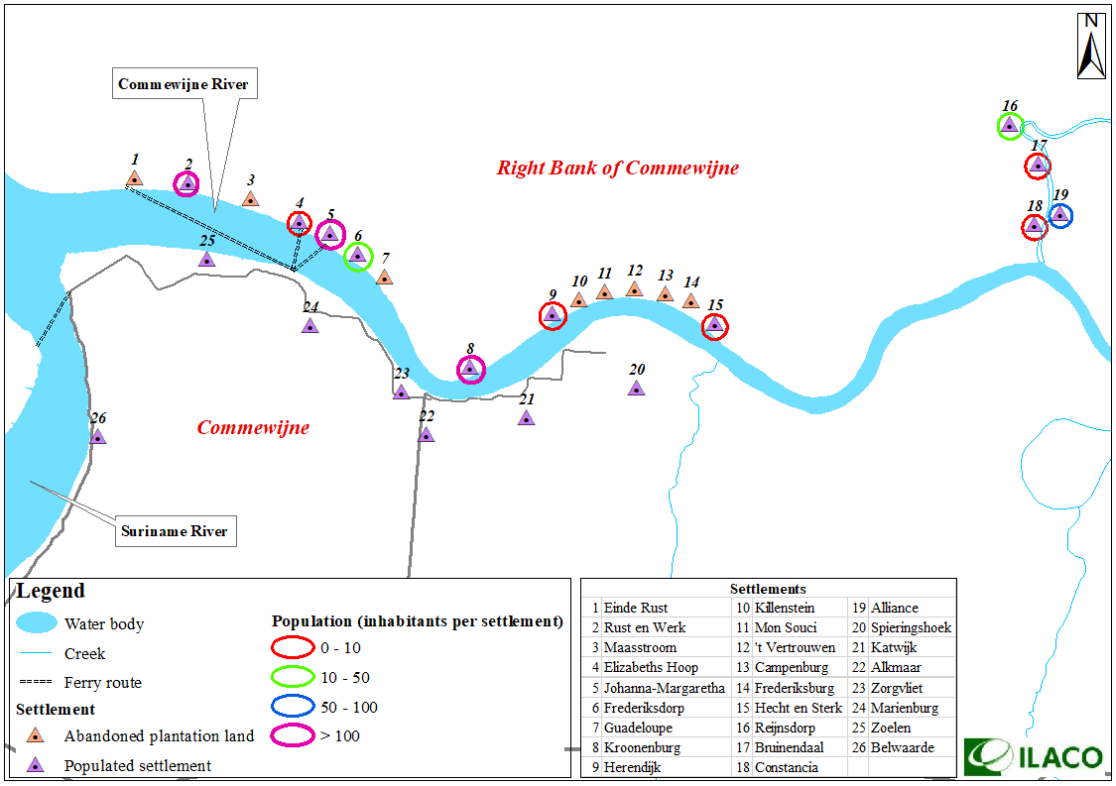


Figure 11: Area of impact at the ROC area

Development projects
Foreseen developments in Commewijne district include (District Commissioner, pers. com. 04 May 2021):

- Shore base facilities at Belwaarde and at Voorburg along resp. the Suriname River and the left bank of the Commewijne River (for Offshore Oil and Gas developments);
- Project of Surinaamse Waterleiding Maatschappij (SWM) at La Liberte (near Peperpot);
- Hydrogen project (opposite Alliance, along the Left bank of the Commewijne River) and
- Mariënburg area; land has been allocated for housing development projects and business creation.

None of these projects take place in the ROC, and it is very unlikely that these projects will affect population or business developments in the ROC. No government projects are planned or foreseen in the ROC. Nevertheless, there are some private initiatives.

4. Impact Assessment

The identified potential bio-physical impacts from the ESIA 2019 (only negative potential impacts have been identified), which are still applicable for the current Commewijne Infrastructure Project, are presented in **Table 3**. An update status is also presented were applicable. No additional bio-physical impacts have been identified. Additional social impacts have been identified during the social impact assessment for the ROC area (see **Annex 5**). The social impacts are presented in **Table 4**.

Table 3: Update status identified potential bio-physical impacts (ESIA 2019) for Commewijne project

Affected Environmental Aspect	Impact Description	Impact Significance	Mitigation Measures (Proposed or recommended)	Residual Impact	Comment regarding proposed current activity	Update Status
Construction phase						
Visual and Aesthetics	Transportation and handling of materials: storage	Negligible	Have proper material storage and have waste management in place; monitor compliance	Negligible		
	Improper waste management and poor material storage result in untidy environment around project sites	Minor				
Air quality	Construction traffic and equipment at project site, and other project traffic: exhaust gasses and dust from traffic.	Negligible	Proper maintenance of vehicles and equipment	Negligible		
	Construction activities at project sites: dust from soil works and handling of materials.	Negligible	Prevent dust emissions by covering and/or wetting of dust generating materials during construction or by placing dust screens.		Mitigation only required in inhabited sections: Mariënburg, Ellen, Johanna & Margaretha, Frederiksdorp, Kroonenburg, Reijnsdorp	
Noise	Increased noise levels at project sites and along project transport routes: project traffic and construction activities on-site.	Negligible	Proper maintenance of vehicles and equipment	Negligible		
Water quality and hydrology	Increased turbidity of road side ditches and canals due to erosion of road sides during works	Negligible	Prevent soil piling to the minimum. Compact loose surfaces as soon as possible	Negligible	Clay-mounds will be constructed at selected locations at ROC where existing distribution line will partially be re-routed.	Prevent blockage of water ways while constructing clay mounds for re-routing distribution line.
Water quality and hydrology Vegetation	Increased turbidity of the Commewijne River as a result of cable placement at the bottom	Negligible	No mitigation required, because the natural high	Negligible	Cable placement will be now be done by using weights instead of	See 3.1.7 The nature of turbidity impacts associated with

Affected Environmental Aspect	Impact Description	Impact Significance	Mitigation Measures (Proposed or recommended)	Residual Impact	Comment regarding proposed current activity	Update Status
			turbidity in the Commewijne River.		horizontal directional drilling (HDD).	cable laying in the Commewijne Estuary will be temporary, localized and short-term.
	Risk of flooding due construction works	Negligible	In planning placement of electricity pylons, restoration/repair of nearby physical infrastructure (dams, trail, and sluices) should be considered to prevent damage to the energy infrastructure and guarantee accessibility Prevent blockage of water ways while constructing clay mounds. Include maintenance of clay mounds in vegetation maintenance plan; which consist of general and major maintenance periods. Regular inspections and make budget reservations for proper maintenance	Negligible		

Affected Environmental Aspect	Impact Description	Impact Significance	Mitigation Measures (Proposed or recommended)	Residual Impact	Comment regarding proposed current activity	Update Status
	Habitat destruction due to vegetation clearance for distribution lines	Negligible		Negligible	The selected route from Richelieu to Mariënburg / Ellen are in a similar environment as the previous considered route. The bio-physical impact: habitat destruction due to vegetation clearance for distribution lines, remains negligible.	Limit vegetation clearing to the minimum.
Vegetation Flora and fauna	Habitat destruction due to vegetation clearance for riser pole locations	Minor	Limit vegetation clearing to the minimum.	Minor		
	Habitat destruction due to vegetation clearance for Right-of-Way re-routing (ROC)	Minor	Limit vegetation clearing to the minimum.	Minor	Re-routing will be undertaken at Mon Souci and Hecht en Sterk over resp. 600 and 1200 meters through secondary marsh vegetation (low and open to closed and moderately high)	Do not clear riverside mangrove forest to the south of the bicycle path.
	Loss of endangered, threatened or vulnerable plant or animal species due to habitat loss or disturbance during project activities	Negligible		Negligible	Wildlife impacts will be insignificant: • Loss of habitat will be very low and the project site (the cleared RoW) will remain surrounded by the current vegetation. • Any wildlife within the RoW to be cleared will have	

Affected Environmental Aspect	Impact Description	Impact Significance	Mitigation Measures (Proposed or recommended)	Residual Impact	Comment regarding proposed current activity	Update Status
					ample time to shift towards the neighboring vegetation that remains in place. • Noise impacts during construction will be small-scale, short-term and localized and wildlife will be able to move away.	
Operation phase						
Visual and Aesthetics Flora and fauna	Improper waste management results in dirty environment around project sites	Negligible	Have waste management in place and monitor compliance	Negligible		
	Interference by distribution lines with bird flight paths and increased potential for bird collisions	Negligible		Negligible		
	Physical presence of distribution lines	Minor	-	Minor		
Flora and fauna	Animal electrocutions by distribution lines	Negligible	Prevent pole climbing by placing an animal barrier on the poles and by proper vegetation maintenance (no climbing plants on poles; no branches near lines).	Negligible	Also see also below under "Improved energy supply".	

Table 4: Identified potential social impacts and mitigation measures for the Commewijne project

Affected Social Aspect	Impact Description	Impact Likelihood	Impact Characteristics and Magnitude	Impact Significance	Mitigation Measures (proposed or recommended)	Residual Impact
Improved energy supply	Redundancy in power supply; fewer power outages; more trust of local stakeholders in energy provision.	High	Direct; medium-term, small scale, reversible. Magnitude: Low	Negligible	Anticipate new requests for connections to the grid. Implement vegetation maintenance plan, including maintenance of constructed clay mounds, for distribution lines in the re-routing transect, and for the distribution line along the bike path for the period that this is not yet rehabilitated. And conduct regular inspections for those line sections that will be maintained by cooperating institutions (such as Ministry of Public Works/ Ministry of Regional Development and Sport) in order to check whether maintenance is in compliance with the EBS requirements.	Moderate Positive
Livelihood	Project provides temporary employment opportunities during construction and operation; excavator and tractor operators; boat transportation, maintenance.	High	Direct; short-term, small-scale, reversible. Magnitude: Low	Minor Positive	As much as possible: hire local field hands for temporary jobs. Promote local procurement of food and lodging.	Minor Positive
Livelihood	Longer term job creation in the area related to maintenance.	Small	Direct; long-term, small-scale, reversible. Magnitude: Low	Negligible	Hire local area inhabitants for maintenance of path underneath power lines.	Minor Positive
Construction noise and traffic	Piling and other construction activity may be a hindrance to local area inhabitants. Also,	Medium	Direct; Short-term, small-scale, reversible. Magnitude: Low	Minor Negative	Warn area residents ahead of time of construction activities, specifying dates, duration, type	Negligible

	the main pathway and dams may be temporary blocked.				of activities and expected hindrance.	
Hindrance of water traffic	During placement of underwater cable, possible hindrance of water traffic or collisions.	Medium	Direct; Short-term, small-scale, reversible. Magnitude: Low	Minor Negative	Timely communication of water users through media messages (radio, newspaper) and billboards on landings, indicating dates, duration and locations.	Negligible
Tourism development	Rehabilitation of path beneath power lines, incl. repair of dams and bridges, can support rehabilitation of bicycle path related to tourism project.	Medium	Indirect; Medium-term, small-scale, reversible. Magnitude: Low	Negligible	Communication with North Commewijne cluster and specifically Bakkie tourism project about path.	Minor positive
Cultural Heritage	Disturbance of archaeological and other cultural heritage sites	Low	Direct; long-term, small-scale, and irreversible. Magnitude: High	Moderate Negative	Verify absence or presence of known historic and archaeological heritage sites with plantation populations once preferred locations for placement of utility poles are known. Follow Suriname draft guidelines and international best practice as described in this ESIA	Negligible
Land tenure	A few selected utility poles may have to be placed on land that has been titled to someone else.	Low	Direct; long-term; small-scale; reversible. Magnitude: Low	Minor Negative	Use standard EBS procedures to deal with land title holders on whose lands utility poles may need to be placed. (have procedures/landowner agreements in place)	Negligible

Summary and Conclusion

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: vegetation (clearing for riser pole locations, clearance for Right-of-Way re-routing (ROC)) and visual and aesthetics (permanent presence of distribution lines).

The main potential positive social impact of this project is that the population in the ROC will experience fewer power outages. The magnitude of this change is considered low, because the present annual number and duration of outages is not very high, and the number of potential Project beneficiaries is small and declining. With mitigation measures, the residual impact can be increased to moderate. Other potential positive social impacts include temporary labor provision via contractors, and more permanent jobs for maintenance of the bicycle path.

Possible negative social impacts include disturbance of cultural heritage sites and land tenure issues, which are respectively moderate and minor impacts. In addition, during the construction phase local area inhabitants may be hindered by noise and traffic obstructions (land and water). With mitigation measures, residual impacts of these negative impacts can be reduced to negligible.

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SRK Consulting, 2007. Water and Sediment Quality Study update for the proposed Suriname River Dredging Project.

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Annexes

Annex 1 Impact Assessment Methodology

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 1: 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 2**,

Table 3 & **Table 4**).

Table 2: 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 3: 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 4: 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
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 5**) as set out below.

Table 5: 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 6**).

Table 6: 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 7**).

Table 7: 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

Annex 2

Field Orientation Report
for the
Addendum ESIA Energy Infrastructure Project Commewijne

Prepared for:

NV Energie Bedrijven Suriname

Paramaribo, May 2021

ILACO

ISO 9001: 2015 certified

Introduction
On the 4th of May 2021, the study area was visited by a team of ILACO and EBS. The team members of ILACO were R. Bong A Jan and M. Fortune. The team members of EBS were E. Kasban, A. Amattamsir and L. Wirjoinangoen.

The purpose of the site visit was to do an orientation of the project location and to verify the current conditions on-site.

The field orientation on the 4th of May included orientation at the following locations:

- Proposed location for the galvanized riser poles for the river cable at Ellen and at Johanna & Margareta;
- Existing distribution line at the right bank of the Commewijne River (from the river site);
- Location of current 12 kV single-circuit line at plantation Kroonenburg;
- Proposed location for the solar plant at Alliance.

Photos of some observations at the different locations is presented below.

<table>
<tr><th colspan="2">Location: Ellen</th></tr>
<tr><td> 
New distribution line will be placed on the right site of Bamistraat (see red arrow), towards the location of the rise pole at Ellen.</td><td> 
Proposed location of the rise pole (end of the Bamistraat). The cable will be placed underground toward the left site of the old jetty (see red arrow). Minimum Parwa vegetation will be disturbed by placing the cable underground. From the left side of the jetty, the cable will go on the river bed.</td></tr>
</table>

RGD Health centre, on east side at the end the Bamistraat

Street at the west side at the end of the Bamistraat. No houses observed near location of rise pole.

Street at the west side at the end of the Bamistraat. Several houses observed on the east side.

Old jetty, still used by some fisher boats. Cable will be placed on the left side.

Parwa vegetation left side of the jetty.

Location: Johanna & Margareta
 Proposed location towards rise pole at Johanna & Margareta, from area with less vegetation
 Proposed location rise pole at Johanna & Margareta and existing distribution line along the bike path. The existing distribution line will be demolished after the new line is placed.

From left to right: riverside- bike path- location rise pole at Johanna & Margareta

Location: Kroonenburg

A location were new distribution line needs to be placed more landwards .

Location at current 12 kV single-circuit line (red cable) at Plantation Kroonenburg

Location were the current net splits to the east and west plantations. East towards Alliance and Reijnsdorp and west towards Fredriksdorp and Johanna & Margareta.

Location: Alliance

Proposed location for solar plant at Alliance near old station of EBS Centrale. The old building will be demolished and an operators room will be build. This aspect was already described in the previous ESIA study for the Commewijne project (ILACO, 2019).

Annex 3 The bio-physical environment (ILACO, 2019)

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.

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 1 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.

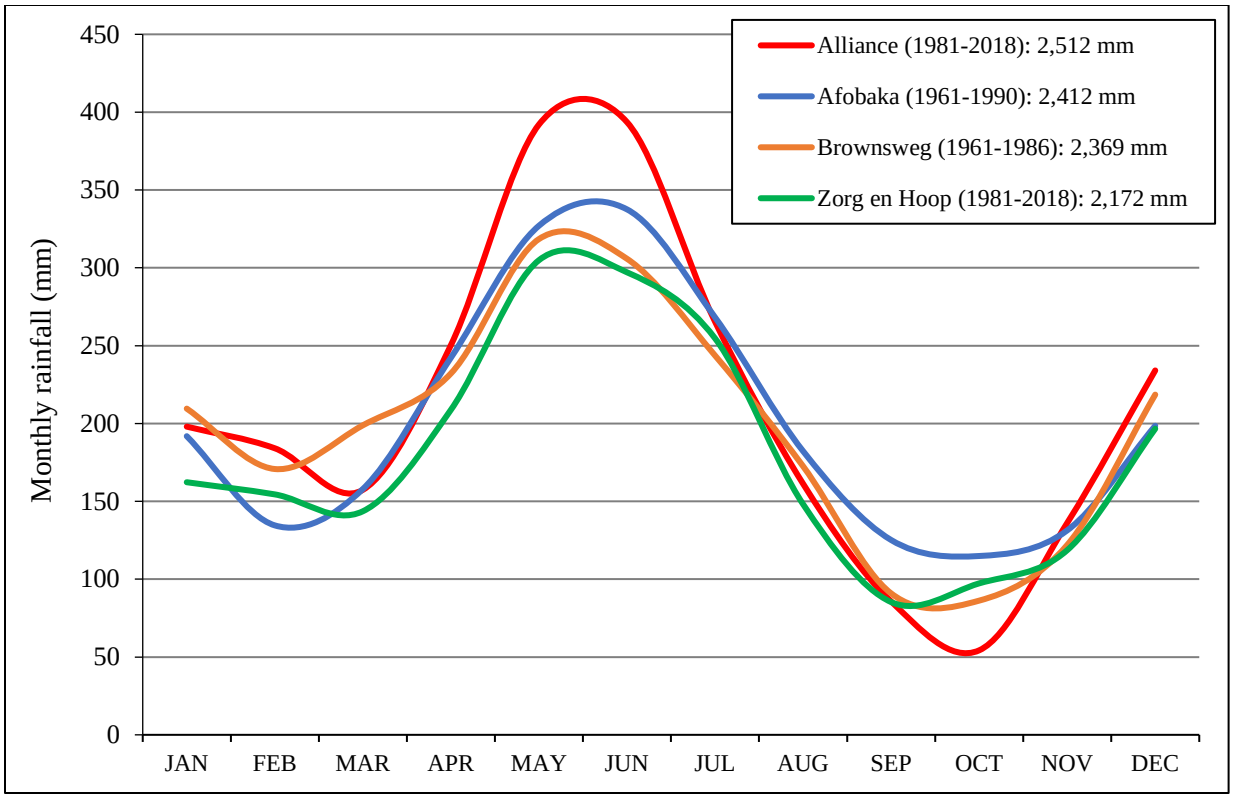

Figure 1: Long-term mean monthly and total annual precipitation for regional stations.

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.

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.

Noise

Noise records taken along main roads in Suriname show that daytime LAeq levels range between 56.0 and 70.4 dBA (see **Table 1**). 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 1: 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 2**.

Table 2: 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.

Land and soil

General

Four major geographical zones can be distinguished in Suriname (Noordam, 1993), which are reflected in **Figure 2**.

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.

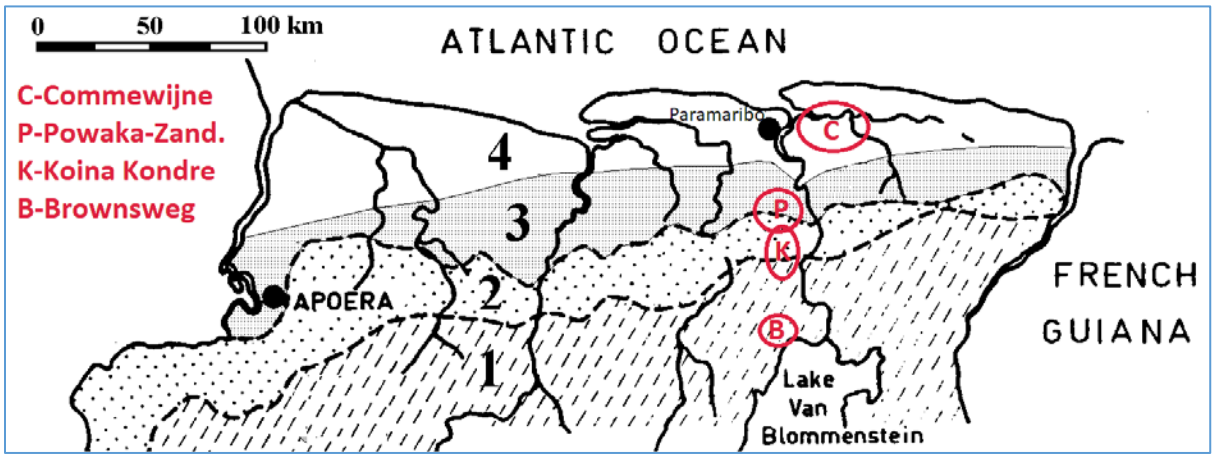

Figure 2: The four major physiographic regions of Northern Suriname

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 JFK-Highway JFK- Highwayruns 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"*.

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.

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 gold mining. 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.

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 **Photo 1**).

Photo 1: Low grass and herbs vegetation along the Afobakaweg

The proposed site for the Alliance solar plant (see **Photo 2**), as well as the proposed substation site at Mariënburg (see **Photo 3:**) 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.

Photo 2: Alliance solar plant proposed site

Photo 3: Mariënburg substation proposed site

The Brownsweg solar plant is situated in a savanna area (see also below) of the Sabanpasi landscape (see **Photo 4**). 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.

Photo 4: 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.

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.

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 3**. 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.

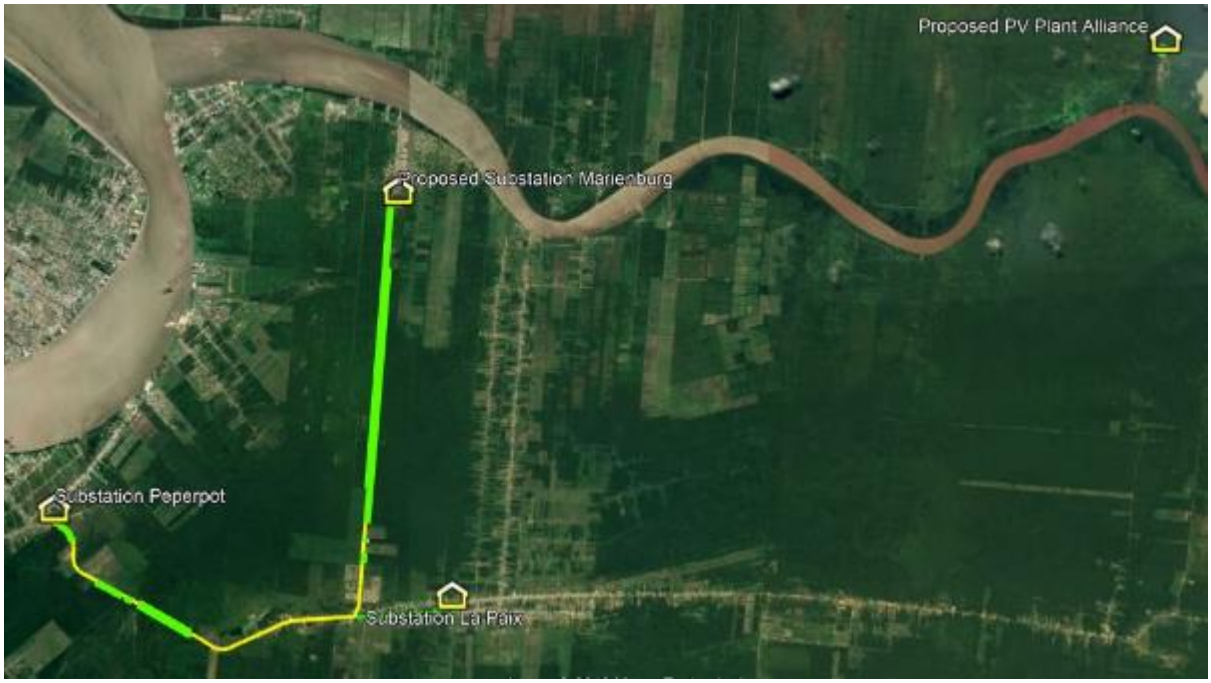

Figure 3: Forested stretches (green lines) along the transmission lines of the Commewijne project

Powaka-Zanderij transmission line

Part of the ecosystem map of Teunissen (1978) is shown in **Figure 4**.
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 3**. Forest is still present on recent Google imagery (September 4th 2018), 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 2018) 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 Philipusshikwabana.

About 2.2 kilometer of the road connecting the Afobakaweg with the JFK-HighwayJFK- Highwaycrosses through swamps, of which about half is covered by swamp forest or swamp wood, and the remaining distance with open grass swamps (see **Table 4**). 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 3** for legend. Some shifting cultivation is observed in the forest zone.

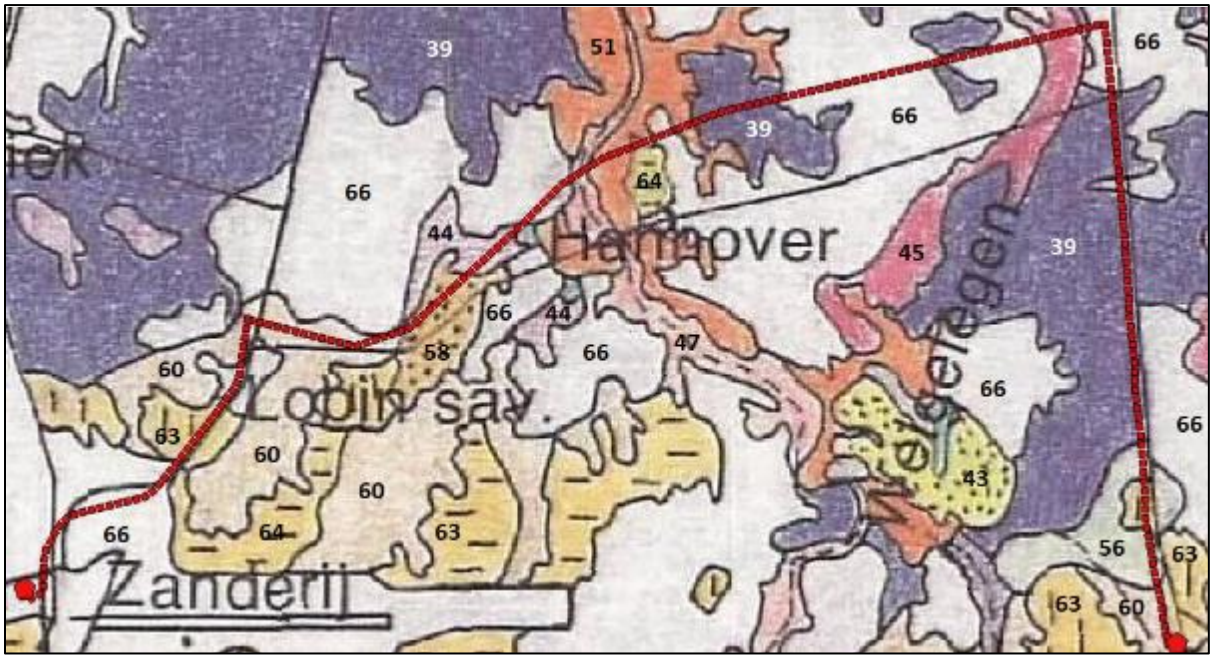

Figure 4: Ecosystem map for the Powaka – Zanderij transmission line (after Teunissen 1978); legend see Table 3

Table 3: 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 4: 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 JFK- Highway towards Zanderij. Natural ecosystems are indicated in **Figure 4**, but most has been cleared over the past 40 years to make room for community development (Google image September 4th, 2018).

Koina Kondre transmission line

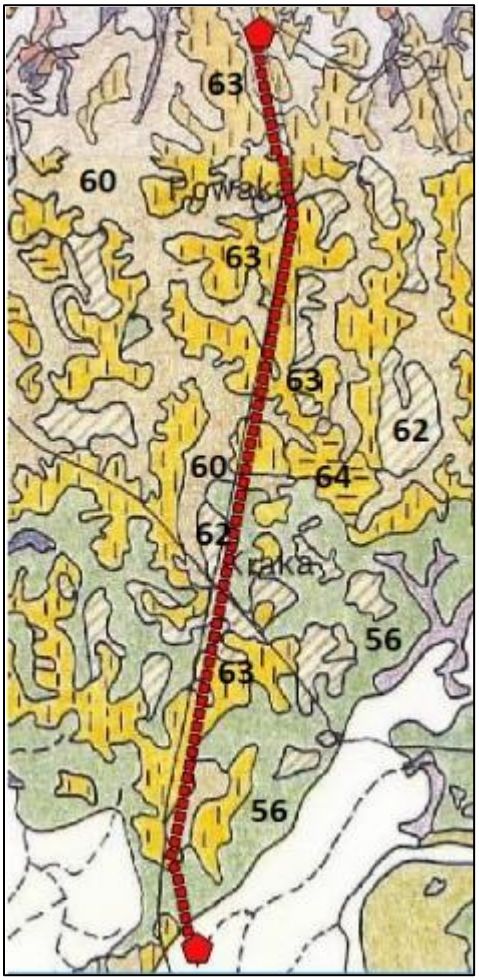

Figure 5: Ecosystem map for the Koina Kondre transmission line (Teunissen 1978)

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 5**). 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, 2018).

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 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.

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.

Wildlife

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 5**, which also provides details on their IUCN and CITES status.

Table 5: 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.

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-JFK-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.

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.

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) (seeTable 15). 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 6 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.

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.

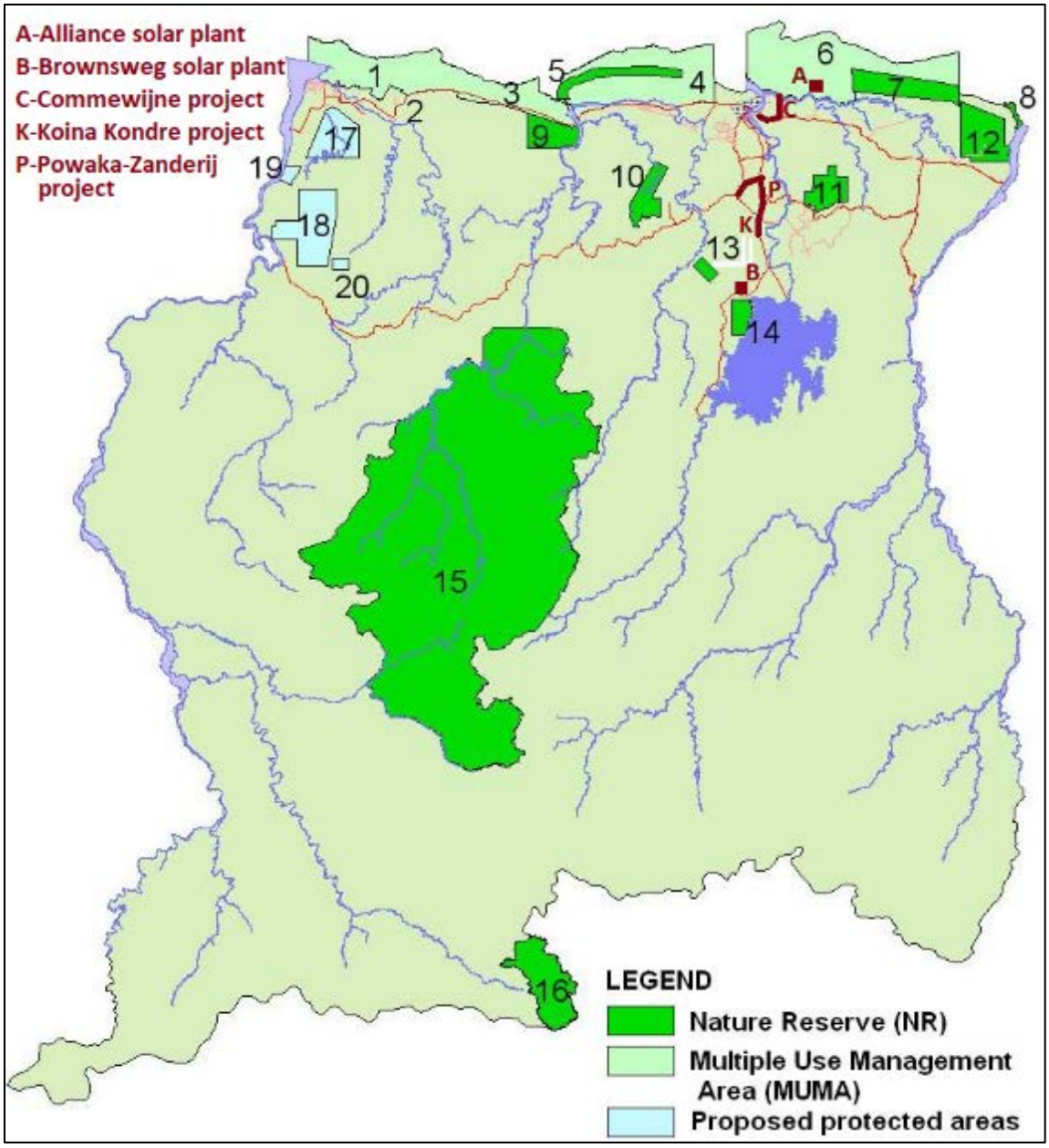

Figure 6: Protected areas in Suriname

Table 6: 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

Annex 4 Minutes of Meetings

Minutes of Meeting

Project:	Addendum ESIA Energy Infrastructural Project Commewijne
Project Code:	IS-386
Onderwerp:	Kick-off meeting
Aanwezig:	**ILACO:** Koenjbiharie S (SK)/ Fortune M (MF)/ Heemskerk M (MH)/Bong A Jan R (RB) **EBS:** Graanoogst F (FG)/Kasban E (EK)
Locatie:	Online via Teams
Datum:	23/04/2021
Tijdstip:	13.20-13.45
Opgesteld door:	Koenjbiharie S

Onderwerp	**Discussie/opmerkingen**
Agenda	- Introductie - Planning - Acties/Follow up - Wat ter tafel komt
Introductie	SK start de meeting om 13.20 en introduceert het ILACO team. **Notitie:** Dirk Noordam is ook onderdeel van het team, maar kon niet aanwezig zijn; hij zal na de meeting geïnformeerd worden over de afspraken en planning. De studie betreft een ESA en is een aanvulling op het Commewijne onderdeel vanwege de scope wijziging. De belangrijkste wijzigingen betreffen: - Vervanging van de 33KV lijn met een 12KV lijn - Cancelen van substation Mariënburg - Introductie van een alternatieve route van de 12KV lijn in het ROC gebied (overkant van de rivier).
Planning	Het contract is getekend op 14 april 2021. De planning is opgesteld op basis van gemaakte afspraken. Het project heeft een uitvoeringstijd van ongeveer 3 maanden. We zitten nu in de voorbereidingstijd en daarbij zijn de volgende acties cruciaal: - Aanleveren van een complete project omschrijving en justification. - Informeren van de stakeholders. De DC is hierbij een key stakeholder. - Gezamenlijke oriëntatiebezoek (EBS/ILACO) Ad. 1: Het traject van de alternatieve route is erg belangrijk. EK: de route zal zoveel mogelijk door openbaar terrein lopen; bij een gedeelte van 4-5 km is er meer zwampgebied. Het is mogelijk dat het op enkele plekken door prive terrein gaat. MH: is de status van de gronden bekend? Belangrijk om te weten op welke plekken de kabel via prive terrein loopt. Ook belangrijk om te weten waar er land is waar er mensen een claim op kunnen maken vb. Plantage besturen, plantage eigenaren, boeren. Dit zal in het veld ook worden besproken met o.a. plantage bestuur en de boeren. Ad. 2: FG: de stakeholders zijn nog niet geïnformeerd. Er wordt voorgesteld om de DC gezamenlijk te benaderen. MH: Akkoord. Na ontvangst van de project omschrijving zal de datum voor deze meeting nader worden bepaald. Ad. 3: Er wordt voorgesteld om het trace samen met de EBS langs te lopen in de eerste week van mei.

	De planning voor de uitvoering is o.a. afhankelijk van de projectomschrijving. Verder moeten wij rekening houden met de COVID-19 updates. De planning zal zo nodig worden bijgesteld.
Acties/Follow-up	- ILACO deelt de planning samen met de minutes of meeting uiterlijk 26 april. - ILACO levert template aan uiterlijk 26 april. - EBS levert projectomschrijving aan, inclusief justification en stakeholder contactinfo (voor veldwerk), uiterlijk 30 april. - Na intern overleg komt ILACO met een voorsteldatum voor meeting met de DC, uiterlijk 30 april. - EBS zorgt voor boottransport. Planning voor veldbezoeken liefst 2-3 dagen van te voren doorgeven aan EK zodat boottransport kan worden geregeld.

Minutes of Meeting

Project: Environmental and Social Impact Assessment of Energy Infrastructure Projects
Project Code: IS-386
Subject: Meeting with DC Commewijne, ILACO and EBS
Purpose of the Meeting: Informing the DC about the proposed project
Attendance: District Commissioner Commewijne: DC M. Radjab/ M. Sewpersad (minutes secretary)
ILACO: Bong A Jan, R. /Fortune, M.
EBS: Kasban. E. / Amattamsir, A. / Wirjoinangoen L.
Location: Districtscommissariaat Commewijne, Nieuw-Amsterdam
Date: 04/May/2021
Compiled by: Fortune, M.

Subject	**Discussion/Remarks**
Agenda	- Introduction & project information - Discussion - Follow up
Introduction & project information	The meeting was opened by the DC of Commewijne, followed by a short introduction. Mr. E. Kasban, project manager of the project in Commewijne, explained the proposed project and the role of ILACO within the project, namely the execution of an Environmental and Social Impact Assessment. The Commewijne project is part of the IDB Infrastructural Projects. The purpose of the Commewijne project is to improve the energy supply to the Right Bank of the Commewijne River (ROC). Currently there is one single line from plantation MonTresor to Kroonenburg. In case of a failure in this transmission line, the whole right bank of the Commewijne River will be devoid of electricity. Within this project the distribution grid from plantation Richelieu will be extended through Mariënburg to Ellen (near the local Medical center). From there, a river cable will be placed across the river (underwater) toward Johanna & Margaretha. The whole network from Johanna & Margareta till Reijnsdorp will be changed. Sections along the river that flood during springtide, will be replaced by a new distribution line that is located more northwards. In Alliance a 200-kilowatt Solar plant will be constructed as an additional system for more efficiency and less use of fuel. There are 2 options for river cable placement, namely by drilling (which is more expensive) or by using weights placed on the cable at different distances. The project planning entails finalizing all documentation by August 2021 and start the construction activities in 2022, which will have a duration of 3 years. The construction phase is divided in 3 lots: 1. Extend distribution grid from Richelieu to Mariënburg 2. Placement of the river cable 3. Making the connections in the ROC
Discussion	The DC had the following remarks/ input regarding the project: • EBS should involve the Ministry of ROGB in case the roads will be widened. Mr. Kasban explained that it's more related to the roadsides and that the EBS

has already sent a request to the Ministry of Public Works. They are still awaiting their response.

- The DC inquired whether the distribution line would be placed underground or aboveground, because he was concerned about the high rate of accidents involving collisions with EBS poles. Mr. Kasban explained the infrastructure would be situated aboveground, because it would be too costly to implement an underground network.
- The DC will not be able to provide support with clearing the area of Mariënburg where the distribution line is projected, due to limited resources (e.g., equipment). The Commissioner's Office only managed to clear a section of the area (circa 3km onwards from Richelieu), but the remainder still needs to be done.
- Regarding the network at the ROC area, he suggested the EBS to work together with Mr. Sebastian "Bas" Spek, as he is currently working on the rehabilitation of the bike path that connects several plantations located in the ROC. The plantations are private property; you will have to contact the owners for further inquiries. Get in touch with Mr. Spek; he can provide additional information.
- The following persons can also be contacted for additional input/ support:
    - Mr. Zalman, Sirano, regarding tourism activities at Fredriksdorp
    - Mr. Van Alen in relation to activities at Rust en Werk
    - Mr. Sebastian "Bas" Spek can also give additional information regarding other stakeholders to be involved

The DC mentioned some other planned projects in the district of Commewijne are:

- Shore base facilities at Belwaarde and at Voorburg (on account of Offshore developments)
- Project of SWM at La Liberte (near Peperpot)
- Hydrogen project

The DC expects that due to abovementioned projects approximately 3000 jobs will be created in Commewijne; it is anticipated that about 100-200 persons will have a job by next year.

Mr. Kasban also mentioned a project involving a weather station that will take wind measurements in order to create a wind map of the coastal area. The purpose is to monitor the potential for wind energy.

<u>Questions</u>

Location River cable

- Mw. Bong A Jan: Is there much river traffic near the proposed location of the river cable?
- DC Radjab: There is not much traffic. Only the small ferry boats.
- Mw. Bong A Jan: Are there fishing activities in this area?
- DC Radjab: There are no big fishing activities in that area. Only individual fishing (sport fishing).

Policy plans of the Government

- Mw. Bong A Jan: What are the policy plans of the government for the project area of EBS.

	• DC Radjab: Only for the Mariënburg area there may be some activities in the coming years. Land has been allocated in that area, so there will be housing development projects and business creation.
Follow up	ILACO will contact the DC if additional information is required e.g. District Plan.

Annex 5

Commewijne ROC

Social Impact Assessment report produced as part of the addendum ESIA for EBS power delivery project to Upgrade and extend the Commewijne right bank Distribution Grid

21 February 2022| Final Report

Produced for:

ILACO

Produced by:

Social Solutions
Haydnstraat 15
Paramaribo, Suriname
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ABBREVIATIONS AND ACRONYMS

AI	Area of Influence
BO	Bestuursopzichter; Local staff in the communities employed by Ministry of Regional Development and Sport
CBB	Central Bureau for Citizens Affairs (*Centraal Bureau voor Burgerzaken*)
DC	District Commissioner (*Districtscommissaris*)
DR	District council members
EBS	Energie Bedrijven Suriname
ESIA	Environmental and Social Impact Assessment
GoS	Government of Suriname
ICOMOS	International Council on Monuments and Sites
LOC	Left bank of the Commewijne River
LVV	Agriculture, Animal Husbandry and Fisheries (*Landbouw, Veeteelt en Visserij*), Ministry of
MinOWC	Ministry of Education, Science and Culture
NVB	National Transportation Service (*Nationaal Vervoer Bedrijf*)
PV	Photo Voltaic
RGD	Regional Health Service (*Regionale Gezondheidsdienst*)
ROC	Right bank of the Commewijne River
ROS	Regional Development and Sports (*Regionale Ontwikkeling en Sport*), Ministry of
RR	Resort council members
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SBHF	Suriname Built Heritage Foundation
SIA	Social Impact Assessment
TCT	Transport, Communication and Tourism, Ministry of
VCM	Verenigde Cultuur Maatschappijen NV
WHS	World Heritage Site

TABLE OF CONTENTS

1. INTRODUCTION

This document ("ROC-SIA") presents the social baseline study and impact assessment for the NV Energie Bedrijven Suriname (EBS) "Component 2.2 – Commewijne Project", which is an addendum to the Environmental & Social Impact Assessment (ESIA) study carried out in 2019, for the preparation of four (4) Energy infrastructure projects under the initiative: Consolidating a Sustainable Energy Sector (SU-L1055).

2. METHODS

2.1 AREA OF IMPACT

The Area of Impact for this Social Impact Assessment (SIA) is the right bank of the Commewijne River (ROC, Figure 1), between Elizabethshoop in the west, and Alliance in the east. The SIA primarily focusses on the populated plantation lands in this area, and on infrastructure and services used by the people in the ROC.

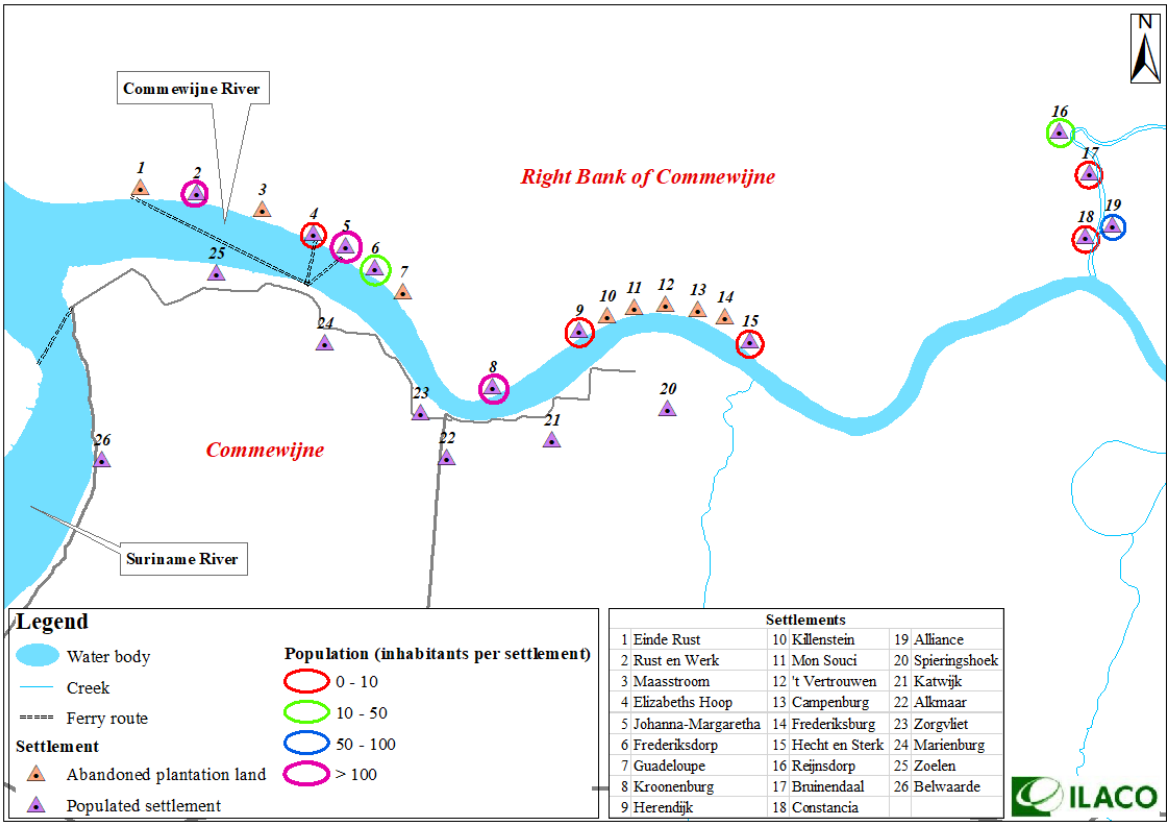


FIGURE 1. MAP OF AREA OF IMPACT

2.2 GENERAL APPROACH

The 2019 impact assessment for different EBS energy infrastructure projects included a SIA for the "Upgrade critical infrastructure Commewijne including solar plant Alliance". In the context of this study, baseline data were collected for the right bank of the Commewijne River, with special attention paid to Alliance. Given the availability of recent baseline data, data collection for the present social baseline for the ROC was limited to an orientation visit to the area, a visit to the district government, a field visit to the ROC area, which included stakeholder consultations, and communication with the EBS Project Manager & Environmental Specialist of this project. This additional data collection allowed the social specialist team to assess the current situation and collect targeted information for the affected area.

During the orientation visit on May 04, 2021, the consultant held a consultation meeting with the District Commissioner of Commewijne, at the District Commissioner's office in Nieuw Amsterdam. During the subsequent field visit (May 19, 2021), the consultant visited the following plantations: Johanna & Margaretha, Kroonenburg, Herendijk, Hecht en Sterk, Constantia, Alliance, and Reijnsdorp/Bakkie (Figure 1). During the field visit, the consultant was accompanied by four EBS staff members, among whom two were local staff for the target area.

The SIA was carried out in line with relevant IDB standards, notably:

- IDB OP 703: Environment and Safeguards Compliance
- IDB OP-710: Involuntary Resettlement.

2.3 PUBLIC CONSULTATION

A large general public meeting was not possible due to government restrictions on gatherings related to the COVID-19 pandemic. Therefore, the consultant contacted the most relevant stakeholders individually by phone, e-mail and in person. Landowners were traced with the help of EBS and referrals from others. In the case of the District Commissioner's office, consultation was combined with data collection during the orientation visit (May 04, 2021).

Each consultation started with the consultant explaining the project and the ESIA to the stakeholder. Information was provided about the reason for the project, execution, and expected positive and negative impacts. In addition to consultations with local stakeholders in the area, different plantation landowners and managers were contacted by e-mail or phone to explain the project and ask about possible concerns. Examples of stakeholder questions and concerns included: Why is this project executed? Will EBS place lights along the trail beneath the power lines? Are there any plans for developments in this area? How far land-inward will the pylons be placed? Will cracks in the existing road be repaired?

All questions that the consultant could not answer were presented to EBS. The EBS answered the questions by e-mail, with the consultant in cc, so that the consultant could verify that all concerns were adequately addressed.

Even though this method of consultation did not allow for stakeholders to interact, the consultant is convinced that this was the best possible way during the COVID-19 pandemic to ensure that stakeholders were able to ask questions and voice their concerns. We also are convinced that all relevant stakeholders have been informed and heard through the site visit and additional targeted communication with key persons via phone and e-mail.

A list of consulted stakeholders is attached as ANNEX 1 and key remarks of stakeholder consultations can be found in ANNEX 2.

3. SOCIAL BASELINE

3.1 COMMEWIJNE DISTRICT

TABLE 1. COMMEWIJNE DISTRICT KEY INDICATORS

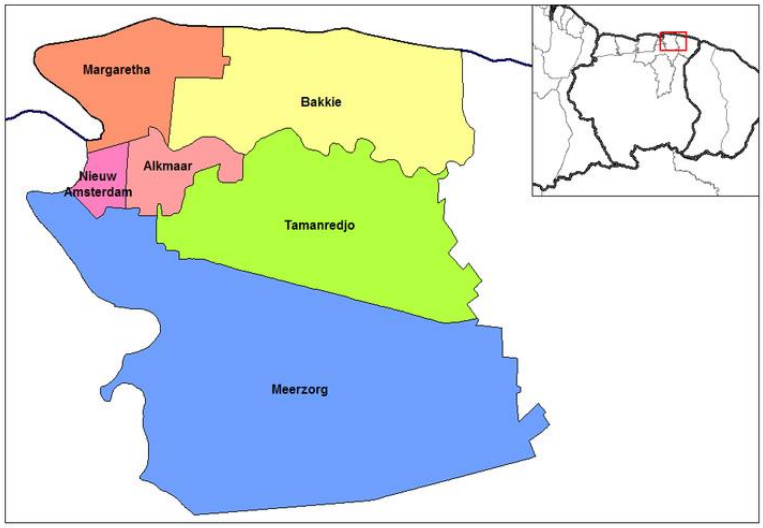
Population	31,420 (2012)
Population characteristics	Largest population segment is of Javanese ethnic descent (47%), followed by Hindustani (30%) and smaller numbers of Creoles, Maroons and others.
Indigenous populations	Very few individuals, no Indigenous communities
Educational facilities	There are several elementary schools. Continued education (middle school, high school and/or vocational education) can be followed in Nw. Amsterdam, Ellen, Meerzorg and Tamanredjo.
Health care facilities	Present in the whole district: one health center providing general services, one health center with extensive health services, five policlinics, and five auxiliary policlinics.
Electricity supply	Most locations
Clients pay for electricity?	Yes
Running water	Most locations
Telecommunication services available?	Yes
Accessibility	By boat or car from Paramaribo city

Commewijne district (2353 km^2) is located along the coast of Suriname, just across the Suriname River from Paramaribo City. The capital of Commewijne is Nieuw Amsterdam. Other population centres are Tamanredjo, Meerzorg, Alkmaar, Mariënburg, 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 e.g. Mariënburg.

Commewijne district counts six resorts. The ROC contains the resorts Margaretha and Bakkie (Figure 2). The land along both banks of the Commewijne River consists mostly of former plantations, where coffee, cacao and sugar were produced. The ROC Area of Indirect Impact consists entirely of former plantations. After emancipation (1863), virtually all enslaved Africans left the plantations. The population was replaced by contract labourers from India and Java (island within the Dutch East Indies, now Indonesia). The current population in the Area of Influence (AI) consists primarily of descendants of these contract labourers.

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

FIGURE 2. RESORTS OF COMMEWIJNE



3.2 SOCIOECONOMIC AND PHYSICAL INFRASTRUCTURE OF THE ROC

3.2.1 PUBLIC FACILITIES

The ROC features approximately 60 former plantation lands (Annex 3). Most of these plantations have been abandoned and do not contain any economic activities. In 1965, the area counted 25 inhabited plantations, excluding Batavia (Pomona/Braamspunt) further West. Nowadays, in 2021, only eleven plantations in the ROC are still populated, among whom ten are located in the AI (Figures 1 and 3).

Four of the eleven populated plantations on the ROC feature an elementary school, namely: Alliance, Kroonenburg, Johanna & Margareta, and Rust en Werk. The latter plantation is not part of the Project area. Information about the schools in the project area is provided in Table 2.

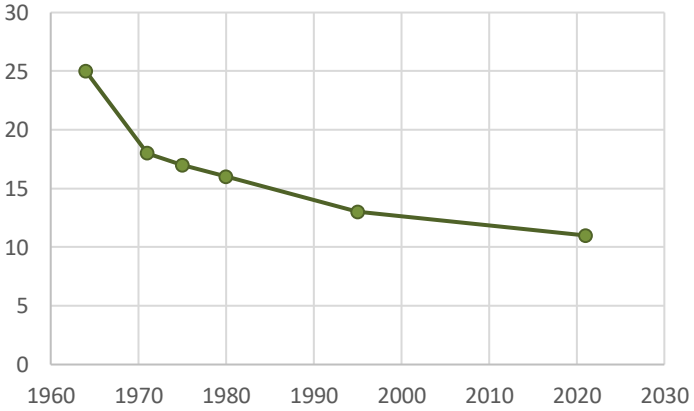


FIGURE 3. NUMBER OF POPULATED PLANTATIONS IN THE ROC (EXCL. BATAVIA)

The elementary school at Reijnsdorp closed about 10 years ago. One child from this plantation travels with the school boat to Alliance. At Constantia there is one 14-year old boy, but he no longer attends school. There are no children on the other populated plantations in the Project area.

TABLE 2. ELEMENTARY SCHOOLS IN THE ROC AREA

Name Plantation	Johanna & Margaretha	Kroonenburg	Alliance
Number of classes	8; pre-school and grades 1-6	8; pre-school and grades 1-6	8; pre-school and grades 1-6
Number of students	43	25	8 (incl. one from Reijnsdorp)

There are Regional Health Service (RGD) clinics in Alliance, Kroonenburg, and Johanna & Margaretha (Table 3). The clinics of Alliance and Kroonenburg are only operational biweekly on Thursdays, when a medical doctor visits. In case of an emergency, inhabitants of these plantations visit the RGD clinic of Alkmaar. The clinic at Alkmaar is open on Monday through Friday. The clinic of Johanna & Margaretha provides services five days a week through a local nurse and biweekly on Thursdays the medical doctor is available.

The national and district government are present through local offices in different communities. There are local government manager (*Bestuursopzichter*-BO) offices of the Ministry of Regional Development and Sports (ROS) in Kroonenburg and Johanna & Margaretha, and offices of the Ministry of Agriculture, Animal Husbandry and Fisheries (*Landbouw, Veeteelt en Visserij* - LVV) in Kroonenburg and Alliance. In Alliance, there also is an office of the Central bureau for Citizens Affairs (*Centraal Bureau voor Burgerzaken* - CBB).

None of the communities in the ROC are connected to the public drinking water network. Inhabitants of the area rely on rainwater, which is harvested from roof tops in large rainwater collection bins. The area is not connected to communication land lines, but mobile phone and internet reach is available throughout the area through the Telesur provider. From Kroonenburg to the west (Resort Margaretha), one also has mobile reach through the Digicel provider.

TABLE 3. INFRASTRUCTURE AND SERVICES PER POPULATED PLANTATION IN THE AREA OF IMAPCT

Plantation	Land ownership	Clinic	Prayer house	Elementary school	Government offices
Frederiksdorp	Micronclean Worldwide, with share holders	No	No	No	No
Johanna & Margaretha	Government	Yes	Church, Mosque, Temple	Yes	BO office (ROS)
Elizabethshoop	Part VCM/Van Alen; part Rosiek family	No	No	No	No
Kroonenburg	Government	Yes	Mosque, Temple	Yes	LVV BO office (ROS)
Herendijk	VCM/Van Alen, land lease	No	No	No	No
Hecht en Sterk	Debisaran, land lease	No	No	No	No
Constantia	Government	No	No	No	No
Alliance	Government	Yes	Apostolic church, Mosque	Yes	CBB, LVV
Reijnsdorp/ Bakkie	Land lease to former contract labourers	No	Mosque, not operational	Closed	No
Bruinendaal		No	No	No	No

3.2.2 TRAFFIC, ACCESS AND TRANSPORTATION

There is no road access to the project area. To reach the ROC, one needs to cross the Commewijne River with one of the small ferry boats.

Public transportation is provided by a shuttle boat of the National Transportation Service (NVB -*Nationaal Vervoer Bedrijf*) of the Ministry of TCT (*Transport, Communicatie en Toerisme*). This vessel travels along the Commewijne River on Mondays, Wednesdays, Fridays, weekends and public holidays. It leaves Alliance at 6:30am to arrive in Reijnsdorp at 7am, and next travels back along Alliance to the west, picking up people on both sides of the Commewijne River. The final stop is Leliëndaal, on the left bank of the river. The NVB vessel does not stop at every plantation, but drivers may be willing to divert from their usual route and pick someone up at a plantation without boat stop (e.g. Constantia). By 16:00 the boat sails back to Alliance (and Bakkie). The boat carries approx. 20 passengers.

Boat traffic on the Commewijne River mostly consists of ferry boats, a government shuttle twice a day, and local fishers. Less frequently, larger barges use the Commewijne River to transport heavy equipment to mining areas in East Suriname. Also, occasionally, a larger ship uses the River to transport mining equipment for Newmont Suriname, also to East Suriname. Recently, local contractors were working to repair a dam near Constantia and Bakkie. On such occasions, the contractor uses a barge to transport his equipment. The Verenigde Cultuur Maatschappijen NV (VCM) uses a barge to transport cattle. This vessel is most active around Rust and Werk and does not go river upward beyond Herendijk.

Inhabitants in the eastern part of resort Bakkie, upstream from Kroonenburg, are relatively more isolated because there is no land way that connects these plantations to Kroonenburg and the other larger plantations. From resort Margaretha, there are more frequent ferry services to the Left Bank of the Commewijne River (LOC), which is connected to Paramaribo with a bridge. About a decade ago, it was still possible to drive a moped or bike on a dirt path from Bakkie to Kroonenburg, but this path is now largely overgrown with weeds and inaccessible beyond Constantia. Moreover, the sluices at a number of locations are collapsed and there are no bridges across the canals. A heritage tourism firm at Plantation Reijnsdorp is currently working on a project to open up the pathway to Kroonenburg to allow for bicycle tours along the plantations. This not-yet-prepared trail is currently known as the “bicycle trail”.

Different stakeholders commented on the nuisances of frequent flooding due to dilapidated infrastructure. For example, because the sluices of plantation Frederiksburg are broken, plantation Hecht and Sterk experiences a large influx of river water at every high tide. This water has destroyed the road, and is causing erosion. In planning placement of electricity pylons, restoration of nearby physical infrastructure (dams, trail, and sluices) should be considered to prevent damage to the energy infrastructure and guarantee accessibility.

3.2.3 LAND TENURE

The project foresees re-routing of the existing distribution line at the right bank of the Commewijne River by replacing old utility poles that are deteriorated, inundated or inconveniently placed. The new utility poles will, like the old ones, mostly be placed on the public maintenance strip. Yet to prevent flooding, they will be placed more land inward (mostly towards the north) in some locations. EBS aims to execute all the activities on public land. At the time of preparation of this report, the land tenure status of some of the lands in the ROC was not yet clear, but the EBS will consult with a surveyor before the construction phase starts (EBS, e-mail, 3 June 2021). The existing pathway will be used as much as possible to construct the distribution line. Where necessary, pylons will be placed on land that belongs to private land owners. In such cases, IDB Operational Policy (OP) 710 applies.

Plantation Alliance is entirely government land. Also at the proposed location of the solar power plant there are no land tenure claims of third parties. The Ministry of Agriculture, Animal Husbandry and fishing (LVV) is an important government stakeholder because this Ministry is responsible for lands where agricultural activities are

executed. The secondary roads fall under responsibility of the Ministry of Regional Development and Sports (ROS) and the ministry of Public Works (OW) is responsible for the bridges.

Several other plantations feature private land tenure titles. Table 3 lists land ownership of the populated plantations in the AI. Further west, the plantation Rust & Werk – also populated-, is titled to VCM. Among the unpopulated plantation lands, land title is unknown for most. Known land title holders included:

- 't Vertrouwen, titled to Hagemeijer.
- Mon Souci, titled to Moenne.
- Frederiksburg, titled to Oedit.

According to IDB policy OP-710 on Involuntary Resettlement and OP-703 on Environmental and Safeguards Compliance, no land take can happen without appropriate compensation at replacement value. Land take includes the placement of pylons on the land of private landowners, and RoW that traverses the land of private landowners. This applies to all Transmission Lines covered in the ESIA.

The EBS has standard procedures to deal with land title issues. These procedures have not been written down in an operational manual or guidance document. Nevertheless, the EBS uses standard (unwritten) procedures when confronted with land tenure issues. The EBS is only rarely confronted with necessity to place electricity pylons for transmission lines (110 kV or higher) on private land. In these cases EBS will negotiate with the owner to either buy the land or to settle for a lease. Also in the case of pylons for distribution lines (12kV and low voltage), EBS rarely encounters issues related to Right of Way on private land.

In Practice, when placing pylons on titled land, the EBS Legal Department contacts the landowner to discuss this matter. The EBS usually discusses the importance of the distribution line for the area with the landowner. In most cases the landowner has no objections and an agreement is signed between the EBS and the landowner (E. Kasban/F. Graanoogst, e-mail conversations 27-28 July). To date, EBS has not paid compensation in these cases, as agreements have been reached based on goodwill.
Because this project is part of an IDB loan agreement, the IDB Operational Policies (Ops) apply. These OPs are particularly important in dealing with landowners because the EBS does not have written procedures to deal with private land owners. Following IDB OP 7.10, in case pylons and Right of Way[1] (RoW) will be located in private land, EBS will buy the land or settle for a lease.

No involuntary resettlement is foreseen in the context of this project. All consulted land owners conveyed that they were willing to accommodate EBS pylons and RoW on their land. In the unlikely case of objection, the EBS will negotiate with the landowner until a mutually satisfactory agreement is reached (F. Graanoogst, EBS phone com. 31/08/2021).

3.3 POPULATION IN THE PROJECT AREA

At the time of the most recent census (2012), Commewijne district counted 31,420 inhabitants. The General bureau of Statistics does not provide more recent data. In that year, the two resorts of the ROC, Margaretha and Bakkie, counted, respectively, 756 and 447 individuals. The population in the ROC is dominated by men: 659 men versus 544 women lived in the ROC in 2012. Our interviews suggest that this gender imbalance is particularly prominent in the most eastern plantations of the ROC (Between Herendijk and Reijnsdorp/Bakkie).

[1] The legal right, established by usage or grant, to pass along a specific route through grounds or property belonging to another.

In the past decade, the population of Commewijne has consistently been growing as Commewijne has become a more affordable and quiet place to live for people working in Paramaribo. In 2019, 1,044 persons moved to Commewijne, while 706 persons left, for a total migration surplus of 338 individuals. Population growth, however, applies to the left bank of the Commewijne River, where several public and private allotment projects are being developed.

The AI, by contrast, is increasingly depopulated. In 1965, the national census counted 6438 persons living in the ROC. Less than 10 years later, in 1971 there were only 2811 persons still living in the ROC. Their numbers decreased to 1877 persons in 1980; 1442 persons in 1995; and 1203 persons in 2012. In 2021, the AI counted approximately 700 persons, but this figure included plantations Rust en Werk and Batavia, which are located in the ROC but outside of the project area. Annex 1 shows the population decline per still populated plantation in the ROC.

Particularly young families and young adults leave because of a lack of educational opportunities and employment. This was reported in all visited plantations, but the decrease has been most dramatic in the most eastern plantations (Resort Bakkie), most of which are deserted. In Herendijk and Hecht en Sterk, there are no more permanent inhabitants anymore other than a guard to keep an eye on the place (Table 4). At Herendijk an administrator passes by once in a while. In the past 20 years, approximately 10-15 families left Reijnsdorp/Bakkie to enjoy better services/facilities elsewhere, be less isolated, and provide their children with a better future. Meanwhile, no new families have settled at Reijnsdorp/Bakkie in the past few years. In Alliance, around 10 families left Alliance some 5 years ago, and circa two to three years ago, one more family left. Also in Kroonenburg and Johanna & Margaretha it was reported that “a lot” of families and youngsters had left to continue education, build a house on the other side of the Commewijne River, or go live in Paramaribo.

TABLE 4. POPULATION CHARACTERISTICS PER INHABITED PLANTATION

Plantation	Permanent residents	Transient Population	EBS connections	Ethnicity
Frederiksdorp	0	5-10*	9 (8 one owner)	Various
Johanna & Margaretha	~300-400 (80 households)	NA	93	~40 % Hindu, 60% Javanese, and mixed
Elizabethshoop	8-10 (4 households)	0	4	Hindustani
Kroonenburg	150-200	Several vacant houses	82	Hindustani and Javanese
Herendijk	1 guard	0	1	NA
Hecht en Sterk	1 guard	0	3	Hindustani
Constantia	7	2	8	5 Hindustani, 2 Javanese
Alliance	60-80 (~27 households)	NA	62	Most Javanese, also Hindustani and some others.
Reijnsdorp/ Bakkie	25-26 (17 households)	~7 households	31	Most Javanese, 1 Hindustani, 1 Creole and 1 Dutch
Bruinendaal	3 males (3 households)	1 household	3	Javanese

TOTAL in Project area	**~700 persons**		**404**	**Javanese, Hindustani, and a few others**

*The administrator and his family are always present, in addition there is administrative staff.

EBS has not conducted a study on the likelihood of population growth in the AI. Based on actual data from the target area, and the fact that limited new development (employment, secondary schools) are foreseen in the near future, the consultant projects a continuation of population decline.

Ethnically the population in the ROC consists mainly of people of Javanese and Hindustani (East-Indian) descent (Table 4), with a few selected other ethnicities. The dominant religions are Christianity and Islam, and a smaller number of individuals are Hindu. Within the ADI there are churches in Alliance (Apostolic) and Johanna & Margaretha. There are mosques in Johanna & Margaretha, Kroonenburg, Alliance, Rust en Werk, and Reijnsdorp/Bakkie, but the latter is inactive. Johanna & Margaretha and Kroonenburg feature a Hindu temple, and Johanna & Margaretha features an evangelical church.

3.4 VULNERABLE POPULATIONS

There are not many vulnerable populations in the Project area. Many households earn relatively low salaried incomes, if any, but they can supplement their food supply and income with planting and fishing and hunting. At all plantations people cultivate crops and fish for auto consumption. The various ethnic and religious groups live harmoniously together, and there are no signs of discrimination of specific minorities. There are no elderly homes; the elderlies are taken care of by their families.

HERENDIJK		
 *Bicycle trail facing south, with EBS distribution line*	 *Coconut trees planted alongside the main canal of the plantation*	 *Main sluice where the bike path crosses the canal*
HECHT en STERK		
 *Residences*	 *View of the dike (facing south)*	 *Overgrown bicycle trail on the dam*
CONSTANTIA		

 *Bridge leading to the residences (facing west)*	 *One of the houses at Constantia*	 *Bike trail section leading towards Bakkie (facing North)*

FIGURE 4. IMAGES CAPTURED DURING THE FIELD VISIT OF MAY 19, 2021

3.5 THE NORTH COMMEWIJNE CLUSTER

The Cluster acts as a spokesperson for the ROC plantations, and has initiated projects such as the rehabilitation of the bicycle trail in North Commewijne (see below). The North-Commewijne cluster comprises 17 companies and plantations in North Commewijne including Bakkie, Frederiksdorp, Katwijk (on the left bank), VCM/Van Alen and various others. The cluster works in partnership with different companies and organizations, including Staatsolie N.V., Grassalco, Vabi, GHFS, and the Ministry of Public Works. The managers of the tourism projects at plantations Frederiksdorp and Bakkie are the de facto group leaders.

3.6 ECONOMIC DEVELOPMENT

3.6.1 LIVELIHOOD ACTIVITIES

The main livelihood activities in the ROC are working at cattle farms, agriculture, fishing and tourism.

Cattle farming

In 1979, the family Van Alen took over Verenigde Cultuur Maatschappijen N.V. (VCM), which covers plantation Rust en Werk and neighbouring plantations, and transformed it into a blooming farm. In past years, the firm expanded and it now covers 11 connected plantations, with a 12th plantation Herendijk, further upsteam. Today, VCM covers around 5,000 ha, harbouring over 5,600 cows, 550 sheep and goats, 40 buffalo's and 20 horses. Only Herendijk falls within the AI. Products from Herendijk (agricultural yield and beef) are sold at Rust en Werk in North Commewijne and in Paramaribo at the Rossignol stores.

There is not much cattle farming on the other plantations.

Tourism

Commewijne district is known for plantation tourism. Bicycle and boat-tours to visit the plantations are organised from Paramaribo. On the ROC, the most popular tourism destinations are Frederiksdorp, Reijnsdorp/Bakkie, and Johanna & Margaretha.

Frederiksdorp is a former 18th century coffee and cacao plantation, which owes its name to the first owner, a German named Johan Friedrich Knöffel. In the early 20th century, the plantation became neglected and in 1976 the plantation was bought by Hagemeijer. They used it for agriculture and cattle farming, and restored some of the plantation and its buildings, making the location suitable for tourism. In 2004, Frederiksdorp was declared a national monument. In 2016, Hagemeijer sold the plantation to a Dutch investor. Together with four shareholders, the investor has transformed Frederiksdorp into a luxury tourism resort with lodging facilities, a bar-restaurant and a swimming pool.

Johanna & Margaretha is the access point to Diana beach, which is a small stretch of sea turtle nesting beach near Braamspunt. In the nesting and hatching seasons, tourists visit the plantation to watch these processes. In addition to Sea Turtle tours, the plantation offers plantation tours, dolphin watching tours, bird watching tours and swamp tours. Johanna & Margaretha has a developed tourism infrastructure with lodging locations and various small restaurants and bars. In addition, community members are working as tourist guides.

The former plantation Reijnsdorp, better known as Bakkie, was a former coffee and cacao plantation. Around 1902, plantation Reynsdorp was bought by the government and parcelled out in small allotments for former contract labourers. In the early 2000s, a Surinamese-Dutch couple began to restore some of the old colonial structures and infrastructure, open up the Warapa Creek, and develop the plantation as a tourist attraction. Today, plantation Reijnsdorp features several well restored colonial buildings, lodging facilities, a small museum, and a bar-restaurant.

Agriculture and horticulture

The main agricultural producer in the ROC is plantation Alliance. In 1973, the government established 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. The state firm employs 27 persons. In addition to working as public workers, these persons are also allowed to plant their own fruits and vegetables for auto-consumption or sale. People who do not work for the state also plant to sell at markets in Paramaribo or Commewijne.

Also in Constantia and Kroonenburg, agriculture and horticulture are a main source of income. Crops include cabbage, tomatoes, watermelon, and various other vegetables, which are sold in Paramaribo. One person who lives in Constantia works for the Alliance citrus plantation. Also in Reijnsdorp/Bakkie and at Herendijk, citrus, plantain, coconut, mango, among others, are planted commercially.

Fishing

Inhabitants of all visited plantations fish, either for auto-consumption or commercially. In Johanna & Margaretha, the majority of the population are fishers. Fish are especially caught in the swamps surrounding the community, and sold to middlemen from the community. About 80% of the yield is sold in Paramaribo. Also on the other plantations, people fish in the swamp areas or else in the river. We have not heard of people going out at sea to fish. Fish are sold locally or on the Commewijne or Paramaribo markets.

In Alliance, people fish only for own consumption.

Government

The government is one of the main employers in the ROC. All economically active persons at Alliance work public jobs; either at the state firm (run by the Ministry of Agriculture, Animal Husbandry and Fisheries – 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), EBS, and the Ministry of Regional Development and Sport (ROS).

On other plantations, government jobs are less prominent, but still a considerable number of persons work for the MinOWC (teachers, maintenance, cleaning) and local government functions through the Ministry of Regional Development and Sport (resort council members -RR, district council members -DR, government managers – BO).

3.6.2 BUSINESSES

Private businesses in the ADI other than farming, fishing and tourism related businesses include:

- Supermarkets, bar-restaurants and a lottery stand in Johanna & Margaretha, Alliance, and Kroonenburg.
- Ferry services
- Small entrepreneurs such as a tailor.

Very few, if any, business opportunities will result from the project. All the goods to be used for constructing the 12 kV distribution line will be purchased from abroad except wooden/concrete poles. For the ROC area Bruinhart (wooden) poles will be used as experience from the EBS shows that the galvanic masts rust after a while, especially with the ROC area being close to the sea and thus the salinity probably being higher (speeds up the rusting process). Furthermore, to reduce costs of the project the contractor will make use of local accommodation (EBS, e-mail, 26 May 2021). It is unlikely that new businesses will be developed due to the improved energy provision in the ROC.

3.6.3 PLANNED DEVELOPMENT

Foreseen developments in Commewijne district include:

- Shore base facilities at Belwaarde and at Voorburg along resp. the Suriname River and the left bank of the Commewijne River (for Offshore Oil and Gas developments)
- Project of SWM at La Liberte (near Peperpot)
- Hydrogen project (opposite Alliance, along the LOC)
- Mariënburg area; land has been allocated for housing development projects and business creation.

(District Commissioner, pers. com. 04 May 2021)

None of these projects take place in the ROC, and it is very unlikely that these projects will affect population or business developments in the ROC. If the shore bases and the hydrogen project will indeed be developed, it is likely that most staff will be recruited in the larger population centres of the left bank of the Commewijne River, where it may be easier to find persons of certain skills levels.

No government projects are planned or foreseen in the ROC. Nevertheless, there are some private initiatives, such as from Verenigde Cultuur Maatschappijen NV (VCM) and Frederiksdorp and Reijnsdorp/Bakkie. VCM, which has its primary activities at Rust en Werk (outside of the project area), is expanding its cattle farming and horticulture to other locations in the ROC, including Herendijk. VCM is currently working on their expansion plan. Depending on the negotiations that are now underway, the need for energy will increase sharply. There is presently even talk of 2 Megawatts of power. The correct information will be known by the end of 2021. In the case that other projects in North Commewijne are further developed, it is possible that the VCM benefits from spin-off activities. Furthermore, in past years, both Frederiksdorp and Reijnsdorp/Bakkie have expanded the tourism potential of the ROC through the restoration of old buildings, providing information about, and access to, historic objects, and by rehabilitation of a 24 km long bicycle trail between Bakkie and Rust en Werk.

The bicycle trail project is one of the main current projects initiated by the North Commewijne cluster. The works at the bicycle trail is not advancing rapidly but there are some activities. For example, not long ago, the Suriname firm VABI built a steel bridge near Kroonenburg. Part of the trail is destroyed due to riverbank erosion and some of the dams have broken; moreover, the sluices across some of the plantation canals have disappeared as a result of year-long neglect. The Cluster plans to address this problem with support from the State Oil company Staatsolie N.V. The EBS used to be involved as a partner in activities of the cluster, but its support has not been consistent. EBS is responsible for clearing part of the trail that overlaps with its service route, but due to insufficient maintenance these areas are largely overgrown. The North Commewijne Cluster would like to see the return of EBS as a project partner, especially in light of planned electrification developments.

Due to the Covid-19 pandemic, international tourism has been virtually absent, and the developments have slowed down. It is not expected that, once Covid-19 is under control and tourism is possible again, tourism developments will drive a significantly increased demand in energy. It is possible that one or two small restaurants will be constructed along the route, but tourism in this area is not likely to boost the building of large hotels or other major tourist facilities.

3.6.4 EMPLOYMENT OPPORTUNITIES PROVIDED BY THE PROJECT

At the moment, EBS employs seven full-time staff members who are responsible for the ROC distribution network, of whom six are stationed in the ROC. During the operational phase of the project no additional (new) employees will be hired for operational and maintenance works (EBS, e-mail, 26 May 2021).

During the construction phase, various skilled and unskilled workers will be hired through contractors, including excavator operator (vegetation clearance), tractor operator (transportation of the poles), electrical line workers (setting up the poles and also stringing the cables), and boat operator (transportations of various materials).

In the case that workers will stay onsite, cooks will be needed. If materials are stored onsite, contractors will be approached to deliver security personnel.

The exact number of workers is not known yet (EBS, e-mail, 26 May 2021).

3.7 ARCHAEOLOGICAL RESOURCES, TANGIBLE HERITAGE, AND OTHER PLACES OF CULTURAL SIGNIFICANCE

In line with IFC performance standard 8 on cultural heritage, tangible cultural heritage refers to (i) tangible forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values; and (ii) unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls (IFC PS 2012)[2]

The AI (Area of Impact) features various structures and locations that belong to tangible heritage, including historic buildings, historic infrastructure and objects, and archaeological sites. Frederiksdorp has the status of a national monument. No excavation or other physical works are planned in this area, and cultural heritage structures in this location will not be impacted. Most plantations feature historic colonial infrastructure such as sluices and walls, and there are historic buildings at the plantations Mariënbosch, Reijnsdorp and Alliance. It is not foreseen that construction works or other project activities will affect these structures. Precolumbian archaeological sites are not known in this area; the nearest known sites are located some 8 km east of Alliance, along the Motkreek.

The Warapa Creek running from the plantation Reijnsdorp to the Atlantic Ocean, in the east of the AI, is a place of specific historical value. Along the creek a number of abandoned plantations is present with several historical sites, such as a sugar factory with steam engines from 1830, a steam car, old locks and gates, tombs and the original 'ring dams' around which poisonous cacti were planted to prevent slaves from escaping. During excavations in the Warapa Creek, much objects of historical interest was unearthed, which is now on display in Bakkie's museum.

Also during excavation works on other plantations, historic objects have been found, mostly bottles from the colonial era. Because of the rich history of the entire ROC area, it is not unlikely that historic objects will be encountered during digging works to place the utility poles, but especially during the construction of new sections of the dam on which the electricity grid is placed at locations where the current bicycle path is damaged or at risk from river erosion.

Direct Project activities and activities indirectly resulting from the Project activities in the longer run, should comply with:

- Internationally recognized good practice as described in the ICOMOS (1990) Charter for the Protection and Management of the Archaeological Heritage.
- IDB guidelines on chance finds, as indicated in IDB Operational policy (OP) 7.03.

[2] https://www.ifc.org/wps/wcm/connect/a02b1f32-1d64-4454-a7c4 aac49c9daa04/PS8_English_2012.pdf?MOD=AJPERES&CVID=jiVQJ7k

- Chance find procedure in Appendix D of the Environmental and Social Management Plan
- Government of Suriname (GoS) Monuments Act (1963, revised 2002). In the 2002 revision, the Act established the Monuments Committee. The International Council on Monuments and Sites (ICOMOS), Suriname Built Heritage Foundation (SBHF), and the Monuments Committee are collaborating on providing proposed revisions to the Act to accommodate the Paramaribo WHS.
- The draft national guidelines of the Directorate of Culture of the Ministry of Education, Science and Culture (MinOWC) for immoveable archaeological resources found during the course of the project. These guidelines are used internally to guide archaeological work, but they have not yet been officiated by the Minister.

Article 20.1 of the Monument Law stipulates that monuments found in excavations and on which no one can prove the right of ownership are owned by the state. 20.2. 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. 20.3. 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.

The Project activities also should comply with a zoning standard for places of cultural importance and archaeological sites. If archaeological or cultural historical findings are made, relics and locations have to be reported immediately to the Ministry of Education, Science and Culture (MINOWC - *Ministerie van Onderwijs, Wetenschap en Cultuur*). The licensee and their staff, contractors or representatives will refrain from interfering in any way with such sites and / or relics.

3.8 ENERGY PROVISION

All communities in the ROC are connected to the national EBS power grid. A total of 404 EBS connections are listed in this area. According to consulted EBS staff, the network is now 26 years old and needs to be upgraded. Among others, there is material fatigue; e.g. insulators, brackets, and masts are weathering.

In the period 2019-2021 (through September), the ROC experienced 132 power outages, most of which were related to the power lines (Table 5). Most of the outages were due to unknown sources (Table 6). Of the known causes of power outages, most common were birds, lightning (probably) and trees. Based on feedback received from stakeholders, power failures for unknown causes are partly attributed to animals (opossums, monkeys) that sit or walk on the power lines and to tree branches that touch or fall on the lines. This happens relatively more often in the eastern part of the ROC because this area is relatively more forested. In addition, hard winds can cause the power lines to touch one another (EBS, pers. com. 07/10/21). EBS requires from the contracted firm that it delivers types of overhead line that prevent or mitigate outages as a result of animals and vegetation.

EBS data suggest that, in the past three years, most power outages have been the result of outages at pole CR-246 (Kroonenburg) (ibid).

TABLE 5. NUMBER AND AVERAGE TIME OF POWER OUTAGES IN THE ROC

Year	Line power outage[3]		Transformer power outage[4]	
	Number	Av. time	Number	Av. time
2019	52	03:53	6	05:16
2020	18	07:32	6	03:01
2021 - through sept	40	02:34	10	03:57
TOTAL	**110**	**04:39**	**22**	**04:04**

TABLE 6. NUMBER OF POWER OUTAGES CLASSIFIED BY CAUSE

Cause Description	**Line**	**Transformer**
Unknown	75	12
Birds	9	4
Lightning, probably	7	2
Tree fallen in net	5	2
Tree branches	3	-
Fallen pin from top of pole	2	-
Wind	2	-
Other (not specified)	2	1
Short circuit in the grid	1	1
Rotten power pole	1	-
Network weak	1	-
Defect isolator	1	-
Car collision of pole	1	-
	110	**22**

Consulted plantation inhabitants from Johanna & Margaretha and Kroonenburg reported that they did not experience many power outages. Others, such as the manager of the tourist resort at Frederiksdorp, a representative of the VCM, and the plantation owner of Mariënbosch (also plantation manager of Guadeloupe) did report frequent and lengthy power outages in recent weeks (Consultations July/August 2021). According to EBS, the outages are all over the ROC (EBS, e-mail, 26 May 2021).

Power outages are relatively more frequent in the eastern part of the ROC, between Reijnsdorp/Bakkie and Herendijk. In this area, there are in total 108 EBS connections. According to local area inhabitants, power failures

[3] A line power outage is an outage in a relatively larger area, whereby all transformers behind the line cutout are not receiving power.

[4] A transformer power outage is a power failure in one transformer, which services a group of houses. It concerns a relatively smaller area than a line power outage.

occur, on average, about one to two times a month. Power outages in this area usually last for a couple of hours, and are resolved the same day. Problems with the power supply were not mentioned as a reason for outmigration.

Maintenance is often delayed because some areas are difficult to reach, as grasses and weeds have taken over the access ways. This situation also hampers regular maintenance inspections. In order to resolve the problem of poor access, the EBS will need to:

- Repair broken dams and/or construct new dams
- Create a new path to reach the areas where poles are placed further land inward.
- Develop and reserve budget for a maintenance plan for the bike path

The department Distribution Maintenance coordinates vegetation management of the Right of Way. Vegetation management for the ROC occurs once every four years, most recently in December 2020 (EBS, e-mail, 13 October 2021). Contractors are hired to execute this work. In 2018, the EBS developed specifications for vegetation clearance works along and underneath the power lines in the ROC, including application forms for interested contractors. These contractors have to comply with the *Code of practice for personnel*, related to electrical safety for vegetation control work near live power lines.

Judging by the state of the vegetation growth underneath the electricity lines, the current method and/or frequency of maintenance is insufficient to ensure that EBS utility poles are accessible. The project description states that "Vegetation management will be undertaken in cooperation with all relevant institutions such as the Road Authority/Ministry of Public Works". To date, however, there has been no agreement with these government agencies about their assistance in vegetation management.

Without a plan for maintenance of the ROC, it is likely that the transmission lines and pylons become difficult to access, maintain, and repair in the case of a power outage. The consultant emphasizes the importance for EBS to have a realistic and sustainable maintenance plan, as well as dedicated budget, for vegetation clearance in place prior to starting the project.

At plantation Alliance, an on-grid PV system is planned as part of the electrification improvement project. The planned installed capacity is 200 kWp.

4. POTENTIAL IMPACTS & PROPOSED MITIGATION MEASURES

Table 7 lists predicted project impacts, positive or negative, direct or indirect. The table also suggests mitigation measures, and predicts a residual impact that remains after application of the mitigation measures.

Affected Social Aspect	Impact Description	Impact Likelihood	Impact Characteristics and Magnitude	Impact Significance	Mitigation Measures (proposed or recommended)	Residual Impact
Improved energy supply	Redundancy in power supply; fewer power outages; more trust of local stakeholders in energy provision.	High	Direct; medium-term, small scale, reversible. Magnitude: Low	Negligible	Anticipate new requests for connections to the grid. Implement vegetation maintenance plan, including maintenance of constructed clay mounds, for distribution lines in the re-routing transect, and for the distribution line along the bike path for the period that this is not yet rehabilitated. And conduct inspections for those line sections that will be maintained by cooperating institutions (such as Ministry of Public Works/ Ministry of Regional Development and Sport) in order to check whether maintenance is in compliance with the EBS requirements.	Moderate Positive
Livelihood	Project provide temporary employment opportunities during construction and operation; excavator and tractor operators; boat transportation, maintenance.	High	Direct; short-term, small-scale, reversible. Magnitude: Low	Minor Positive	As much as possible: hire local field hands for temporary jobs. Promote local procurement of food and lodging.	Minor Positive
Livelihood	Longer term job creation in the area related to maintenance.	Small	Direct; long-term, small-scale, reversible. Magnitude: Low	Negligible	Hire local area inhabitants for maintenance of path underneath power lines.	Minor Positive
Construction noise and traffic	Piling and other construction activity may be a hindrance to local area inhabitants. Also, the main pathway and dams may be temporary blocked.	Medium	Direct; Short-term, small-scale, reversible. Magnitude: Low	Minor Negative	Warn area residents ahead of time of construction activities, specifying dates, duration, type of activities and expected hindrance.	Negligible

Hindrance of water traffic	During building of underwater cable, possible hindrance of water traffic or collisions.	Medium	Direct; Short-term, small-scale, reversible. Magnitude: Low	Minor Negative	Timely communication of water users through media messages (radio, newspaper) and billboards on landings, indicating dates, duration and locations.	Negligible
Tourism development	Rehabilitation of path beneath power lines, incl. repair of dams and bridges, can support rehabilitation of bicycle path related to tourism project.	Medium	Indirect; Medium-term, small-scale, reversible. Magnitude: Low	Negligible	Communication with North Commewijne cluster and specifically Bakkie tourism project about path.	Minor positive
Cultural Heritage	Disturbance of archaeological and other cultural heritage sites	Low	Direct; long-term, small-scale, and irreversible. Magnitude: High	Moderate Negative	Verify absence or presence of known historic and archaeological heritage sites with plantation populations once preferred locations for placement of utility poles are known. Follow Suriname draft guidelines and international best practice as described in this ESIA	Negligible
Land tenure	A few selected utility poles may have to be placed on land that has been titled to someone else.	Low	Direct; long-term; small-scale; reversible. Magnitude: Low	Minor Negative	Use standard EBS procedures to deal with land title holders on whose lands utility poles may need to be placed.	Negligible

The main potential positive impact of this project is that the population in the ROC will experience fewer power outages. The magnitude of this change is considered low, because the present annual number and duration of outages is not very high, and the number of potential Project beneficiaries is small and declining. With mitigation measures, the residual impact can be increased to moderate. Other potential positive impacts include temporary labour provision via contractors, and more permanent jobs for maintenance of the bicycle path.

Possible negative impacts include disturbance of cultural heritage sites and land tenure issues. In addition, during the construction phase local area inhabitants may be hindered by noise and traffic obstructions (land and water). With mitigation measures, residual impacts can be reduced to negligible (see Impact Table).

TABLE 7. IMPACT RATING TABLE

ANNEX 1. LIST OF CONSULTED STAKEHOLDERS

Date	Organization or function	Method of Contact	Location*
4 May 2021	District Commissioner	In person	DC Office, Nieuw Amsterdam
	District Secretary	In person	DC Office, Nieuw Amsterdam
	EBS staff; Project Manager	In person	ROC
	EBS staff; Electrical Engineer	In person	ROC
	EBS staff; Jr HSEQ Officer	In person	ROC
	EBS staff; Local Supervisor	In person	ROC
	Manager Alliance Plantation	In person	ROC
19 May 2021	EBS staff	In person	ROC
	EBS staff; Distribution Maintenance - Overhead Maintenance	In person	ROC
	EBS staff	In person	ROC
	Laborers working at the Van Alen farm	In person	Herendijk
	Guard	In person	Hecht en Sterk
	Resident	In person	Constancia
	Resident	In person	Bakkie / Reijnsdorp and Bruinendaal
	Resident	In person	Bakkie / Reijnsdorp and Bruinendaal
	Resident / EBS staff	In person	Alliance
	Resident / Schoolteacher	In person	Kroonenburg
	Resident / Tailor	In person	Johanna&Margaretha
	Resident / Business owner	In person	Johanna&Margaretha
9, 13, 14, 19, and 21 June 2021; 29 July 2021	Resident / Business owner Bakkie	Phone and Email	NA

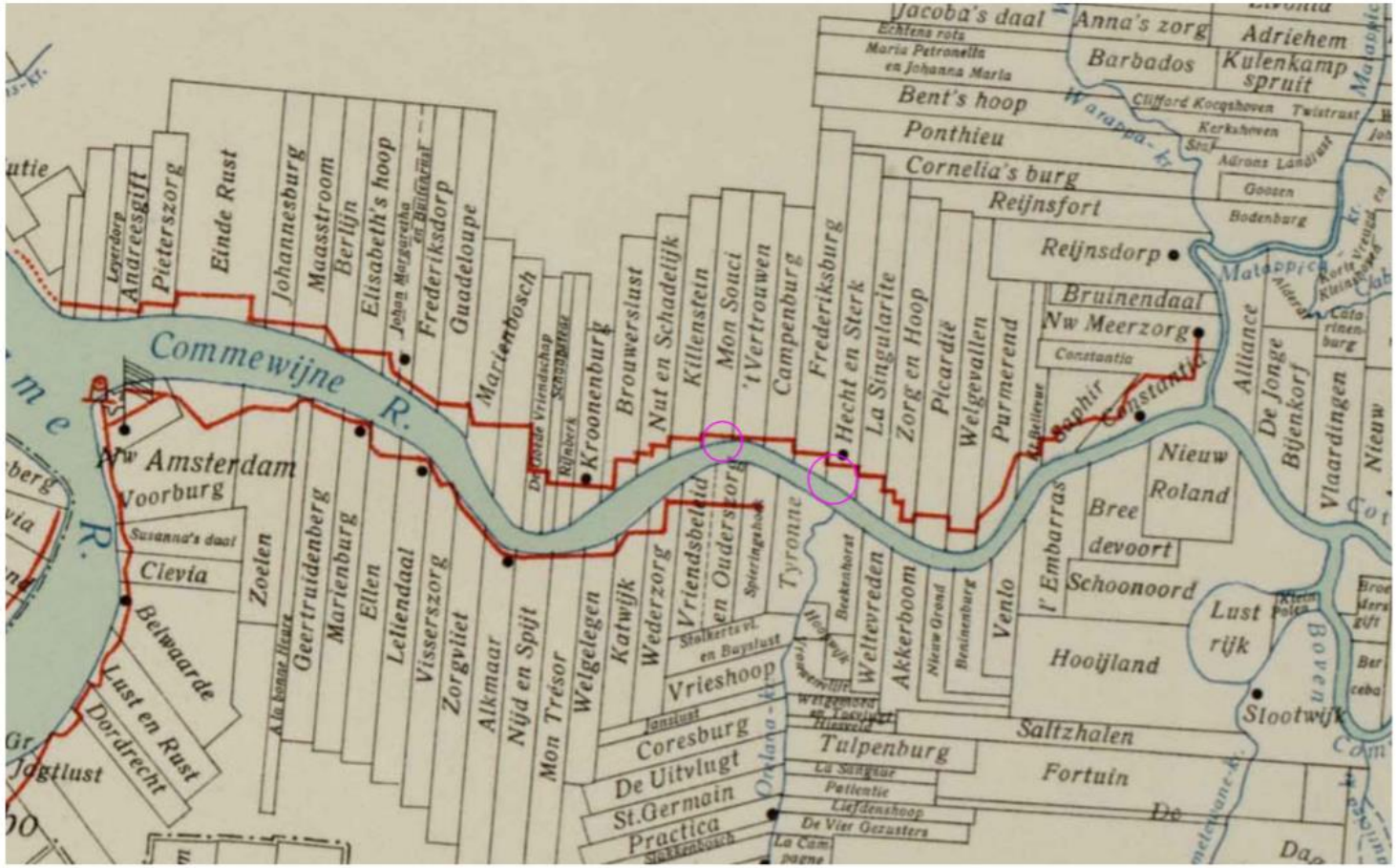
22 June 2021	EBS staff	Phone	NA
29 July 2021, 2, 3, 6 August 2021	Manager Alliance Plantation	Email and Phone	NA
29 July 2021, 2, 6 August 2021	Manager Plantation Resort Frederiksdorp	Phone and Email	NA
2 and 6 August 202	Manager (VCM Plantations)	Phone and Email	NA
2, 3, 6 August 2021	Owners Plantation ‘t Vertrouwen	Phone and Email	NA
2 August 2021	Owner Plantation Mon Souci	Phone	NA
2 and 3 August 2021	Owner Plantation Mariënbosch and manager Plantation Guadeloupe	Phone	NA
3 August 2021	Owner Plantation Hecht en Sterk	Phone	NA
Various	EBS Sr. Environmental Technician	Email and Phone	NA
Various	EBS Electrical Engineer	Email	NA

ANNEX 2. KEY NOTES STAKEHOLDER CONSULTATIONS

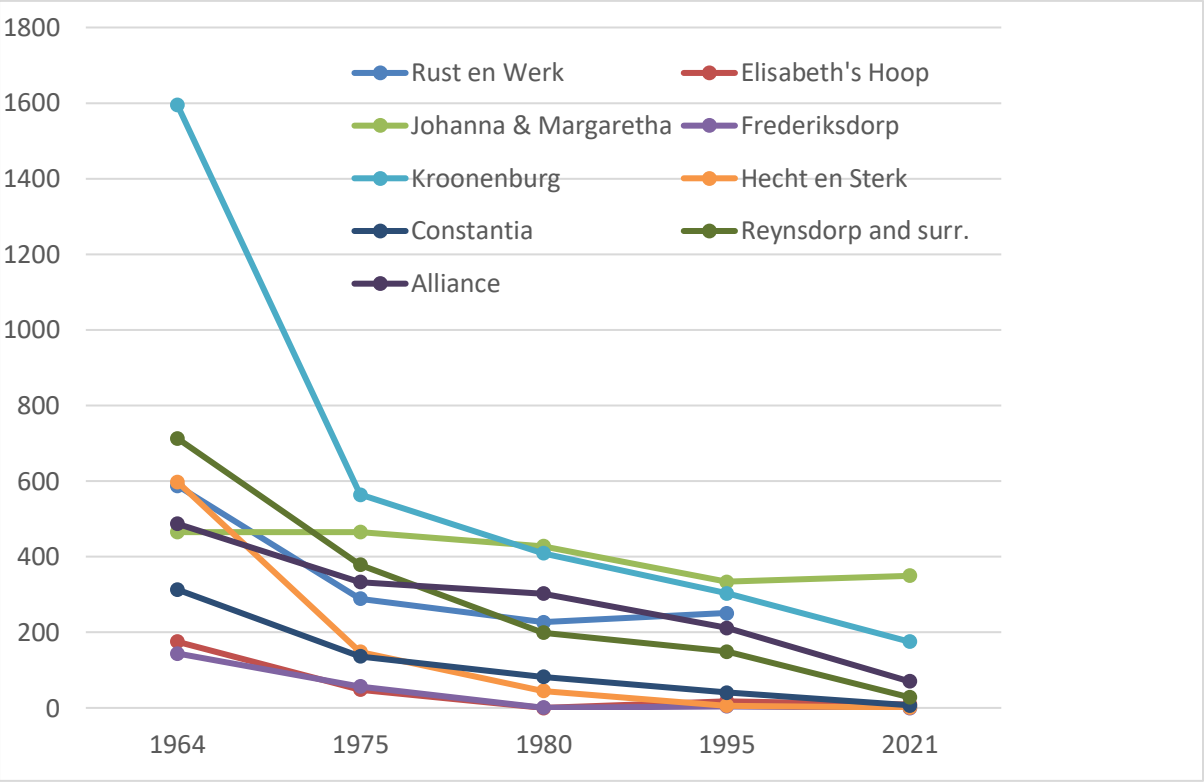
Key notes of consultations with stakeholders			
	Name stakeholder	**Function**	**Feedback received from stakeholder (issues raised, comments provided)**
1	Mr. F. Kurban	Manager Alliance Plantation	Mr. Kurban indicated that, only just recently, he had received a detailed description of the solar project -in writing- from the EBS. Although he welcomed the initiative, he will need some time to properly study the document provided to him, before he can offer his objective view on the matter.
2	Mr. B. Spek	Resident / Business owner Bakkie (a.k.a. Reijnsdorp)	Information was shared by Mr. Spek about the activities of the North Commewijne Tourism Cluster Project in the ROC, especially with regard to the 24 km bicycle trail that extends from Rust en Werk plantation to Bakkie. This information was relevant to disclose since the bike trail is situated alongside the distribution network of the EBS in the ROC area. Key information concerning land owners of the plantations located in the project area and information about plantation Bakkie was also provided by Mr. Spek. Some inquiries were made by Mr. Spek regarding (1) the financing of the proposed project and (2) whether the rehabilitation and lighting of the bike trail was included in the proposed project. The inquiries made were presented to the EBS and addressed afterwards. Additionally, Mr. Spek also informed whether the Project would perhaps consider placement of a fiber optic cable since internet communication is expensive and slow. The consultant noted that this may be more of a matter for Telesur rather than the EBS.
3	Mr. S. Zalman	Manager Plantation Resort Frederiksdorp	Mr. Zalman indicated that frequent power outages were experienced recently, about 2-3 times a week. Therefore, he has no objections to the proposed project if it will result in improved power supply.
4	Mr. C. van Dijk	Manager (VCM Plantations e.g. Herendijk)	Mr. van Dijk mentioned that the VCM management team welcomes the Project, because they are currently experiencing a lot of power failures and this Project will hopefully greatly reduce the risk of interruptions in the power supply. Furthermore, it was noted that N.V. VCM is currently working on an expansion plan and depending on the negotiations that are under way, the need for energy will increase considerably. The high-voltage grid will also need to be expanded by about 4 km. It would be appreciated if this power could be available after completion of this Project, and that it increases the feasibility for EBS. Additionally, perhaps it is worth considering instead of laying the underwater cable

			at Johanna & Margaretha, to do this at plantation Rust en Werk. The management team is open to a discussion about this and can possibly make space available.
5	Mr. A. Hagemeijer and Mr. M. Hagemeijer	Owners Plantation 't Vertrouwen	Mr. M. Hagemeijer was of the opinion that the proposed Project is a good initiative. He asked a few questions about the Project (e.g. regarding construction activities), which were then presented to the EBS and addressed accordingly. Mr. A. Hagemeijer wondered whether the location chosen for placement of the underwater cable was appropriate, since it was understood that the Commewijne River was rather shallow near Johanna & Margaretha (based on information from the Maritime Authority Suriname-not confirmed by the consultant). There was concern about possible damage that could be caused to the underwater cable by large ships passing by. The consultant indicated that the underwater cable would be weighted down to avoid these kinds of situations. Moreover, Mr. A. Hagemeijer also asked if the EBS could consider taking the opportunity to install a fiber optic cable together with the underwater cable, since internet connection in the area was not great and modems are very expensive.
6	Mr. J. Moenne	Owner Plantation Mon Souci	Mr. Moenne has no objections to the installation of electricity pylons further inland. He is currently repairing some dams in the area.
7.	Mrs. K. Debisarun	Owner Plantation Hecht en Sterk	Mrs. Debisarun stated that power outages occur almost daily. If there is a local power failure at Hecht en Sterk, the problem is repaired by the EBS. Mrs. Debisarun has no objections to the installation of electricity pylons further inland. The biggest problem experienced at Hecht en Sterk is flooding of the land. The cause of this can be attributed to the adjacent Frederiksburg plantation where the sluices have been broken for about 20 years. As a result, every time with high tide Hecht en Sterk gets inundated. (Note consultant: perhaps it is advisable that EBS repairs some of those dams and sluices, otherwise the power poles cannot be reached at high tide)
8.	Mr. S. Abdoelrahman	Owner Plantation Mariënbosch and manager Plantation Guadeloupe	At Mariënbosch there is a tourist resort, but now due to COVID there are no tourists. Mariënbosch and Guadeloupe are regularly visited by the owner/manager for maintenance purposes. Mr. Abdoelrahman has no objections to EBS moving the poles, but they have to look carefully at where the poles will be placed (the new locations). Previously, a pole was wrongly positioned and this seriously hindered maintenance activity. The mistake was corrected afterwards.

ANNEX 3. MAP OF FORMER PLANTATIONS IN THE ROC



ANNEX 4. POPULATION NUMBERS IN THE ROC



Sources: 1964: ABS; 1975: Van Trikt en Oostvriesland (1976); 1980: ABS; 1995: Population Registration Office at Nw Amsterdam, 1995; 2021: Estimates based on field visit.

Source for 1964-1995: Teunissen, P.A. 1997. Coastal Management Plan for the proposed Multiple-Use Management Area Commewijne-Marowijne Suriname