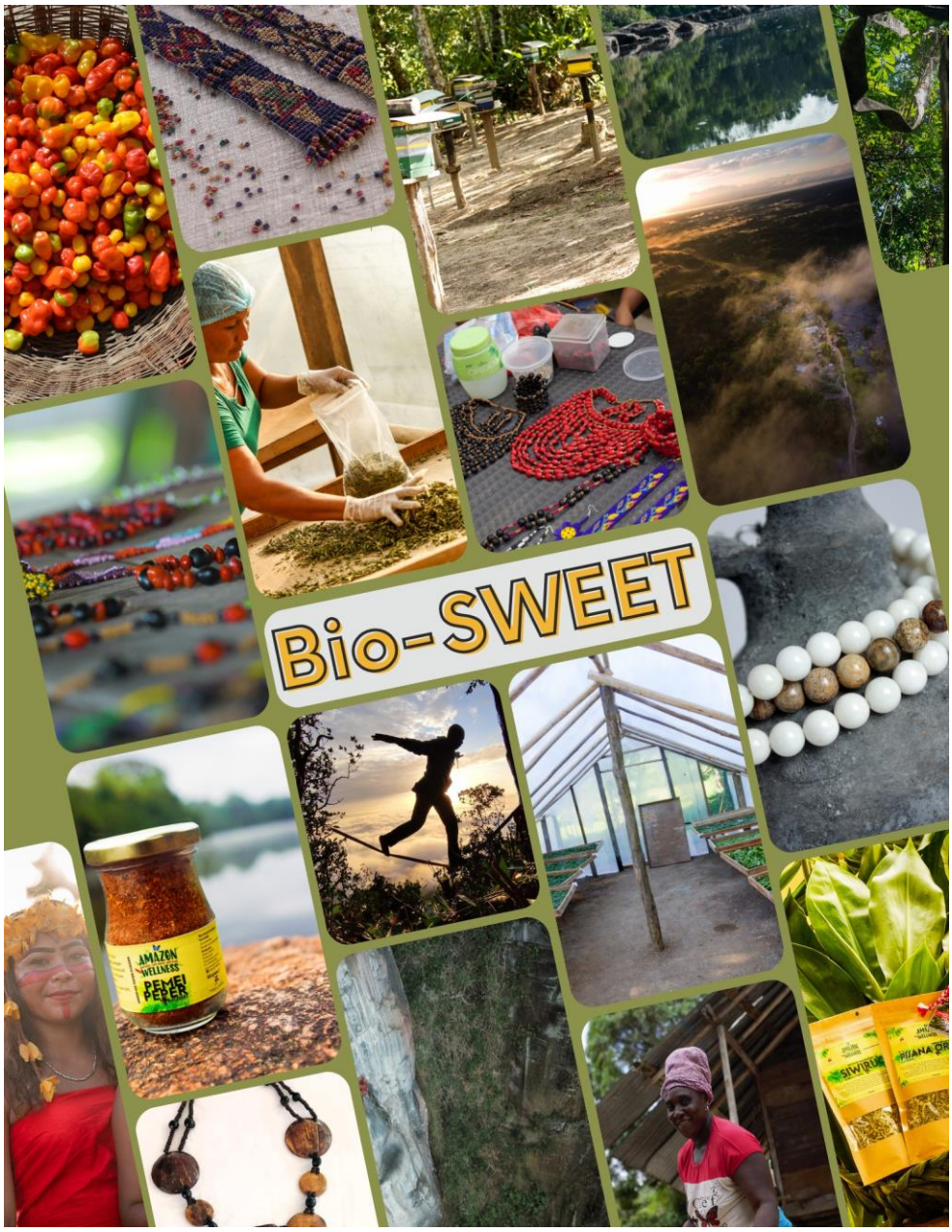

ENVIRONMENTAL AND SOCIAL ASSESSMENTS TO SUPPORT RURAL ELECTRIFICATION WITH RENEWABLE ENGERGY, POTABLE WATER, AND TELECOMMUNICATIONS IN SURINAME

ABSTRACT

This document presents the findings of the Environmental and Social Assessment and Environmental & Social Management Plan performed through this consultancy

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Paramaribo, 1 July 2024

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1 Introduction

This report presents the results of the "BIO-ECONOMY EMPOWERMENT IN SURINAME'S INDIGENOUS COMMUNITIES THROUGH ACCESS TO WATER, ENERGY, AND TELECOMMUNICATIONS (BIO-SWEET)' against the disaster and Climate Change Risk Assessment

The project aims at promoting a just, clean and sustainable energy transition by increasing access to electricity, water, telecommunications services in rural areas and by promoting the decarbonization of the electricity sector.
The general objective of the first operation is to promote the socio-economic development of villages in the Amazon rural areas of Suriname. The specific objectives are to:

(i) provide 10 villages in the Amazon rural areas of Suriname with reliable access to renewable energy-based electricity, potable water supply, and telecommunication systems and
(ii) (ii) foster the development of a bio economy in the Amazon rural areas of Suriname with a gender and diversity perspective.

This report consists of 2 sub-reports:

- *Environmental and Social Assessments (ESAs)*
- *Environmental and Social Management Plan (ESMPs)*

This report was last updated on July 1st, 2024.

2 Background Information

The BIO-SWEET Program is part of the larger project entailing the Conditional Credit Line for Investment Programs (CCLIP). The objective of this CCLIP is to support the Government of Suriname in its efforts to promote a just, clean and sustainable energy transition by increasing access to electricity, water, telecommunications services in rural areas and by promoting the decarbonization of the electricity sector.

The general objective of the BIO-SWEET is to promote the socio-economic development of villages in the Amazon rural areas of Suriname. The specific objectives are to: (i) provide villages in the Amazon rural areas of Suriname with reliable access to renewable energy-based electricity, potable water supply, and telecommunication systems and (ii) foster the development of a bio economy in the Amazon rural areas of Suriname with a gender and diversity perspective.

Component I. Infrastructure investments. This component will finance the provision of electricity, water and telecommunications services and their productive use in the Amazon rural areas of Suriname with four subcomponents. Given that the operation is structured as a multiple works investment loan, which entails the financing of several independent, but technically similar subprojects towards achieving project objectives, a representative sample for Component I of around 50% of the total investment will be defined in order to process and approve the operation.

Subcomponent I.1. Energy systems. Finances the supply, installation, and commissioning of solar mini-grids, resilient to natural phenomena and including the upgrade of the existing distribution network to provide 24/7 electricity supply in the Amazon rural areas. This subcomponent will also promote the efficient use of electricity in these villages.

Subcomponent I.2. Water systems. Finances the upgrade of the existing water intake, treatment and distribution to provide clean and reliable water supply to the villages in the Amazon rural areas. This component will also promote the efficient use of water in these villages.

Subcomponent I.3. Telecommunications systems. Finances the upgrade of existing and deployment of new distribution and access telecommunications infrastructure to provide reliable telecommunications services in the Amazon rural areas.

Subcomponent I.4. Bio-economy development and community awareness. Finances the implementation of productive and sustainable uses of electricity, water, and telecommunications, focused on bio-economy, within the Amazon rural areas. Also, it finances activities to strengthening the beneficiaries' commitment and ownership of the projects and technical training for women and indigenous women and support their participation in the installation and maintenance of the energy systems. The bioeconomic activities will be designed to maximize the benefits to women, indigenous population and afro descendants.

Component II. Institutional Capacity. Strengthens the institutional capacity of MNH and EBS to plan, design and supervise rural electrification and water projects. It will finance the following activities: (i) training of personnel in project management, rural electrification, water systems, digital technologies; and implementing the gender and diversity action plan of EBS (ii) specialized technical support for the design, coordination, and supervision of the works and (iii) managing environmental and social considerations of projects.

IDB

The Inter-American Development Bank (IDB) is the main source of financing for sustainable, social, economic and institutional development in Latin America and the Caribbean. The bank will facilitate an energy, water and telecommunications project for the sustainable development of Indigenous peoples in south Suriname in Alalapadu, Apetina, Sipaliwini, Kwamalasamutu, Kawemhakan, Kumakapan, Pelelu Tepoe, Palumeu, Amotopo and Coeroeni.

The project phases include:

1. Information gathering in 2022 and 2023
2. Preparation and planning in 2023 and 2024
3. Project start in 2025.

The assessment phase was conducted in close collaboration with the Ministry of RoS and Ministry NH, as well as the VIDS, TTA as contractor and sub-contractor ACT-Suriname

Amazon Conservation Team Guianas (prior known as Amazon Conservation Team Suriname) was hired as a subcontractor by Trama Tecno Ambiental (TTA) in the information gathering process for supporting the initial engagement strategy in t 10 previously mentioned indigenous villages in South-Suriname. The report prepared by ACT-Guianas under that consultancy assignment served as a key output deliverable for Trama Tecno Ambiental (TTA).

Trama Tecno Ambiental (TTA)
Trama Tecno Ambiental is a global consulting and engineering company with headquarters in Barcelona, Spain. Since its founding in 1986, fully committed to a sustainable energy development, TTA has been providing specialized services in distributed generation through renewable energies, energy management and efficiency, rural electrification, self-generation, integration of renewables in buildings, sustainable architecture, as well as, specialized training, education and technological development related to its activities.

Amazon Conservation Team Guianas (ACT-G)
The Amazon Conservation Team Guianas (ACT-G) is a nonprofit organization that is dedicated to protecting the Amazon rainforest. ACT-Guianas aims to achieve this via partnerships with the local native Indigenous and tribal peoples of Suriname, the traditional inhabitants and users of the rainforest. Respect for, and integration of, their traditional cultural knowledge is crucial for the protection of their land's ecosystems.

3 Objectives

The objective of this Consultancy is to prepare Environmental and Social (E&S) documents required for the preparation of a multiple works operation ("Bio-SWEET") that will strengthen the bio-economy potential for indigenous communities in the Sipaliwini District of Suriname through improvements in energy, water, and telecommunications infrastructure, in accordance with the requirements of the Bank's E&S Policy Framework (ESPF) and its E&S Performance Standards (ESPSs), building upon the Strategic E&S Assessment (SESA) currently in progress for works in **ten** communities of the District.

4 Methodology

The preparation of the ESA and ESMP was undertaken by the consultant using the following approach and methodology:

Literature Review:
A review of existing baseline information and literature material was undertaken. In addition, there was an examination of relevant national policies, strategies, plans and legislation as well as IDB Safeguards Policies, and international guidelines and standards.

Stakeholders Engagements and Community Engagements:
A Stakeholders Engagement analysis was carried out by Ilaco, on behalf of TTA, for the introduction of water, electricity and telecom in 10 Indigenous villages in question in the South of Suriname. This report was positively assessed as part of the literature review and was therefore adopted in its entirety within this report. The analysis was carried to empower stakeholders, especially with the focus on the communities, and drive forward the shared vision of 24/7 access to energy, water, and telecommunication in South Suriname, and empowering the socio-economic wellbeing through the development the bio economy. Its primary goal is to establish a strategic framework that promotes active participation, open communication, and collaboration among community members, local authorities, and relevant stakeholders.

Site Visit: Visits were made to the ten villages.

Preparation of the ESA and ESMP:

The preparation of the ESA and ESMP conducted, following:

- Collation of baseline data on the social and environmental conditions of the general area where the targeted facilities, access to energy, water, and telecommunication in South Suriname, and empowering the socio-economic wellbeing through the development the bio economy, are located along with site specific baseline information;
- Identification of current environmental management systems and practices in rural electrification with renewable energy, potable water, and telecommunications in Suriname;
- Identification and analysis of potential environmental and social impacts; and
- Preparation of the environmental and social management plan including identifying requirements to be complied with and roles and responsibilities.

5 Project description

General objective of the First Individual Investment Operation.

The general objective of the first operation is to promote the socio-economic development of villages in ten Indigenous Peoples villages in the Amazon rural areas of Suriname. These villages are Alalapadu, Apetina, Sipaliwini, Kwamalasamutu, Kawemhakan, Kumakapan, Pelelu Tepoe, Palumeu, Amotopo and Coeroeni. These are small Trio and Wayana villages located in the Coeroeni, and Tapanahony resort within Sipaliwini District.

The specific objectives are to:

(i) provide villages in the Amazon rural areas of Suriname with reliable access to renewable energy-based electricity, potable water supply, and telecommunication systems and

(ii) foster the development of a bio economy in the Amazon rural areas of Suriname with a gender and diversity perspective.

Component I. Infrastructure investments (IDB OC: US$37.25 million; Co-financing: US$3.9 million23).

This component will finance the provision of electricity, water and telecommunications services and their productive use in the Amazon rural areas of Suriname with four subcomponents. Given that the operation is structured as a multiple works' investment loan, which entails the financing of several independent, but technically similar subprojects towards achieving project objectives, a representative sample for Component I of around 50% of the total investment will be defined in order to process and approve the operation.

Subcomponent I.1. Energy systems (US$20 million).

Finances the supply, installation, and commissioning of solar mini-grids, resilient to natural phenomena and including the upgrade of the existing distribution network to provide 24/7 electricity supply in the Amazon rural areas. This subcomponent will also promote the efficient use of electricity in these villages.

Subcomponent I.2. Water systems (US$10.15 million).

Finances the upgrade of the existing water intake, treatment and distribution to provide clean and reliable water supply to the villages in the Amazon rural areas. This component will also promote the efficient use of water in these villages.

Subcomponent I.3. Telecommunications systems (US$1 million).
Finances the upgrade of existing and deployment of new distribution and access telecommunications infrastructure (antennas, towers, cables, routers) to provide reliable telecommunications services in the Amazon rural areas.

Subcomponent I.4. Bio economy development and community awareness (US$10 million).
Finances the implementation of productive and sustainable uses of electricity, water, and telecommunications, focused on bio economy, within the Amazon rural areas. Also, it finances activities to strengthening the beneficiaries' commitment and ownership of the projects and technical training for women and indigenous women and support their participation in the installation and maintenance of the energy systems. The bioeconomic activities will be designed to maximize the benefits to women, indigenous population and afro descendants.

Component II. Institutional Capacity (US$2.75 million).
Strengthens the institutional capacity of MNH and EBS to plan, design and supervise rural electrification and water projects. It will finance the following activities:

(i) training of personnel in project management, rural electrification, water systems, digital technologies; and implementing the gender and diversity action plan of EBS
(ii) specialized technical support for the design, coordination, and supervision of the works and
(iii) managing environmental and social considerations of projects.

6 Legal and Policy Frame work

All of the components that are important for reducing pressures on biodiversity and for enhancing benefits from ecosystem services will require a solid legal basis for modern times and complex problems. Suriname recognizes the need to update or reformulate its biodiversity related legislation, such as the Nature Conservation Act, the Mining Act and other (in)direct related legislation. A key priority is also the adoption of new legislation which has thus far been lacking, such as on water resource management and climate change. This includes the further legislative and policy elaboration of the Environmental Framework Act. In all of the above, collective Rights of the Indigenous Peoples and tribal Peoples will have to be incorporated as soon as the act is approved.

6.1 Policy environment

This paragraph will describe the policy environment of the energy sector in Suriname, with a focus on the electrification situation in rural areas and the barriers currently hampering electrification of rural Suriname.

Relevant National and Sector Strategies and Policies
According to Suriname's draft Energy Policy Plan 2013-2033, the peak energy demand of the country's population is between 150 and 250 Mega Watt (MW). The needs in the energy sector such as access and security, are significant and require a coordinated and systematic approach in order to ensure sustainability. The GoS has prioritized the expansion, provision, and enhancement of basic amenities in both urban and rural areas across the country.

The Medium-Term Development Plan (MOP) for the period 2022-2026 underscores the importance of creating conditions conducive to sustainable development. One of the intended outcomes from this plan is the implementation of programs to reduce CO2 emissions through the utilization of renewable sources for electricity generation. With a steadily growing annual energy demand, governmental actions are needed in order to ensure smooth economic growth within the country. It is therefore the objective of the Government to guarantee the country's electrical energy supply on a short as well as long term basis.

The **Electricity Act** and the **Energy Authority Suriname (EAS)** Act were adopted by the National Assembly in 2016. With this, the first steps were taken in the restructuring and regulation of the electricity supply sector. The Energy Authority Suriname is responsible for regulation, enforcement, information dissemination, and advisory functions.
The Energy Authority Suriname must, at least once every five years, in consultation with the electricity supply sector, prepare an Electricity Sector Plan (ESP), which can be adopted by government decree.

The ESP includes both the:
- Strategic plan, which looks at least 20 years ahead regarding further sustainability of the sector, as well as
- Technical plan, which maps out the needs for capacity expansion in production, transmission, and distribution for a period of 5 years.
- In addition, a Regulatory plan, which ensures that the implementation and oversight of regulation in the sector by the EAS are based on predictable business considerations. Not only technical and financial considerations, but especially environmentally friendly generation, transmission, and distribution systems.

Energie Bedrijven Suriname (EBS) *serves as the leading utility company tasked with energy production and distribution throughout Suriname. Its responsibilities in these areas have expanded in recent years. While the Ministry of Natural Resources previously managed rural electrification through a dedicated division (DEV-Electrification Division), EBS is now transitioning to become a comprehensive energy provider nationwide. The EBS has several departments to address the following:*

- *Electricity Generation: Operates power plants to generate electricity using various sources such as thermal (using fossil fuels like diesel or heavy fuel oil) and hydroelectric power (utilizing the country's rivers and water resources).*
- *Transmission: Manages the transmission of electricity from power generation plants to distribution sub-stations using a network of transmission lines and infrastructure. This involves ensuring the efficient and reliable transfer of electricity over long distances.*
- *Distribution: Responsible for distributing electricity from substations to consumers, including residential, commercial, and industrial customers. This entails maintaining a network of distribution lines, transformers, and other equipment to deliver electricity to end-users.*
- *Customer Service: Supports its customers, including billing, metering, and responding to inquiries or complaints related to electricity supply.*
- *Infrastructure Maintenance: Maintains and upgrades its infrastructure, including power plants, transmission lines, substations, and distribution networks, to ensure the reliability and safety of the electricity supply.*

Overall, EBS plays a crucial role in ensuring the availability, reliability, and accessibility of electricity to the population of Suriname through its activities in energy production and distribution.

The **Environmental Framework act and the project Classification guidelines** form the basis for the required Environmental and Social Impact Assessment (ESIA).
Where national legislation does not sufficiently address the potential damage, reference to international conventions will be guiding.
As of the actual implementation phase, the labor act is guiding, and for ITPs zone, the absence of collective rights diverts the GO to deal with jurisprudent.
The Environmental Framework Act and the Project Classification Guidelines serve as the foundation for conducting the required Environmental and Social Impact Assessment (ESIA) for the project. In cases where national legislation does not adequately address potential environmental or social damage, reference to relevant international conventions will inform decision-making and mitigation measures. During the actual implementation phase, adherence to labor laws governs the project's labor practices. Additionally, for Indigenous and Tribal Peoples (ITPs) zones, where collective rights may be absent, the government addresses any legal matters through jurisprudence and established legal precedents.

The Legislative Framework for the National Biodiversity Action Plan is built on the following acts:

i. The **Nature Conservation Legislation** (1954-Protected Areas designated and the management of those), predominantly keeping both levels' responsibility at the central Government. Although coordination between stakeholders is key in a MUMA (-IUCN category 6) the interpretation is not consistent and thus is the GOS once again in the lead. There is a draft act underway, which acknowledges the importance of inclusion of private lands and ICA (Indigenous designated and Managed lands).
   The challenge is that ITPs have no collective rights nor inclusion in land tenure system. Because this process is ongoing for decades, ITPS have used and managed their ancestral lands by themselves. Organically mapping their territories and managing with community rangers to prevent intrusion of their livelihoods was the aim. Currently about 45 community rangers in central and south Suriname are trained and well equipped to monitor the immediate lands within 5-10 kilometers from their village.
ii. The **Mining and Logging acts** allow the business to encroach on the ITP ancestral lands mainly because of the centralized licensing policies. These are threats to the biodiversity and human settlements. The forest depended community is suffering from the impact of deforestation, degradation and social eruptions due to the quick transformation of human and ecological habitat. Map depicts a larger area which represented the field situation early 2022. Both land use activities result in expansion of the road network, which allows for unregulated intrusion and poaching of the south. With a local corps of rangers alone, given the safety issues, patrolling is not sufficient for ecosystem and biodiversity loss.
iii. The **Environmental Framework act** allows for preventive, mitigation and creative measures to enforce and to ensure that the quest from Suriname to gain economic prosperity for all remain a sustainable process. The authority to monitor and execute is in the making.
iv. **Tourism act** is recently approved in Parliament and provides opportunities for a more coordinated and environmental and social sound development of the industry. Given the opportunities CBT (Community based Tourism) – conducting ESIAs remain important.

<u>Alignment with National and Sector Strategies and Policies</u>

The main objectives of a NAMA (Nationally Appropriate Mitigation Action) are to achieve significant sustainable development and in parallel to mitigate GHG emissions in the interior of Suriname. The NAMA encourages the adoption of renewable energy solutions in the interior with the support of international financers, catalyzing a reduction in GHG emissions and increasing sustainable growth and development.

The mandate for NAMA development is determined by Suriname's key policies, such as the INDC, Suriname's Energy Policy Plan 2013 – 2033 (draft), Medium-Term Development Plan (MOP) for the period 2022-2026.
Suriname's Energy Policy Plan 2013-2033 (draft) provides the basis for NAMA development that will be further determined by the ESP based on the new Electricity Act 2016. The NAMA will build on the strategies set out within the ESP regarding a coherent policy for promoting the development of electricity generation using renewable energy technologies. Notwithstanding, there is need for formulation of a long-term NAMA vision and a clear mandate assigned to a suitable coordinating and/or implementing body. The largest gaps exist in terms of human and institutional capacities. There is, for instance, a limited technical understanding of climate change mitigation and NAMA development at ministry, NGO, and private sector levels. Table 1 gives an overview of the country's key relevant policies, their descriptions and gaps in relation to the NAMA.

Table 1: ***Overview of relevant policies, their descriptions and gaps in relation to the NAMA.***

Policy	Description	Gaps
Intended National Determined Contribution (INDC), 2015	The sectors covered in this INDC are 'Forests' and 'Renewable Energy'. Under the Renewable Energy section, the INDC states that "Through existing efforts and with funding for implementation, Suriname is keen to continue the transition of its energy sector to ensure it stays above 25% renewable by 2025" (p.10)	Regarding the Renewable Energy sector, the INDC does not give a clear strategy nor actions in order to reach the proposed target.
Suriname's Energy Policy Plan 2013 -2033 (Draft)	The plan presents the long-term vision for the energy sector in Suriname and the policy/strategic framework (goals and strategies). The Policy considers goals and strategies that will facilitate access to electricity for all, secure sustainable energy supply using both renewable energy sources and fossil fuels, and explore options for developing the country's indigenous energy sources.	Even though the policy mentions wide-scale development, deployment and use of renewable energy (Goal 3) and provides broadly mentioned strategies and actions to achieve this, it still lacks a clear renewable energy (RE) policy and renewable energy solutions and targets for both on-grid and off-grid production and for the use of renewable energy in rural electrification. In addition, the policy lacks clearly defined roles and responsibilities for the renewable energy sector.

Electricity Act 2016	*Electricity Act 2016* strengthens the institutional and regulatory framework by creating an Energy Authority (EAS), establishing a single-buyer scheme, and instituting cost-recovering tariffs and focalized subsidies. The *Electricity Act* provides guarantees for the energy produced from solar and wind plants connected to the national grid, and is a great step towards incentivizing renewable energy sources in Suriname. The Act prescribes that the EAS regulate all entities carrying out generation, transmission, distribution or supply functions. However, this applies only if these entities are connected to the "landelijk net" i.e. the national electricity grid that is operated by EBS.	The Act lacks a clear and comprehensive section about electrification for the communities in the hinterland of Suriname. The promotion and regulation of off-grid renewable energy for self-consumption in the interior is not incorporated in the *Electricity Act*. Currently, the GoS is in the process of establishing the Energy Authority which is foreseen to be in place by end of 2018.
Electricity Sector Plan	The Electricity Sector Plan (ESP), to be prepared at least every five years, establishes a long-term strategic development plan for the sector and provides guidance for taking investment decisions, defining performance targets, and setting electricity tariffs.	The ESP is still in preparation and is expected to be finalized at the end of 2018.

7 Environmental and Social Baseline

This paragraph provides a description of the environmental and social baseline conditions within the communities of Alalapadu, Apetina, Sipaliwini, Kwamalasamutu, Kawemhakan, Kumakapan, Pelelu Tepoe, Palumeu, Amotopo and Coeroeni.

7.1 Baseline social assessment

The baseline social assessment in relation to energy, water, telecommunications service and electrical appliances was executed as presented below. For this the following characterizations are tackled: Socio-cultural, Household, Belief system, Government structure and Demographics.

Socio-cultural characterization:

Traditional structures

The granman is the paramount chief or head of the tribe. The current Granman of the Wayanas is Ipomadi Pelenapïn and the granman of the Tirió's is Jimmy Ronald Toeroemang who resides in Kwamalasamutu. Below the granman are the captains followed by the Basjas on the village level.

Table 2: Key stakeholders

Villages	Function	Familyname & First Name
Kwamalasamutu	Granman	Toeroenmang, Jimmy
Kwamalasamutu	Head-captain	Shonshonson, Wakoeroeman
Kwamalasamutu	Captain	Moeshe, Menio
Kwamalasamutu	Captain	Puttoena, Sheddida
Kwamalasamutu	Head-basja	Nola, Amessaja
Kwamalasamutu	Basja	Inarew, Shalome
Kwamalasamutu	Head- basja	Koemoe, Oewawa
Kwamalasamutu	Basja	Sinkara, Mikowe
Kwamalasamutu	Basja	Sinkara, Reitia
Kwamalasamutu	Basja	Waachpi, Jakoeta
Amotopo	Head-captain	Ipajadi, Pepo
Amotopo	Captain	Panekke, Paneshi
Amotopo	Head- basja	Kuuruui, Pikoekoe
Amotopo	Basja	Ineshaachpe, Rosianna
Sipaliwini	Captain	Ijapawai, Essikijo
Sipaliwini	Head-captain	Antawa, Essikaja
Sipaliwini	Basja	Ineshaachpe, Simiehpe
Sipaliwini	Basja	Oochpatapo, Kraske
Sipaliwini	Basja	Merekeru, Reki
Sipaliwini	Basja	Shanaide, Idaike
Alalapadu	Captain	Morishi, Janinipuung
Alalapadu	Head- basja	Padoe, Nikolashi
Alalapadu	Basja	Iejoepi, Roekoe
Alalapadu	Basja	Shokopo, Klavin
Alalapadu	Basja	Padoe, Mieke
Alalapadu	Basja	Jitashe, Itaria

Coeroeni	Head-captain	Toehanpe, Akuupashe
Coeroeni	Captain	Toehanpe, Koronu
Coeroeni	Basja	Wono, Sasseke
Coeroeni	Basja	Takajana, Aletashi
Coeroeni	Basja	Sinkara, Ira
Coeroeni	Basja	Tawadi, Regina
Apetina	Basja	Tenopo, Jari, Trg. K.T.
Apetina	Captain	Same, Ikinaidoe
Apetina	Head-captain	Japanaloe, Oeloekoeni
Apetina	Basja	Ikinaidoe, Shitoenka
Apetina	Captain	Mettelli, Ainakadi
Apetina	Basja	Pawkoe, Olokwi
Apetina	Basja	Shadi, Tamussi
Apetina	Basja	Koemaja, Jadiwana
Apetina	Basja	Merenke, Marius
Apetina	Basja	Meliwa, Pessida Walita
Apetina	Chief	Aptuh, Noewahe
Apetina	Captain	Ajamaka, Pantakoe Idimawal
Apetina	Basja	Neni, Emahpe Sela
Apetina	Captain	Mettelli, Evelina Nora Joana
Kawamhakan	Basja	Idiwa, Makiloewa
Kawamhakan	Basja	Itoewaki, Kelista Kwaikoe
Kawamhakan	Basja	Moekoewa, Makidoe
Kawamhakan	Basja	Tajan, Settipan
Kawamhakan	Captain	Palijale, Apoetoe
Kawamhakan	Basja	Alampia, Madijalapoe J.
Kawamhakan	Chief	Pelenapin, Ipomadi Took
Kawamhakan	Head-captain	Pelenapin, Mitioe M.
Kawamhakan	Head- basja	Malikoe, Liejoe
Palumeu	Basja	Ikoewa, Nolina
Palumeu	Head-captain	Padoe, Pishiechpe
Palumeu	Basja	Madena, Tujokuunke
Palumeu	Basja	Madena, Aneshinke
Palumeu	Basja	Malakaita, Sikiwa
Palumeu	Basja	Makainoe, Jakoenoena
Palumeu	Head- basja	Arekepuung, Kajese D.
Pelelu Tepoe	Captain	Nola, Shitipani
Pelelu Tepoe	Basja	Wenaloe, Diter
Pelelu Tepoe	Captain	Saimanie, Shoepipi
Pelelu Tepoe	Basja	Tajawade, Piatoe
Pelelu Tepoe	Basja	Teweme, Pemei
Pelelu Tepoe	Head-captain	Shanaupe, Moshesi Mokuphe
Pelelu Tepoe	Basja	Shokopo, Ikoewenna
Pelelu Tepoe	Head- basja	Shanaupe, Jang
Pelelu Tepoe	Basja	Shokopo, Sabrina Caroline

Pelelu Tepoe	Basja	Kawaidoe, Marcel Asaina
Pelelu Tepoe	Basja	Atoewinali, Kamala
Pelelu Tepoe	Basja	Mapadina, Kererija
Pelelu Tepoe	Basja	Atoewinali, Midijang
Pelelu Tepoe	Basja	Ankarapi, Patowa
Pelelu Tepoe	Basja	Ashiware, Siteisi Jacob
Pelelu Tepoe	Bassia	Alekkawa, Shalome Natase
Pelelu Tepoe	Captain	Ankarapi, Lola
Pelelu Tepoe	Basja	Imeroepeng, Arikoeiwa Loi
Pelelu Tepoe	Basja	Sapa, Madijanneke
Pelelu Tepoe	Basja	Maisani, Dennio
Pelelu Tepoe	Basja	Maisani, Josepi
Kumakapan	Not yet appointed as basja	Anita Ariyana-Baisha

Household characterization

Traditional gender roles.

In the South of Suriname there are traditional gender roles: the men hunt to provide food for their family and the women fetch water, cook and take care of the children. In Sipaliwini, Pelele Tepoe, Palumeu and Kwamalasamutu the men can likely be engaged in illegal wildlife trades.

The indigenous partners have asked ACT-G for income generating projects which led to the creation of several programs including beekeeping (honey and proprolis production) for the men and women, herbal tea farming, tea production, jewelry, pepper farming and ground pepper production for women. The organization Conservation International Suriname (CI) developed a Tuhka project also called brazil nut factory in Alalapadu where both men and women work.

In addition, ACT-G has other initiatives that were organically developed based on local needs and demands. As such the rangers' program was designed to address biodiversity monitoring and surveillance of ancestral territories. The proven concept since 2007, has extended to 8 of the 10 Indigenous villages. Additionally, the ACT ranger teams are striving for recruiting more female colleagues.

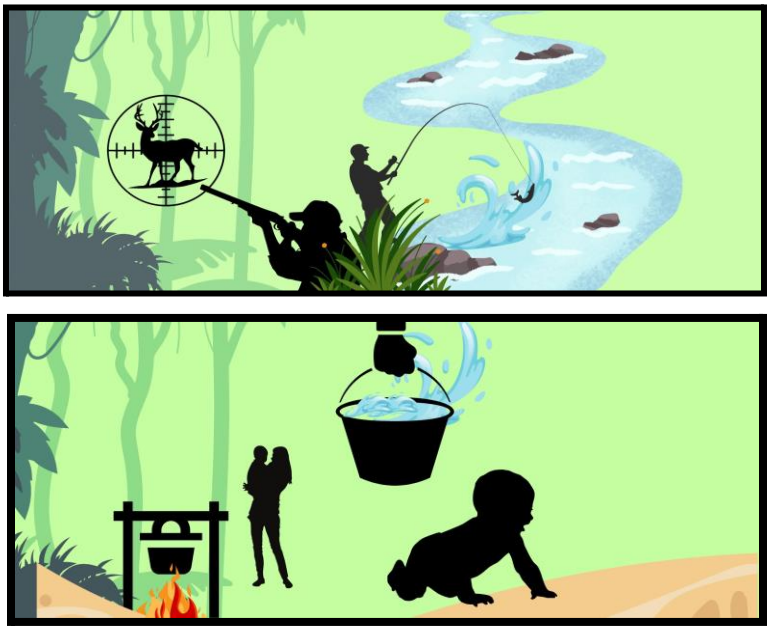

Table 3: ACT-S livelihood projects per location

ACT-S livelihood projects	Location
Stingless beekeepers	Palumeu, Pelelu Tepoe, Coeroeni and Kwamalasamutu
Tea farming and products	Pelelutepoe, Kwamalasamutu and Coeroeni
Jewelry making	Kwamalasamutu, Sipaliwini, Pelelu Tepoe and Apetina.
Ground pepper production	Pelelutepoe and Kwamalasamutu.

Belief systems

All villages are Baptist Christians. Shamanism has eroded over time. Traditional medicinal knowledge was kept to a certain level and through the three clinics in different villages knowledge transfer to the 4th generation of traditional healers was met after starting this initiative

Table 4: Tribe and traditional medicine clinic per location

	Tribe	**Active traditional medicine clinics/shamans**
Alalapadu	Tirió	
Apetina	Wayana	Yes
Sipaliwini	Tirió	
Kwamalasamutu	Mostly Tirió	Yes
Kawamhakan	Wayana	
Kumakapan	Wayana	
Pelelu Tepoe	Mostly Tirió	Yes
Palumeu	Tirió and Wayana	
Amotopo	Tirió	
Coeroeni	Tirió	

Government structures:
The villages have official government workers from the MROS: after the District Commissariats' there are Board Supervisors and Assistant Board Supervisors at the village level. Their official tasks are listed in table 5 and 6

Table 5: Official tasks of the Board Supervisor.

Official tasks of the Board supervisor:
1. Receives assignments and instruction from the District-Secretary and in some cases from the District-Commissioner.
2. Is tasked with inventorying, discussing, and suggesting solutions administratively in their resort.
3. Monitors the construction, repair, and maintenance of secondary and tertiary roads.
4. Monitors the regular maintenance works; cleaning maintenance of roadsides, squares, strips, cemeteries and, waste sites.
5. Checks the operation of regularly maintenance of civil/build/technical activities in consultation with the Technical Staff.
6. Checks, in consultation with the civil engineering department, the work performance of third parties, according to the specific conditions;
7. Conducts research into permit requests for setting up and exploiting industries, businesses, shops, and retail companies.
8. Checks the compliance of permit conditions of industries, businesses, shops, and retail companies.
9. Conducts research before giving advice to the district-secretary and/or district-commissioner.
10. Is present for meetings/'Krutus', with people of the resort and/or villagers to identify/list and give solutions to specific problems.
11. Supervises for optimal waste disposal and cleaning services in their resort.
12. Mediates in simple civil cases.
13. Attends audiences at the District-Commissariat.
14. Prepares for visits to their resort from state official and Policymakers.
15. Takes care of the administrative processing for documents pertaining to their resort.
16. Regularly prepares reports pertaining to social, cultural, economic, and ecological developments in their resort for the District-Commissioner or the District-Secretary.
17. Takes care of the proper functioning of the board service in their resort.
18. Is intimately involved in the general, free, and secret elections in their district/resort.
19. Takes care of order in the resort.
20. Stays on top of managerial developments.
21. Delivers advice/opinions to the District-Commissioner, District-Secretary, and the Adjunct District-Secretary.
22. Conducts all activities in the extension of their function.

Table 6: Official tasks of the Assistant Board Supervisor.

Official tasks of the Assistant Board Supervisor
1. Makes an inventory, discusses or advises on (possible) solution(s) at the administrative level in his/her jurisdiction;
2. Also supervises the construction, repair and maintenance of secondary and tertiary roads and the regular maintenance and/or cleaning of roadsides, strips, squares, general cemeteries, rubbish dumps, etc.;
3. Also checks the implementation and regular maintenance of various Civil, Construction/Technical activities;
4. Also supervises, in collaboration with the Civil Engineering Department, the proper execution of work by third parties and others in accordance with specifications;
5. Co-investigates(s) license applications for setting up and operating industries, companies, companies, retail companies, etc. and also checks compliance with permit conditions of industries, companies, companies, retail companies, etc.;
6. Be closely involved in organizing the general, free and secret elections in the relevant district/administrative district;
7. Participate in field research before issuing an advice to the Board Overseer;
8. Attends meetings/Krutus with resort and/or villagers to make an inventory or possibly propose solutions to various problems and also mediates in simple civil matters;
9. Supervises an optimal waste collection and cleaning service in the relevant resort;
10. Attends co-audiences at the district commissariat;
11. Helps prepare official visits by policy and/or state officials to the district/administrative resort or resort;
12. Is also responsible for the overall administrative processing of documents from the relevant jurisdiction and is also responsible for the overall order and peace in the district/administrative jurisdiction or jurisdiction;
13. Keeps himself regularly informed of developments in the field of public administration;
14. Regularly reports both orally and in writing to the Board Overseer;
15. Carry out all activities related to the position.

Demographics:
In table 7 the population number and household info as gathered during Krutu sessions and from ACT-G's databases.

Table 7: Population and household information per location.

Village	Population and household info
Alalapadu	**150 people, 50 households**
Apetina	**400 people, 76 households.**
Sipaliwini	**179 people, 42 households,**
Kwamalasamutu	**800 people,225 households**
Kawamhakan	**300 people, 76 households,**
Kumakapan (small settlement).	**8 households**
Pelelu Tepoe	**450 people, 72 households**
Palumeu	**300 people, 70 households**
Amotopo	**40 people, 21 households**
Curuni	**70 people, 25 households**

Other socio-cultural observations:
Kawamhakan is the most westernized village, their houses are also in a modern western architectural style and the material used is a combination of wood and stone. The village is financially more well off than the other locations. The parents get monthly child benefits if their children are born in French-Guyana. A lot of villagers tend to move between Suriname and French-Guyana due to better access to goods and services and Education.

With about 800 people Kwamalasamutu is the biggest village. Kumakapan has the least amount of people and can be considered a small settlement. Their captain died 4 years ago. The front of the village is deserted and 6 houses are unhabituated in total. There is a female leader of the settlement that wishes to be appointed as Basja.

7.2 Baseline environmental assessment

Table 8 shows the baseline environmental assessment in relation to energy, water, telecommunicationsservice and electrical appliances.

Table 8: Baseline environmental assessment

Baseline environment assessment				
Village	**Energy and light sources.**	**Water quality and potentialfor mercury contamination due to gold extraction.**	**Telecommunicati onservice**	**Electrical appliances**
Alalapadu	• There is a broken solar panel and broken generator in the village. • They rarely received gas for the generator to work. • They do not use candles or kerosene lamps; they use battery charged headlights and flashlights.	• Their source of drinking water is rainwaterand creek water. They cook their water, but especially children still get sick with diarrhea and vomiting. • They also bathe in the creek with soap. They areaware that the creek water is contaminated with stools and dead fish. • They mentioned that they do not do gold extraction because they donot want to pollute the • waters.	• There is telecom/Wi-Fi for theTuhka nut factory. • There is a radiofor landing purposes. Some people that work have phones but are not able to charge them.	• They do not have radios or many other electrical equipment because there is no electricity in the village. • Old motors are kept in the villagein case they can be repaired

Village	Energy and light sources.	Water quality and potentialfor mercury contamination due to gold extraction.	Telecommunicati onservice	Electrical appliances
Apetina	• A diesel generator is present.They need 2-3 vials of diesel oil per month. • Every 2 months they fetch 6-7 fuel vials at Godo Olo. • They have light from 18.00to 23.00hrs.	• There is a potential for mercury contamination intheir water due to gold extraction practices northof the village. • Rainwater is saved in Duro tanks and only available in the rainy season.In the dry season they use water from the river or creeks and let the sedimentsettle. Some people cook it, some do not. • UNICEF set up a clean and safe water system for the school. It has the potentialfor extension to other households via tap water. There are 6 taps in the village. They bathe in the river or creek.	They have Telesur, 3G.	They use cassava mills, drilling machines, telephones, speakerboxes, freezers, tv's, laptops and rechargeable flashlights and headlights.
Village	**Energy and light sources.**	**Water quality and potentialfor mercury contamination due to gold extraction.**	**Telecommunicati onservice**	**Electrical appliances**
Sipaliwini	• There is a central electricityline with a solar panel, but only for the school, church and Tukusipan. • The village does not have agenerator. • The main roads have solarpanel powered lamps.	• Their drinking water is rainwater collected in a Duro tank and tap water. • They bathe with tap water or in the river. • The river and creek waterare polluted in the rainy season. • The villagers are content with the water they have but would want a better quality of water, i.e. cleanerwater options.	• There is telecom fromACT. • People who own a phone use the WIFI signal provided via ACT. • They say Tareno Media is not operational (Indigenous radio station). • ACT's radio station forcommunication with MZ is broken. • Most people own aphone. • Most men know whatthe internet is. • Half of the women know what the internet is.	Clippers, telephones, televisions, freezers.

Village	Energy and light sources.	Water quality and potentialfor mercury contamination due to gold extraction.	Telecommunicati onservice	Electrical appliances
Kwamalasa-mutu	• There is a generator that runs on diesel. They have 7 barrels of diesel oil for 3 months, but they need at least for 10 or 12 months for the generator and excavator. • Some people don't have electricity at all. • The current electricity is irregular, breaking their current freezer and causingmeat to go bad frequently.	• They have a source of tap water which is springwater. • They currently fetch their drinking water from the river, but also collect rainwater and creek water as drinking water. A Duro tank collects the rainwater. They do not have a means to purify the water. • The women bathe in the river or in the creek. Whenthey are 'feeling lazy', theywill use tap water. The men bathe in the river after hunting.	• There is a tower, but theythink it is owned by tourists. They do not know who owns or maintains it.	• All of the men havephones, 10 of the women have phones. • Some do not haveany electric appliances. Some have a freezer, washing machine,rice cooker, tv, charger, batteriesand flashlights. • There are about 150 freezers in the village.
Village	Energy and light sources.	Water quality and potentialfor mercury contamination due to gold extraction.	Telecommunicati onservice	Electrical appliances
Kawemhakan	• They have a generator. Theyneed 9 vials per month. The government pays for it and they receive it via a boat from Albina. • They have light at night. • They need ice to chill their food; they buy ice in French-Guyana.	• There is potential for mercury contamination of their water due to gold extraction upstream of thevillage. • It is a 30-minute walk to theriver where they fetch water in a bucket. • They have tap water but that is not accessible in the dry season. In the rain season people get seriously ill from thetap water. • Rainwater or cooked river water are their source of drinking water. • "The kids of the village keep drinking unsanitary water anyway and they getreally sick…", Miep Doos (head captain). Better water access is theirmain need.	• They have Digicel and Telesur telecommunicatio ns access. • There is not always reception, especially during lightning storms. • Their radio transmitteris broken. • They say they need internet access to be able to do online banking or to easily access government papers from CBB. Theyounger people are more familiar with theinternet.	They have freezers,but not enough capacity to store alltheir food.

Village	Energy and light sources.	Water quality and potentialfor mercury contamination due to gold extraction.	Telecommunicati onservice	Electrical appliances
Kumakapan	There is a generator, but one generator panel is broken. There are also old electrical panels. Electricity is needed.	• There is potential for mercury contamination of their water due to gold extraction upstream of thevillage. • In the rainy season they can use rainwater as drinking water. • Otherwise, they use river water. They are aware that because of gold prospectingmethods, the water is no good for drinking use, especially when the tide is high. In the dry season theyare forced to drink river water.	Digicel and Telesur havereception there, but because there is no electricity there is no facility to charge phones.	Unknown.
Village	**Energy and light sources.**	**Water quality and potentialfor mercury contamination due to gold extraction.**	**Telecommunicati onservice**	**Electrical appliances**
Pelulu Tepoe	• Primarily they use a Photo Voltaic Solar system. Secondarily they use a diesel generator as backup, but there is not always oil available for the generator. Since they have the solar system, the government stopped sending diesel oil for the generator. • Remarkably, everyone seemsto have a freezer. • They have light at night fromthe PV system. The PV system is not operational 24 hours a day. It is operational from 9/10 o' clock in the morning to 12 o' clock at night. • They would like electricityaccess to their houses.	• Their drinking water is fromthe water crane and Duro tank and the river. • Tepoe has their own water system where strategicallyplaced tap points are placed. • However, now of the Krutu interviews, the water system is not operational, so their main water is from Duro tanks. They let the sediments in the water sink to the bottom by letting it settle for a while, then they put the top water in another bucket to drink or use as is or some people cook it. • They only tend to get sick from river water, not from rainwater or crane water. • They bathe in the river or at the crane.	• Telesur, 3G. In the rainyseason, the connection is not optimal. • They do not have radioreception. • 100% of men have beenon the internet before, 60% of women have been on the internet before.	• They have tv's andcan watch channel 12 (Algemene Televisie Verzorging). • They do have phones and activeinternet connections. • All the men own aphone, 80% of the women own a phone. • They have freezers, televisions, smartphones, music speaker boxes, planers and circular saws.

Village	Energy and light sources.	Water quality and potentialfor mercury contamination due to gold extraction.	Telecommunicati onservice	Electrical appliances
Palumeu	• They have a diesel generatorthat hasn't been used for almost 2 years. After the visit for the survey, two technicians of DEV (Dienst Energie Voorziening)went to fix the generator.	• They use river water and collect rainwater. • METS has a water well forthe tourist lodge. • The water system connectsto the water system of the school, not the rest of the village. Since Covid-19, there has been no water supply for the school. ACT has put Duro tanks with water for general use and sanitary use of the school since November 2022. • They seldom get sick fromrainwater, but if the river water is not cooked right they get diarrhea.	• They have Telesur 3G. • Everybody is familiarwith the internet.	• The men and women own mobilephones.
Village	Energy and light sources.	Water quality and potentialfor mercury contamination due to gold extraction.	Telecommunicati onservice	Electrical appliances
Amotopo	• They have no source ofenergy in the village. • They use campfires as a lightsource at night. • There is no light in their house at night. They use flashlights, but if they don't have batteries, it stays dark. • They keep meat conserved by drying and smoking. They would love to have a fridge with improved energy access.	• They use rainwater or riverwater. (Somebody fetches waterfor the elderly in the village) • They can get sick from theriver water.	• They have Wi-Fi fromACT. • Older villagers do nothave phones and are not familiar with the internet. • Younger people are familiar with WhatsApp. • The captain has a radiotransmitter.	

Village	Energy and light sources.	Water quality and potentialfor mercury contamination due to gold extraction.	Telecommunicationservice	Electrical appliances
Coeroeni	• ACT brought solar panels in2019. • They feel they need a bettersolar system.	• Their drinking water is riverwater and rainwater. • They are not used to cooking water and get sicka lot from the water. • They say a water system needs to come as soon as possible. 2024 is too long ofa wait, “Maybe we won’t be able to make it till’ that time”.	There is Wi-Fi in thevillage.	All the men, also theolder men, own phones.

8 Identification and evaluation of the probable environmental and social risks and impacts of the subprojects

8.1 Results Social assessment: potential impact analysis.

From the KPI's, Key Risk Indicators (KRI's) were extrapolated (figure 1). KRI's are metrics that can evaluate potential risks that could negatively impact the environmental theory of change for IDB's water, solar energy- and telecommunications infrastructure projects on Indigenous land in the South of Suriname.

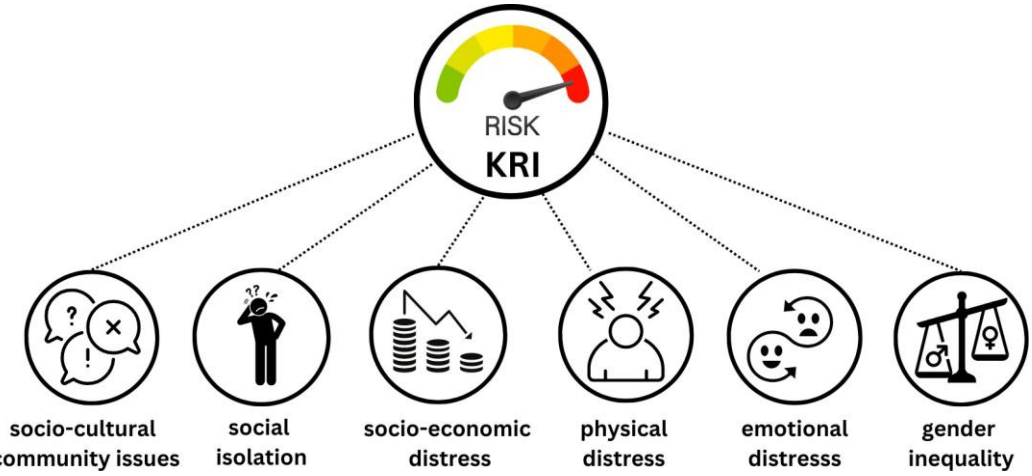

Figure 1: KRI's for the development of water, solar energy- and telecommunications infrastructure on Indigenous land in the South of Suriname.

A risk analysis was carried for these KRI's by:

- Rating the potential negative impact (table 9).
- Rating the likelihood of this negative impact; likelihood is the level of probability that a risk will occur (table 10).
- Evaluating the risk with a risk matrix (risk= potential negative impact x likelihood) (table 11). The potential risks are defined by 4 categories: low risk, moderate risk, substantial risk and high risk. The risk per category is described in table 7, with subsequent plan of actions.

Table 9: Potential negative impact rating.

Potential negative Impact rating	Description	Proceed with:
Very high negative impact	Irreparable damage to social functions, processes or cultural items.	Risk analysis
High negative impact	Significant damage to social functions, processes or cultural items.	Risk analysis.
Medium negative impact	Considerable damage to social functions, processes or cultural items.	Risk analysis.
Low negative impact	No or insignificant damage to social functions, processes or cultural items.	Risk analysis.

Table 10: Likelihood rating.

Likelihood	Description
Very likely	Certain to occur.
Likely	Can occur.
Possible	May occur.
Unlikely	Almost never occurs.

Table 11: Risk matrix

Likelihood- very likely	**Moderate**	**Substantial**	**High**	**High**
likely	**Low**	**Moderate**	**Substantial**	**High**
possible	**Low**	**Moderate**	**Moderate**	**Substantial**
unlikely	**Low**	**Low**	**Low**	**Moderate**
Negative impact	**Low**	**Medium**	**High**	**Very high**

Table 12: Social risk rating and action plan.

Risk rating	Description	Actions
High	Solar energy, water or telecommunications infrastructure activities may cause irreparable direct or indirect damage to Indigenous peoples' socio-cultural community, social participation, socio-economic wellbeing, physical wellbeing, emotional wellbeing or gender equality.	Risk mitigation: The risk can be avoided, reduced to as low as reasonably practical (ALARP), or transferred. The risk is not acceptable. Safeguards should be formulated.
Substantial	Solar energy, water or telecommunications infrastructure activities may cause significant direct or indirect damage to Indigenous peoples' socio-cultural community, social participation, socio-economic wellbeing, physical wellbeing, emotional wellbeing, or gender equality.	Risk mitigation: The risk can be avoided, reduced to as low as reasonably practical (ALARP), transferred or retained. The risk may be acceptable. Safeguards should be formulated.
Moderate	Solar energy, water or telecommunications infrastructure activities may cause considerable direct or indirect damage to Indigenous peoples' socio-cultural community, social participation, socio-economic wellbeing, physical wellbeing, emotional wellbeing or gender equality.	Risk mitigation: The risk can be avoided, reduced to as low as reasonably practical (ALARP), transferred or retained. The risk may be acceptable. Safeguards should be formulated.
Low	Solar energy, water or telecommunications infrastructure activities cause no or insignificant damage to Indigenous peoples' socio-cultural community, social participation, socio-economic wellbeing, physical wellbeing, emotional wellbeing or gender equality.	Further risk reducing measures may not be needed. Guidelines could be formulated.

The following tables show the potential positive impact analysis per location.

Table 13: Positive impact analysis of Alalapadu.

Village: Alalapadu		
Key Performance Indicator	**Potential positive impact rating**	**Comments**
ALALAPADU Socio-cultural community		
1. Optimizing their way of life.	**High**	**Alalapadu currently has no source of electricity or clean water options. Their drinking water consists of creek water, rain water and old bottled water from Paramaribo. It is important for them that their school-going children eat well. Their phone reception is not working well. With a better telecom service, they would have easier access to the city or other villages for emergencies.**
2. Engagement method in place.	**High.**	**The traditional Krutu method serve as the best way to engage with the villagers. Project purposes, planning and goals can be discussed during Krutus.**
3. Cultural heritage and -territories maintained.	**High.**	**Territories for building purposes will be chosen by the villagers themselves. No cultural heritage sites will be disturbed. The women would still want to cook with fire. The men would still want to clean hunted game with fire.**
ALALAPADU Social participation		
4. Easy access to the city for family.	**High**	**Yes, they noted that calling or reaching family more easily is why they would like the project to be executed as soon as possible. They have family members that live in the city, Paramaribo.**
5. Feeling supported.	**High**	**Since they are used to false promises, actual fruition of this project would make them feel very supported.**
6. Willing to accommodate workers to achieve project goals.	**Low**	**Good for training possibilities because they want to learn. However, they do not want to be deceived. "We have a new law, if people come here and lie to us, we will put them back on the plane…"**
7. Willing to be trained for operation and maintenance.	**High**	**They are willing to let people come and train them. They are open to follow up training via videos/ video calls. They insisted on periodic training to help with maintaining the services.**
8. Increased personal development.	**high**	**The villagers are very eager to get training from IDB or others to be able to maintain the services which would help their personal development. They noted that the school teachers do not like to carry water, so that would give them more incentive to come or stay, thus helping the personal development of the children of the village.**
9. Increased sense of equal rights.	**high**	**They would like to be up to date with the news like the rest of the world. They do not want to be "held back and live old-fashioned".**
		They want to participate and have access to services like the rest of the country. They are eager to have access to electricity and clean water and telecom. Especially young villagers would like to see results before they are old.
10. Willing to learn new technologies.	**High**	**They would like the younger villagers to learn about the internet. They are open to being trained online once people have shown them the basics of operation and maintenance. None of this is possible without funds for computers or electronic devices enabling internet connection.**

ALALAPADU **Socio-economic wellbeing**		
11. Willingness to work for operation and maintenance.	**High**	**Men as well as women want to work for the solar, telecom or water projects.**
12. Increased business opportunity.	**Medium**	**With support, there is potential to develop tourism.**
13. Elevation of existing businesses.		**The Tuhka nut factory could be expanded with improved energy and water access. Tourism could be developed more easily which could improve the sales of locally made products.**
14. Use of new tools.	**High**	**The women did mention that if they had the funds, they would buy a rice cooker. They could use this to cook food for tourists quicker in the future.**
ALALAPADU **Physical wellbeing**		
15. Improved medical care.	**High**	**The local nurse could contact the city directly, if needed.** **Better energy access such as light at night could improve their emergency health care.** **Improved water and energy access could improve their medical care.**
16. Improved health and nutrition status.	**High.**	**With improved energy access they could store food longer and improve on their nutrition intake.** **With improved access to better water quality they would have improved physical wellbeing.** **With closer water access the women would not have to fetch water from the creek or river thereby improving their physical health.**
17. Improved food security.	**High.**	**With improved energy access they could buy freezers to save food longer.** **The women would buy a rice cooker for quicker food access if they had the funds.**
18. Improved sense of leisure.	**High.**	**With improved water access, the women would have more time for leisure.** **With the ability to save food in freezers, the men would have to hunt less.**
ALALAPADU **Emotional wellbeing**		
19. Improved sense of safety.	**Low**	**They already feel safe, but light could help with spotting dangerous animals: "Yes because in the dark you can't see everything and snakes and 'jorka fowroe (an owl with red eyes)' are a danger." They think that light at night will probably make these animals appear less frequently.**
20. Less stress.	**High**	**Especially for the women who fetch water.**
ALALAPADU **Gender equality**		
21. More business opportunity for women.	**Medium**	**With the right support and mindfulness of project investors and other organization, the following business opportunities could be created for women:** **● Direct business opportunity:** **The women are willing to work for operation and maintenance of these projects.** **If the women are actively included in gender-environment nexus during project building work and are given compensation for contributing to the waste management and recycling team of building workers or other site workers.** **● Indirect business opportunity:** **Improved energy and water access could potentiate the development of tourism which could lead to more business opportunity for women.**

		They could serve as tour guides, sell their arts and crafts and brazil nuts. Improved energy and water access could lead to investment opportunities in the field of bio economy, such as processing teas or the processing of cinnamon bark into bottled essential oils.
22. Improved physical wellbeing for women.	High	Closer water access will have a high impact on the women that currently fetch water for their families.
23. Men having more time for family or household activities.	Low	The men noted they would have increased sense of leisure.

Table 14: Positive impact analysis of Apetina.

Village: APETINA		
Key Performance Indicator	Potential positive impact rating	Comments
APETINA Socio-cultural community		
1. Optimizing their way of life.	High	Apetina has electricity with a diesel generator and a telecommunications network from Telesur. Via UNICEF they received a clean water system for the school. The rest of the village is still dependent on rain, creek and river water. The villagers tend to get seriously sick from the water with diarrhea or stomach pains, especially from the river water. Not everyone cooks their water before drinking. Their water poses significant health hazards that improvement in their water systems would optimize their life significantly and would solve health issues. Clean water is very important for the villagers. They are not happy with their diesel generator as they have to get vials from Godo Olo and are dependent on the government to receive the vials. They also have to fetch the vials with their boats, through water acceleration areas that could break their boat motors. Solar energy could solve those major issues.
2. Engagement method in place.	High.	The traditional Krutu method serves as the best way to engage with the villagers. Project purposes, planning and goals can be discussed during Krutus.
3. Cultural heritage and -territories maintained.	High.	Territories for building purposes will be chosen by the villagers themselves. Territories that they would not like builders to enter are those far from the village so they are not worried. Those are the cemetery, the school and the spot reserved for a second landing strip. No cultural heritage sites will be disturbed. "We will always keep cooking with fire", - female Krutu participants. The men would still want to play hunted game with fire.
APETINA Social participation		
4. Easy access to the city for family.		N.A. They already have phones and easy access to family.
5. Feeling supported.	High	They strongly agree that they would feel supported. Many false promises were made in the past. The cabinet of the, then president D. Bouterse, send people to Apetina to assess road lighting. But it has not been done up and till now.

6. Willing to accommodate workers to achieve project goals.	Medium	They are willing.
7. Willing to be trained for operation and maintenance.	High	They want to help with building and they are willing to let people come and train them. They are open to follow up training via videos/ video calls.
8. Increased personal development.	high	They would love to help with building work and they would prefer to do all the minor maintenance themselves. They understand it takes time and money to get workers to come to their village.
9. Increased sense of equal rights.		Not answered/ no info.
10. Willing to learn new technologies.	High	Villagers (men and women) are already familiar with the concept of online trainings and already follow several ones. They are open to being trained online once people have shown them the basics of operation and maintenance. The villagers already have laptops available.
APETINA Socio-economic wellbeing		
11. Willingness to work for operation and maintenance.	High	Yes, they would like to be as independent as possible. They want to do minor maintenance themselves.
12. Increased business opportunity.	Medium	With support, there is potential to develop tourism.
13. Elevation of existing businesses.	High	With improved energy and water access they have more potential to develop tourism which could improve the sales of locally made products, such as arts and crafts from woodwork.
14. Use of new tools.	High	They did not mention use of new tools in the Krutus, but with improved energy and water systems they could cook quicker to sell to potential tourists.
APETINA Physical wellbeing		
15. Improved medical care		They have light until 23pm. Improved water access and quality could improve their medical care.
16. Improved health and nutrition status.	High.	With improved water quality and access they would have improved physical wellbeing. With closer water access the women would not have to fetch water from the creek or river.
17. Improved food security.	Medium	They already use electrical appliances to increase food security such as a cassava mill. They have a freezer house that people can use by paying a fee. Improved drinking water and cooking with cleaner water could improve their food quality.
18. Improved sense of leisure.	High.	With improved water access, the women would have more time for leisure.
APETINA Emotional wellbeing		
19. Improved sense of safety.	Low	They already have light from 18.00 to 23.00hrs. Having more light at night could make them feel safer.
20. Less stress.	medium	Especially for the women who fetch water.

APETINA **Gender equality**		
21. More business opportunity for women.	**Medium**	**With the right support and mindfulness of project investors and other organization, the following business opportunities could be created for women:** **● Direct business opportunity:** **The women are willing to work for operation and maintenance of the projects.** **If the women are actively included in gender-environment nexus during project building work and are given compensation for contributing to the waste management and recycling team of building workers or other site workers.** **● Indirect business opportunity:** **Improved energy and water access could potentiate the development of tourism which could lead to more business opportunity for women. They could serve as tour guides, sell their arts and crafts or cook meals.** **Improved energy and water access could lead to investment opportunities in the field of bio economy, such as processing teas or essential oils.**
22. Improved physical wellbeing for women.	**High**	**Closer water access will have a high impact on the women that currently fetch water for their families.**
23. Men having more time for family or household activities.		**N.A.**

Table 15: Positive impact analysis of Sipaliwini.

Village: SIPALIWINI		
Key Performance Indicator	**Potential positive impact rating**	**Comments**
SIPALIWINI **Socio-cultural community**		
1. Optimizing their way of life.	**High**	**Sipaliwini has a solar panel, but only for the school, church and Tukusipan. Most people have no means to chill their food to save for later. They smoke their meat and fish, but it only stays good for a few days.** **The water quality is very important to them. Currently their water gets polluted, mostly during the rainy season.** **Having light at night could improve the way they can respond to medical emergencies, such as giving birth.**
2. Engagement method in place.	**High.**	**The traditional Krutu method serve as the best way to engage with the villagers. Project purposes, planning and goals can be discussed during Krutus.**
3. Cultural heritage and - territories maintained.	**High.**	**Territories for building purposes will be chosen by the villagers themselves.** **Territories, they do not want the outsiders to trespass are the nature reserve and the cemetery.**

SIPALIWINI **Social participation**		
4. Easy access to the city for family.		**N.A. All the men have phones, half the women have phones.**
5. Feeling supported.	**High**	**Yes, they would feel supported. False promises were made in the past by political parties.**
6. Willing to accommodate workers to achieve project goals.	**Medium**	**They are willing.**
7. Willing to be trained for operation and maintenance.	**High**	**Yes, they are willing to learn as much as possible about operation and maintenance. They would also like to get paid for it. They are open to be trained online as well.**
8. Increased personal development.	**high**	**They are eager to learn new things and say they work hard so they can have a better future for their children. New opportunities for development can occur during training for operation and maintenance of the services. New opportunities for personal development are also there with freed up time with less physical manual labor, that is necessary to carry water and to hunt for fresh food, instead of using frozen foods.**
9. Increased sense of equal rights.		**Not answered/ no info.**
10. Willing to learn new technologies.	**High**	**They are open to online trainings.**
SIPALIWINI **Socio-economic wellbeing**		
11. Willingness to work for operation and maintenance.	**High**	**Everyone (men and women) indicated a willingness.**
12. Increased business opportunity.	**Medium**	**With support, there is potential to develop tourism.**
13. Elevation of existing businesses.	**High**	**With improved energy and water access they have more potential to develop tourism which could improve the sales of locally made products, such as arts and crafts from woodwork.**
14. Use of new tools.	**High**	**They did not mention use of new tools in the Krutus, but with improved energy and water systems they could cook quicker to sell to potential tourists.**
SIPALIWINI **Physical wellbeing**		
15. Improved medical care		**There is no telecom (phone reception) available in Sipaliwini. They have to go to the clinic or Medical mission (MZ). If MZ communicates with Paramaribo they use the ACT wifi system. With improved telecommunications they could more easily reach MZ for emergencies. The women say that with the possibility of light at night could improve the way they respond to medical emergencies such as with giving birth. Improved water and energy access could improve their medical care.**
16. Improved health and nutrition status.	**High.**	**With improved water quality and access they would have improved physical wellbeing.** **With energy access to more households they could have improved nutrition, as they could save their foods instead of smoking it to preserve for a few days.**
17. Improved food security.	**High**	**Cleaner water and more energy access will enable them to buy more freezers to save food.**

18. Improved sense of leisure.	Medium	There is already tap water available in the village. The women used to spend about 5 hours to fetch and cook water per day. The men might hunt or fish less if there was more food security (food chilling options per household).
SIPALIWINI Emotional wellbeing		
19. Improved sense of safety.	Medium	More light at night could help them prevent accidents.
20. Less stress.	Medium	Especially regarding their water quality and related health issues.
SIPALIWINI Gender equality		
21. More business opportunity for women.	Medium	With the right support and mindfulness of project investors and other organization, the following business opportunities could be created for women: ● Direct business opportunity: The women are willing to work for operation and maintenance of the projects. If the women are actively included in gender-environment nexus during project building work and are given compensation for contributing to the waste management and recycling team of building workers or other site workers. ● Indirect business opportunity: Improved energy and water access could potentiate the development of tourism which could lead to more business opportunity for women. They could serve as tour guides, sell their arts and crafts or cook meals. Improved energy and water access could lead to investment opportunities in the field of bio economy, such as processing teas or the processing of essential oils.
22. Improved physical wellbeing for women.	Medium	The women already have improved physical wellbeing due to tap water. Improving their water quality could improve their health.
23. Men having more time for family or household activities.	Low	N.A.

Table 16: Positive impact analysis of Kwamalasamutu.

Village: KWAMALASAMUTU		
Key Performance Indicator	Potential positive impact rating	Comments
KWAMALASAMUTU Socio-cultural community		
1. Optimizing their way of life.	High	They already have a generator and freezers in the village, but it's not working as regularly as they would like. Cooking when they need to is important to them, especially so that their school-going children can eat well. There is not always enough water available 24/7. Electricity is also dependent on their availability of diesel oil, which they receive from the government. "…the young people need to have access to the rest of the world. "Our future needs to become better. " Male Krutu participant, Kwamalasamutu.
2. Engagement method in place.	High.	The traditional Krutu method serve as the best way to engage with the villagers. Project purposes, planning and goals can be discussed during Krutus.

3. Cultural heritage and - territories maintained.	High.	Territories for building purposes will be chosen by the villagers themselves.
KWAMALASAMUTU Social participation		
4. Easy access to the city for family.		N.A. They already have phones and access to family via ACT's wifi/telecom.
5. Feeling supported.	High	Yes, they would feel supported. False promises were made in the past by political parties.
6. Willing to accommodate workers to achieve project goals.	Medium	They are willing.
7. Willing to be trained for operation and maintenance.	High	Yes, they are willing to learn as much as possible about operation and maintenance. They would also like to get paid for it. Online trainings would be more difficult because the majority of the Krutu participants did not know what a computer is and have not been on the internet.
8. Increased personal development.	high	They would like to learn.
9. Increased sense of equal rights.		The questions were hard to translate/answer, but the men did say the following: "the young people need to have access to the rest of the world. "Our future needs to become better. "
10. Willing to learn new technologies.	High	All the men and the younger women are interested to learn about the internet so that they can teach their children. They have heard of 'faceboekoe' (facebook). The men are open to online training, the women are neutral.
KWAMALASAMUTU Socio-economic wellbeing		
11. Willingness to work for operation and maintenance.	Medium	They are willing to help with building objectives, but with the help of modern machines like ATV's. "We don't want to carry heavy items ourselves. " They want to work for operation and maintenance if they get paid for it.
12. Increased business opportunity.	Medium	With support, there is potential to develop tourism.
13. Elevation of existing businesses.		Tourism could also be expanded which can improve sales of their locally made products such as honey, tea and traditional medicine.
14. Use of new tools.	High	The men say that with 24/7 electricity the men would buy a circular saw and a planer to make planks all day. We want to work so we can support our kids. "We want to learn more, we want to know more." They did not mention use of new tools in the Krutus, but with improved energy and water systems they could cook quicker to sell food to potential tourists.
KWAMALASAMUTU Physical wellbeing		
15. Improved medical care	High	With improved water and energy access could improve their response to emergency medical care.
16. Improved health and nutrition status.	High.	With improved water quality and access they would have improved physical wellbeing. With energy access to more households they could have improved nutrition, as they could save their foods instead of smoking it to preserve for a few days. "It is important that there is meat for children that go to school. The way it is now we often have to throw away meat that has gone bad." Female Krutu participant, Kwamalasamutu. With closer water access the women would not have to fetch water from the creek or river.

17. Improved food security.	High	Cleaner water and more energy access will enable them to buy more freezers to save food.
18. Improved sense of leisure.	High	The women would like a service where they do not have to go back and forth to fetch water and they would like a water reserve, as there is no water from 6pm onwards. In general men and women would like entertainment on tv or radio, mainly to be able to hear the news.
KWAMALASAMUTU Emotional wellbeing		
19. Improved sense of safety.	Medium	More light at night could help them prevent accidents.
20. Less stress.	Medium	Especially regarding their water quality and related health issues.
KWAMALASAMUTU Gender equality		
21. More business opportunity for women.	Low	With the right support and mindfulness of project investors and other organization, the following business opportunities could be created for women: • Direct business opportunity: The women are willing to work for operation and maintenance of the projects. If the women are actively included in gender-environment nexus during project building work and are given compensation for contributing to the waste management and recycling team of building workers or other site workers. • Indirect business opportunity: Improved energy and water access could potentiate the development of tourism which could lead to more business opportunity for women. They could serve as tour guides, sell their arts and crafts, honey and tea products or cook meals. Improved energy and water access could lead to investment opportunities in the field of bio economy, such as the processing of other kinds of teas or the processing of cinnamon bark into bottled essential oils.
22. Improved physical wellbeing for women.	Low	The women already have improved physical wellbeing due to tap water. Improving their water quality could improve their health.
23. Men having more time for family or household activities.	Low	N.A.

Table 17: Positive impact analysis of Kawamhakan.

Village: KAWAMHAKAN		
Key Performance Indicator	Potential positive impact rating	Comments
KAWAMHAKAN Socio-cultural community		
1. Optimizing their way of life.	High	They have a generator and light at night. They also have freezers but not enough capacity to store their food. Their drinking water is rainwater and river water and can cause illness. They also have tap water but it tends to get polluted in the rain season. Especially their water needs would be optimized.
2. Engagement method in place.	High.	The traditional Krutu method serve as the best way to engage with the villagers. Project purposes, planning and goals can be discussed during Krutus.
3. Cultural heritage and - territories maintained.	High.	Territories for building purposes will be chosen by the villagers themselves.

KAWAMHAKAN **Social participation**		
4. Easy access to the city for family.		**N.A. They have phones and access to family via Digicel and Telesur.**
5. Feeling supported.	**High**	**Yes, they would feel very supported. A lot of false promises have been made in the past.**
6. Willing to accommodate workers to achieve project goals.	**Medium**	**They are willing.**
7. Willing to be trained for operation and maintenance.	**High**	**Yes, they are willing to learn as much as possible about operation and maintenance. They are willing to help with building objectives, but if outsiders would get paid for it, they would also like to get paid.**
8. Increased personal development.	**high**	**There are villagers that actively want to help with work on the solar panels (see capacity gap analysis).**
9. Increased sense of equal rights.	**High**	**Yes, they want the same services as other people.** **They do not want to have to work so hard for light and water. "We would like it to be a given, just like people in the city."**
10. Willing to learn new technologies.	**High**	**They are not willing to be trained online for project objectives. They would like trainers to come to their village directly.** **However, they villagers did note that they want to be able to do online banking via the internet.**
KAWAMHAKAN **Socio-economic wellbeing**		
11. Willingness to work for operation and maintenance.	**High**	**Yes, they want to work and learn. They want to get paid for it.**
12. Increased business opportunity.	**Medium**	**There is an opportunity to develop tourism with the right support. The men said they would want to further develop in tourism by selling souvenirs to tourists or give tours. The women would like to sell and cook food for tourists.**
13. Elevation of existing businesses.		**With improved water access they could develop tourism which could improve the sales of locally made arts and crafts products. They could also cook quicker and more efficiently with quicker clean water access to sell food to tourists.**
14. Use of new tools.	**High**	**They did not mention use of new tools in the Krutus, but with improved water systems they could cook quicker and more efficiently to sell food to potential tourists.**
KAWAMHAKAN **Physical wellbeing**		
15. Improved medical care.	**High**	**They already have the ability to charter an airplane to the city hospitals by calling the clinic by phone. They have light at night.** **Improved water access could improve their medical care.**
16. Improved health and nutrition status.	**High.**	**With improved water quality and access they would have improved physical wellbeing.** **With closer water access the women would not have to fetch water from the creek or river.**
17. Improved food security.	**High**	**Cleaner water could improve their food quality and food safety.**
18. Improved sense of leisure.	**High**	**The women say they would have an improved sense of leisure.**
KAWAMHAKAN **Emotional wellbeing**		
19. Improved sense of safety.		**N.A.** **They already feel safe at night, also when the lights are off.**

20. Less stress.	Medium	The women say they would have less stress and be more peaceful if they did not have to fetch so much water.
KAWAMHAKAN Gender equality		
21. More business opportunity for women.	High	With better water quality, tourists are more likely to visit. The women seem able and willing to find new business opportunity such as cooking and selling food to potential tourists.
22. Improved physical wellbeing for women.	High	Improved water access and quality is very important for the Kawamhakan women as they fetch all the water for their family.
23. Men having more time for family or household activities.	Medium	Indirect impact. Yes, the women noted that with more food chilling capacity and food safety, the men would hunt less and have more time for their family.

Table 18: Positive impact analysis of Kumakapan.

Village: KUMAKAPAN		
Key Performance Indicator	Potential positive impact rating	Comments
KUMAKAPAN Socio-cultural community		
1. Optimizing their way of life.	High	Kumakapan is a very small settlement. The younger people go to school in French-Guyana. The older people that live there daily really need electricity: an older man has no electricity in his house. "There have been snakes in the camp twice; they do have battery powered lamps, but the situation at night is dangerous." They also need electricity for proper saving of meat. They do not have adequate drinking water. Their water is most likely contaminated with mercury but in the dry season they have no other drinking water options. The potential for electricity and clean water could solve major issues they are dealing with.
2. Engagement method in place.		No info.
3. Cultural heritage and -territories maintained.	Medium	It has been made clear that they have cultural artifacts in the ground that need to be considered.
KUMAKAPAN Social participation		
4. Easy access to the city for family.		N.A. There is reception but no electricity to charge phones .
5. Feeling supported.		No info.
6. Willing to accommodate workers to achieve project goals.		No info.
7. Willing to be trained for operation and maintenance.		No info.
8. Increased personal development.		No info.
9. Increased sense of equal rights.		No info.

10. Willing to learn new technologies.		No info.
KUMAKAPAN Socio-economic wellbeing		
11. Willingness to work for operation and maintenance.		No info.
12. Increased business opportunity.	Medium	There in an opportunity to develop tourism with the right support. There is archeological research opportunity.
13. Elevation of existing businesses.		There is one store in the settlement. With improved energy, water and telecom access Kumakapan could become the ideal pit stop for tourists and travelers to buy refreshments.
14. Use of new tools.	High	They did not mention use of new tools, but with improved energy and water systems they could cook quicker to sell food to potential tourists or other travelers.
KUMAKAPAN Physical wellbeing		
15. Improved medical care	High	Currently they have to go to Kawamhakan for medical emergencies. They also do not have charged phones to be able to reach medical help quickly in emergency cases.
16. Improved health and nutrition status.	High.	Yes, they noted they need electricity for better food security and better-quality drinking water as their river waters contaminated due to gold extraction methods and floods.
17. Improved food security.	High	Energy access would highly improve their food security.
18. Improved sense of leisure.	Medium	Not answered.
KUMAKAPAN Emotional wellbeing		
19. Improved sense of safety.	High	They currently do not feel safe at night. Because there is no light at night snakes are able to enter the camp and their houses.
20. Less stress.		Not answered.
KUMAKAPAN Gender equality		
21. More business opportunity for women.	Medium	With improved energy and water access, tourism could be developed in this settlement. It used to be a stopping area for travelers and can be redeveloped as a stopping area for tourists where women could make food and drinks as refreshments. Additionally, there is an opportunity to showcase their cultural artefacts to tourists.
22. Improved physical wellbeing for women.	High	Not answered.
23. Men having more time for family or household activities.	medium	Not answered. But likely low, the children of the village are not present on a daily basis.

Table 19: Positive impact analysis of Pelelu Tepoe.

Village: PELELU TEPOE		
Key Performance Indicator	Potential positive impact rating	Comments
PELELU TEPOE Socio-cultural community		

1. Optimizing their way of life.	High	They already have a solar panel, backup generator, a water crane and telecom in the village. However, their crane/tap water is not currently working properly therefore they still are dependent on river water or rain water. The women say their arms hurt from carrying water from the river. People tend to get ill with diarrhea from the river water. They let the sediment of the water settle, but they do not always cook it before drinking. They would also like to have the solar system expanded so that every household has electricity.
2. Engagement method in place.	High.	The traditional Krutu method serve as the best way to engage with the villagers. Project purposes, planning and goals can be discussed during Krutus.
3. Cultural heritage and - territories maintained.	High.	Territories for building purposes will be chosen by the villagers themselves. Even though they already have a solar system, they still use wood to cook food.
PELELU TEPOE Social participation		
4. Easy access to the city for family.		N.A. They have phones and access to family via Telesur telecommunications connection.
5. Feeling supported.	High	Yes, they would feel very supported. They are especially looking forward to the improvement of their water system. False promises were made a long time ago, but ACT-S has helped them in the meantime.
6. Willing to accommodate workers to achieve project goals.	Medium	They are willing.
7. Willing to be trained for operation and maintenance.	High	Small maintenance they would like to do themselves and get paid for it.
8. Increased personal development.	high	Both the men and women would like to help and work with the potential of project activities. They said if they had even longer energy access, they could be even more productive.
9. Increased sense of equal rights.		N.A. They said they already feel a sense of equal rights as they already have telecom and solar panels.
10. Willing to learn new technologies.	High	They are not willing to be trained online for project objectives. They would like trainers to come to their village directly. They are not open to online training. They are willing to learn new technologies.
PELELU TEPOE Socio-economic wellbeing		
11. Willingness to work for operation and maintenance.	High	Yes, they are willing.
12. Increased business opportunity.	Medium	They are willing to explore the potential of tourism development.
13. Elevation of existing businesses.		With improved energy access they could expand their honey, tea and dried pepper production. Tourism could also be expanded which can improve sales of their locally made products such as ground pepper, honey, tea and traditional medicine.
14. Use of new tools.	High	They did not mention use of new tools in the Krutus, but with improved energy and water systems they could cook quicker to sell food to potential tourists.
PELELU TEPOE Physical wellbeing		

15. Improved medical care.	High	They have light at night. With improved water access and quality their medical care could improve.
16. Improved health and nutrition status.	High.	With improved water quality and access they would have improved physical wellbeing. With closer water access the women would not have to fetch water from the creek or river.
17. Improved food security.	High	Cleaner water could improve their food quality and food safety.
18. Improved sense of leisure.	High	The women say they would have an improved sense of leisure. Their arms hurt from fetching water from the river.
PELELU TEPOE Emotional wellbeing		
19. Improved sense of safety.		N.A. They have light at night and they say it helps them feel safer.
20. Less stress.	Medium	The women say they would have less stress and be more peaceful if they did not have to fetch so much water.
PELELU TEPOE Gender equality		
21. More business opportunity for women.	Medium	Medium. In the ACT ranger program, women are included in their waste management and recycling activities. With the right support and mindfulness of project investors and other organization, the following business opportunities could be created for women: ● Direct business opportunity: The women are willing to work for operation and maintenance of the projects. If the women are actively included in gender-environment nexus during project building work and are given compensation for contributing to the waste management and recycling team of building workers or other site workers. ● Indirect business opportunity: Improved energy and water access could potentiate the development of tourism which could lead to more business opportunity for women. They could serve as tour guides, sell their arts and crafts, honey-, pepper- and tea products or cook meals. Improved energy and water access could lead to investment opportunities in the field of bio economy, such as processing of other kinds of teas or the processing of cinnamon bark into bottled essential oils.
22. Improved physical wellbeing for women.	High	They have water tap system but it is not operational. The women have to fetch water and they say their arms hurt.
23. Men having more time for family or household activities.	medium	They already have energy access but they say that with even more energy access they could be even more productive. The women say that with their improved energy access, the men are able to help more with household and wicker work.

Table 20: Positive impact analysis of Palumeu.

Village: PALUMEU		
Key Performance Indicator	Potential positive impact rating	Comments
PALUMEU Socio-cultural community		

1. Optimizing their way of life.	High	They have a diesel generator that has not worked for 2 years. Their generator might have already been fixed after our field visit by outside expertise. They use river and rainwater as their drinking water. They do have telecom service. ACT has helped with watertanks which helps the women especially. They say they have had more time to relax since. Improving their access and quality of water even further would solve major issues they are dealing with.
2. Engagement method in place.	High.	The traditional Krutu method serve as the best way to engage with the villagers. Project purposes, planning and goals can be discussed during Krutus.
3. Cultural heritage and - territories maintained.	High.	Territories for building purposes will be chosen by the villagers themselves.
PALUMEU Social participation		
4. Easy access to the city for family.		N.A. They already have phones and access to family via Telesur telecommunications connection.
5. Feeling supported.	High	Yes, they would feel more supported. False promises were made by the government.
6. Willing to accommodate workers to achieve project goals.	Medium	They are willing.
7. Willing to be trained for operation and maintenance.	High	Small maintenance they would like to do themselves and get paid for it.
8. Increased personal development.	high	Both the men and women would like to help and work with the potential of project activities. They said if they had even longer energy access, they could be even more productive.
9. Increased sense of equal rights.		Question was hard to answer.
10. Willing to learn new technologies.	High	Everybody is interested in learning new technologies. They are not open to online training.
PALUMEU Socio-economic wellbeing		
11. Willingness to work for operation and maintenance.	High	Yes, they are willing.
12. Increased business opportunity.	Medium	They are open to explore the redevelopment of tourism in their village.
13. Elevation of existing businesses.	Medium	They already had an existing framework of tourism before covid-19. With improved energy and water access they could have more opportunities for redevelopment of their tourist attractions. That way they could also make more sales for their locally produced products such as honey from stingless bees.
14. Use of new tools.	High	They did not mention use of new tools in the Krutus, but with improved energy and water systems they could cook quicker to sell food to potential tourists.
PALUMEU Physical wellbeing		
15. Improved medical care.	High	Electricity and light at night could help them respond to medical emergencies more quickly.

16. Improved health and nutrition status.	High	With improved water quality and access they would have improved physical wellbeing. With closer water access the women would not have to fetch water from the creek or river.
17. Improved food security.	High	Cleaner water could improve their food quality and food safety.
18. Improved sense of leisure.	Medium	The women say they already have an improved sense of leisure with the Duro tanks from ACT. More water infrastructure could further improve this.
PALUMEU Emotional wellbeing		
19. Improved sense of safety.		N.A. They already feel safe at night, also when the lights are off.
20. Less stress.	High	The women are already happy with the Duro tanks provided by ACT. This leads to less work for carrying. A water system with cranes to the village would improve their stress levels even further.
PALUMEU Gender equality		
21. More business opportunity for women.	Medium	With the right support and mindfulness of project investors and other organization, the following business opportunities could be created for women: ● Direct business opportunity: The women are willing to work for operation and maintenance of the projects. If the women are actively included in gender-environment nexus during project building work and are given compensation for contributing to the waste management and recycling team of building workers or other site workers. ● Indirect business opportunity: Improved energy and water access could potentiate the development of tourism which could lead to more business opportunity for women. They could serve as tour guides, sell their arts and crafts, honey products or cook meals. Improved energy and water access could lead to investment opportunities in the field of bio economy, such as processing teas or the processing of cinnamon bark into bottled essential oils.
22. Improved physical wellbeing for women.	High	Easier clean water access to the rest of the village could significantly improve their wellbeing.
23. Men having more time for family or household activities.	Medium	The women say that the men can help with chores at night if they had light.

Table 21:Positive impact analysis of Amotopo.

Village: AMOTOPO		
Key Performance Indicator	Potential positive impact rating	Comments
AMOTOPO Socio-cultural community		
1. Optimizing their way of life.	High	They have no source of energy in the village. They use river and rain water. They do have telecom access via ACT. Their life would be significantly optimized with improved energy and clean water access.
2. Engagement method in place.	High.	The traditional Krutu method serve as the best way to engage with the villagers. Project purposes, planning and goals can be discussed during Krutus.

3. Cultural heritage and - territories maintained.	High.	-Territories for building purposes will be chosen by the villagers themselves.
AMOTOPO Social participation		
4. Easy access to the city for family.	High	Not everyone owns phones and there is no energy access to charge the phones. They would want to call family members in the city to see how they are doing.
5. Feeling supported.	High	Yes, they would feel very supported. False promises were made by the government and political parties.
6. Willing to accommodate workers to achieve project goals.	High	They are willing. The men said they are willing to build a house specifically for the purposes of accommodating project workers.
7. Willing to be trained for operation and maintenance.	High	They would like to be trained for small maintenance, yes.
8. Increased personal development.	high	They would like the younger people of the village to learn more.
9. Increased sense of equal rights.	High	Yes, they strongly agree that they would feel an increased sense of equal rights with better access to energy and water.
10. Willing to learn new technologies.	High	They would like the younger people of the village to learn new technologies, the grandchildren of the Krutu participants. They are not open to online training.
AMOTOPO Socio-economic wellbeing		
11. Willingness to work for operation and maintenance.	High	Yes, they are willing.
12. Increased business opportunity.	Medium	Improved energy and water access could improve their tourism development.
13. Elevation of existing businesses.	High	They used to sell locally made products to tourists, improved energy and water access could improve this business opportunity.
14. Use of new tools.	High	They did not mention use of new tools in the Krutus, but with improved energy and water systems they could cook quicker to sell food to potential tourists.
AMOTOPO Physical wellbeing		
15. Improved medical care.	Medium	Better energy access such as light at night and cleaner water could improve their response to emergency medical care.
16. Improved health and nutrition status.	High.	With energy access they could buy freezers. With improved water quality and access they would have improved physical wellbeing. With closer water access the women would not have to fetch water from the creek or river.
17. Improved food security.	High	Cleaner water could improve their food quality and food safety. Energy access could help them save food longer.
18. Improved sense of leisure.	High	Mainly applicable for the women; they would not have to fetch water.
AMOTOPO Emotional wellbeing		
19. Improved sense of safety.	High	Yes, they would feel safer with light at night because there are dangerous snakes and frogs in the village.

20. Less stress.	High	With the potential business opportunities in tourism with improved energy and water access, they could have less overall stress. Especially the women would have less stress fetching water with improved water access. The men say they would go out hunting less.
AMOTOPO Gender equality		
21. More business opportunity for women.	Medium	With the right support and mindfulness of project investors and other organization, the following business opportunities could be created for women: ● Direct business opportunity: The women are willing to work for operation and maintenance of the projects. If the women are actively included in gender-environment nexus during project building work and are given compensation for contributing to the waste management and recycling team of building workers or other site workers. ● Indirect business opportunity: Improved energy and water access could potentiate the development of tourism which could lead to more business opportunity for women. They could serve as tour guides, sell their arts and crafts, local tea and honey products or cook meals. Improved energy and water access could lead to investment opportunities in the field of bio economy such as the processing of teas or processing cinnamon bark into bottled essential oils.
22. Improved physical wellbeing for women.	High	Easier clean water access to the rest of the village could significantly improve their wellbeing.
23. Men having more time for family or household activities.		Unknown.

Table 22: Positive impact analysis of Coeroeni.

Village: COEROENI		
Key Performance Indicator	Potential positive impact rating	Comments
COEROENI Socio-cultural community		
1. Optimizing their way of life.	High	Their most important need is a water system. They say they want it as soon as possible. They collect rainwater and river water and tend to get sick if they don't cook their water.
2. Engagement method in place.	High.	The traditional Krutu method serve as the best way to engage with the villagers. Project purposes, planning and goals can be discussed during Krutus.
3. Cultural heritage and -territories maintained.	High.	Territories for building purposes will be chosen by the villagers themselves.
COEROENI Social participation		
4. Easy access to the city for family.		N.A. All the male Krutu participants already own phones and they have solar panel electricity available in the village.
5. Feeling supported.	High	Yes, they would feel very supported. They are happy with the potential of the project. False promises were made by the government and political parties.

6. Willing to accommodate workers to achieve project goals.	Medium.	They are willing.
7. Willing to be trained for operation and maintenance.	High	Yes, they are willing.
8. Increased personal development.	high	All the men said they are willing to learn about being a ranger. Some men noted their names for helping with solar panels and telecom construction and operation (see capacity gap analysis).
9. Increased sense of equal rights.	High	Yes, they think that especially their great grandchildren who go to the city often will feel a sense of equal rights with improved basic needs.
10. Willing to learn new technologies.	Medium	They are willing to learn new technologies. They feel neutral about online trainings.
COEROENI Socio-economic wellbeing		
11. Willingness to work for operation and maintenance.	High	Yes, they are willing (see capacity gap analysis).
12. Increased business opportunity.	Medium	Improved energy and water access could improve their tourism development which they are interested to explore. Tourism could lead to sales of locally made products.
13. Elevation of existing businesses.	high	With improved energy access they could expand their honey and tea production. Tourism could also be expanded which can improve sales of their locally made products such as honey and tea.
14. Use of new tools.	High	They did not mention use of new tools in the Krutus, but with improved energy and water systems they could cook quicker to sell food to potential tourists.
COEROENI Physical wellbeing		
15. Improved medical care.	High	They contact a clinic with a two-way radio signal to the city. Better energy access such as light at night could improve their response to medical emergencies.
16. Improved health and nutrition status.	High.	They would like to have fridges and better solar panel systems to store their food and drinks. They currently smoke and salt their food and they do not find it tasty and still get sick from the food. With better water access they would get less diarrhea.
17. Improved food security.	High	They say they need fridges to store food.
18. Improved sense of leisure.	High	The women of Coeroeni were not interviewed due to a lack of time. The men would want to listen to the radio and especially the elderly men would like a tv.
COEROENI Emotional wellbeing		
19. Improved sense of safety.	High	Yes, they would definitely feel safer. -he men come home late from hunting and would like to see better with light. There are snakes present in the village sometimes.
20. Less stress.	High	They say that the potential of easier access to clean water would make their lives easier.

COEROENI Gender equality		
21. More business opportunity for women.	Medium	With the right support and mindfulness of project investors and other organization, the following business opportunities could be created for women: ● Direct business opportunity: The women are willing to work for operation and maintenance of the projects. If the women are actively included in gender-environment nexus during project building work and are given compensation for contributing to the waste management and recycling team of building workers or other site workers. ● Indirect business opportunity: Improved energy and water access could potentiate the development of tourism which could lead to more business opportunity for women. They could serve as tour guides, sell their arts and crafts, local tea and honey products or cook meals. Improved energy and water access could lead to investment opportunities in the field of bio economy, such as the processing of cinnamon bark into bottled essential oils.
22. Improved physical wellbeing for women.		No information. Women were not interviewed. But likely.
23. Men having more time for family or household activities.		No info.

8.2 Results Social assessment: risk analysis.

The following tables show the risk analysis per location.

Table 23: Risk analysis of Alalapadu.

Village: Alalapadu	Risk analysis			
Key Risk indicators	Potential negative impact rating.	Likelihood.	Potential risk rating.	Comments.
ALALAPADU Socio-cultural community issues				
1. Indecision about community ownership models.	Low	Possible	Moderate	If they do not decide on an ownership model or plan as a community, project goals could be slowed down and conflict could occur in the community. They already use a community ownership model by gathering money to buy diesel oil for the generator. However, they do need some more gatherings to decide on their specific payment model. Some say that the stronger ones should pay for it, others say that everyone who uses it should pay for it and that usage should be measured per household, just like in the city.
2. Temporary displacement due to project building activities.	Low	Unlikely	Low	Is unlikely to occur.
ALALAPADU Social isolation				
3. Unequal distribution of water, energy or telecom services.	Low	unlikely	low	N.A.
4. Lack of local capacity and expertise to sustain maintenance or operation of the systems.	High	Likely	Substantial.	There is no technical local expertise for energy, water or telecom operations. Minor maintenance could be done by the villagers if they are trained.
5. Lack of trust due to past false promises.	High	Likely	Substantial	The Alalapadu men say: "So many people make promises, but nobody comes to actually do it." Final statements of villagers: "We have a new law: if people come here and lie to us, we will put them back on the plane. There are a lot of young people here, we want to see results before we are old." A lot of people have promised them electricity, but nobody comes to actually do it.

ALALAPADU **Socio-economic distress**				
6. Lack of paid jobs or employed villagers to upkeep ongoing costs.	**Medium**	**Likely**	**Moderate.**	**The community funds to cover operational and maintenance costs depends on enough paid jobs in the village.** **Currently there is a Tuhka nut factory that offers job opportunities. The villagers are worried about generating the finances for maintaining the project. The men have no idea how they would pay for it, the women answered they would generate money via the factory, by hustling and selling things and saving up money.**
7. Inability to buy freezers, electronic devices or other electrical tools.	**Medium.**	**Very likely.**	**Substantial.**	**The positive effect of food security with improved energy access is dependent on their ability to buy food chilling equipment such as freezers or fridges. Their ability to cook food quicker for quick food access is depends on their ability to buy cooking devices.** **The positive effect of better physical wellbeing by reaching medical help quicker is dependent on their ability to buy phones or other electronic devices.**
ALALAPADU **Physical distress**				
8. Physical injury while supporting project objectives.	**Low**	**Possible**	**Low**	**N.A. right now, but may occur.**
9. Noise disturbance at critical locations.	**Low**	**Possible**	**Low**	**The villagers are okay with it.**
10. Distance for fetching water too far, especially for the elderly.				**N.A./ not answered.**
11. Dust production during building activities.	**Low**	**Possible**	**Low**	**The villagers are okay with it.**
ALALAPADU **Emotional distress**				
12. Worries and stress about generating the finances for the projects.	**Low**	**Very likely**	**Moderate**	**If they do not have enough funds, they will not be able to maintain the services or upkeep the maintenance.**
13. Temporary distress due to project building activities.	**Low**	**Possible**	**Low**	**Villagers said they would be okay with dust or noise production to reach project goals.**

ALALAPADU **Gender inequality**				
14. Gender inequality in the ability to pay for and maintain services.	**Low**	**Likely**	**Low**	**Men as well as women have job opportunities to work for the Tuhka nut factory to help pay for maintenance or operation costs of energy, water or telecom services.**
15. Gender inequality in potential job creation.	**Low**	**likely**	**Low**	**In the environmental field, only men are interested in becoming rangers.** **Only the men that do not have jobs want to help with project building objectives, the women do not.** **There could be options for women in the field of tourism or in the field of bio economy.**

Table 24: Risk analysis of Apetina.

Village: APETINA	**Risk analysis**			
Key Risk indicators	**Potential negative impact rating.**	**Likelihood.**	**Potential risk rating.**	**Comments.**
APETINA **Socio-cultural community issues**				
1. Indecision about community ownership models.	**Low**	**Unlikely**	**Low**	**There was no indecision about ownership models. The villagers agree that they are currently able to pay for operational and maintenance costs together with their own income.**
2. Temporary displacement due to project building activities.	**Low**	**unlikely**	**Low**	**Is unlikely to occur.**
APETINA **Social isolation**				
3. Unequal distribution of water, energy or telecom services.	**Low**	**unlikely**	**low**	**Their current water infrastructure system via UNICEF prioritized clean water for the school. This can be considered as unequal distribution. Additional water infrastructure in the village could focus on other areas in the village eliminating the current unequal distribution.**
4. Lack of local capacity and expertise to sustain maintenance or operation of the systems.	**Low**	**Likely**	**Low**	**There is some capacity already present and working on their generator and telecom systems. However, this is only for minor maintenance. For technical maintenance they need people from the city.** **They already have the 'know-how' or expertise to access people from the city to help with operation and maintenance.** **They say they have the potential to pay for operation and maintenance.**
5. Lack of trust due to past false promises.	**Medium**	**Possible**	**Moderate**	**False promises have been made before by the political parties.**

APETINA **Socio-economic distress**				
6. Lack of paid jobs or employed villagers to upkeep ongoing costs.	**Low**	**Unlikely**	**Low**	**NA.** **They say that they are able to cover operation and maintenance costs.** **They are also already able to upkeep maintenance costs for their telecom.**
7. Inability to buy freezers, electronic devices or other electrical tools.	**Low**	**Unlikely**	**Low**	**N.A.** **They already have electricity and freezers.**
APETINA **Physical distress**				
8. Physical injury while supporting project objectives.	**Low**	**Possible**	**Low**	**N.A. right now, but may occur.**
9. Noise disturbance at critical locations.	**Medium**	**Possible**	**Moderate**	**If it is really loud noise or a lot of dust, preferably not close to the church or school during active hours.**
10. Distance for fetching water too far, especially for the elderly.				**No info.**
11. Dust production during building activities.	**Medium**	**Possible**	**Moderate**	**If it is really loud noise or a lot of dust, preferably not close to the church or school during active hours.**
APETINA **Emotional distress**				
12. Worries and stress about generating the finances for the projects.	**Low**	**Unlikely**	**Low**	**The villagers are not stressed about this.**
13. Temporary distress due to project building activities.	**Low**	**Possible**	**Low**	**They are okay with temporary distress as long as builders take the school and church into account in the case of any nuisances.**
APETINA **Gender inequality**				
14. Gender inequality in the ability to pay for and maintain services.	**Low**	**Unlikely**	**Low**	**Men as well as women have job opportunities to help pay for maintenance or operation costs of energy, water or telecom services.**
15. Gender inequality in potential job creation.	**Low**	**Unlikely**	**Low**	**The women already have job opportunities and seem able to create more job opportunities such as in tourism, arts and crafts.** **Both the men and women are interested in becoming rangers.**

Table 25: Risk analysis of Sipaliwini

Village: Sipaliwini	Risk analysis			
Key Risk indicators	Potential negative impact rating.	Likelihood.	Potential risk rating.	Comments.
SIPALIWINI **Socio-cultural community issues**				
1. Indecision about community ownership models.	Low	Unlikely	Low	N.A. There was no indecision about ownership models. They acknowledge that together as a community they would be able to have enough money to contribute; if it is not enough, they would ask for help from NGO's or the government. They are still worried about how much it would cost. Initially the men say that ideally, they would approach the government first, then NGO's to help with operational costs. When more villagers have income, then they would be able to pay for it themselves. Initially the women said they would ideally pay for the operational costs as a village with the money they earn from selling arts and crafts, or other government work or from selling wild meat.
2. Temporary displacement due to project building activities.	Low	unlikely	Low	Is unlikely to occur.
SIPALIWINI **Social isolation**				
3. Unequal distribution of water, energy or telecom services.	Low	unlikely	low	N.A.
4. Lack of local capacity and expertise to sustain maintenance or operation of the systems.	Medium	Likely	Moderate	They are willing to learn as much as possible to do operation and minor maintenance. However, they do not have existing frameworks for maintenance or technical capacity.
5. Lack of trust due to past false promises.	Low	Unlikely	Low	False promises have been made before by the political parties.
SIPALIWINI **Socio-economic distress**				
6. Lack of paid jobs or employed villagers to upkeep ongoing costs.	Medium	Possible	Moderate	The villagers have income in the village. However, they are worried that it might not cover all the needed costs for regular operation and maintenance.

7. Inability to buy freezers, electronic devices or other electrical tools.	Low	Unlikely	Low	They have income and potential to create funds to buy electrical equipment. They also already have television and freezers available in the village.
SIPALIWINI Physical distress				
8. Physical injury while supporting project objectives.	Low	Possible	Low	N.A. right now, but may occur.
9. Noise disturbance at critical locations.	Low	Possible	Low	They are willing to endure noise and/or dust production for a short time, because it is for the development of their village.
10. Distance for fetching water too far, especially for the elderly.				No info.
11. Dust production during building activities.	Medium	Possible	Moderate	They are willing to endure noise and/or dust production for a short time, because it is for the development of their village.
SIPALIWINI Emotional distress				
12. Worries and stress about generating the finances for the projects.	Medium	Likely	Moderate	Yes, the villagers are stressed about this.
13. Temporary distress due to project building activities.	Low	Possible	Low	They are okay with some minor temporary distress such as noise or dust.
SIPALIWINI Gender inequality				
14. Gender inequality in the ability to pay for and maintain services.	Low	Unlikely	Low	Men as well as women have job opportunities to help pay for maintenance or operation costs of energy, water or telecom services.
15. Gender inequality in potential job creation.	Low	Unlikely	Low	The women already have job opportunities present in the village. They already have rangers in the village. But there were more men interested to join. None of the women were interested.

Table 26: Risk analysis of Kwamalasamutu

Village: KWAMALASAMUTU	Risk analysis			
Key Risk indicators	Potential negative impact rating.	Likelihood.	Potential risk rating.	Comments.
KWAMALASAMUTU Socio-cultural community issues				
1. Indecision about community ownership models.	Medium	Possible	Moderate	There is some indecision about ownership models. Some say that everyone has to pay a little bit. Others say only those that actively use it have to pay for it. The women say they could pay together if there is a social affairs person managing it.
2. Temporary displacement due to project building activities.	Low	unlikely	Low	Is unlikely to occur.
KWAMALASAMUTU Social isolation				
3. Unequal distribution of water, energy or telecom services.	Low	unlikely	low	N.A.
4. Lack of local capacity and expertise to sustain maintenance or operation of the systems.	Medium	Likely	Moderate	They are willing to learn as much as possible to do operation and minor maintenance. However, they do not have existing frameworks for maintenance or technical capacity.
5. Lack of trust due to past false promises.	Low	Unlikely	Low	False promises have been made before by the political parties.
KWAMALASAMUTU Socio-economic distress				
6. Lack of paid jobs or employed villagers to upkeep ongoing costs.	Medium	Possible	Moderate	The villagers have income in the village. However, they are worried that it might not cover all the needed costs for regular operation and maintenance.
7. Inability to buy freezers, electronic devices or other electrical tools.	Low	Unlikely	Low	They have income and potential to create funds to buy electrical equipment. They also already have television and freezers available in the village.
KWAMALASAMUTU Physical distress				
8. Physical injury while supporting project objectives.	Medium	Possible	Moderate	The villagers noted they are not willing to carry heavy items themselves, an ATV is needed for that.
9. Noise disturbance at critical locations.	Medium	Possible	Moderate	They would rather not have a lot of noise during school time.
10. Distance for fetching water too far, especially for the elderly.				No info.
11. Dust production during building activities.	Medium	Possible	Moderate	Not if somebody is ill. We would be okay with it if it is temporary and not all day, every day.

KWAMALASAMUTU Emotional distress				
12. Worries and stress about generating the finances for the projects.	**Medium**	**Likely**	**Moderate**	**Yes, the villagers are worried.**
13. Temporary distress due to project building activities.	**Low**	**Possible**	**Low**	**They are okay with some minor temporary distress.**
KWAMALASAMUTU Gender inequality				
14. Gender inequality in the ability to pay for and maintain services.	**Low**	**Unlikely**	**Low**	**Most of the women do not have money to pay for it. However, some women do have income and are willing to pay.**
15. Gender inequality in potential job creation.	**Low**	**Unlikely**	**Low**	**There was only one woman, named Zen, willing to become a ranger. The men were not interested. They would like to be able to hustle and sell animals freely. Being a ranger does not seem to fit this goal.**
				There could be options for women in the field of tourism or in the field of bio economy.

Table 27: Risk analysis of Kawamhakan

Village: KAWAMHAKAN	**Risk analysis**			
Key Risk indicators	**Potential negative impact rating.**	**Likelihood.**	**Potential risk rating.**	**Comments.**
KAWAMHAKAN Socio-cultural community issues				
1. Indecision about community ownership models.	**Medium**	**Possible**	**Moderate**	**The head captain noted that the villagers would be able to pay together per family household. During Krutu sessions some said that everyone who uses it would have to pay individually. They would need some further discussions to decide on their final model.**
2. Temporary displacement due to project building activities.	**Low**	**unlikely**	**Low**	**Is unlikely to occur.**
KAWAMHAKAN Social isolation				
3. Unequal distribution of water, energy or telecom services.	**Low**	**unlikely**	**low**	**N.A.**
4. Lack of local capacity and expertise to sustain maintenance or operation of the systems.	**Low**	**Possible**	**Low**	**Kawamhakan has potential for technical expertise regarding the solar panel activities (see capacity gap analysis). Some Krutu participants also wanted to help with the solar panel activities.**
5. Lack of trust due to past false promises.	**Low**	**Unlikely**	**Low**	**A lot of promises were made. They do not want to name any names.**

KAWAMHAKAN **Socio-economic distress**				
6. Lack of paid jobs or employed villagers to upkeep ongoing costs.	**Low**	**Possible**	**Low**	**The villagers have income in the village. However, they are worried about the finances for this project because they say they know that the government has no money for them.** **Compared to the other villages, they would have more access to finances.**
7. Inability to buy freezers, electronic devices or other electrical tools.	**Low**	**Unlikely**	**Low**	**They have some income and they also already have some freezers already available in the village.**
KAWAMHAKAN **Physical distress**				
8. Physical injury while supporting project objectives.	**Low**	**Possible**	**Low**	**N.A. right now, but may occur.**
9. Noise disturbance at critical locations.	**Low**	**Possible**	**Low**	**They are okay with it, because it is for a good purpose.**
10. Distance for fetching water too far, especially for the elderly.				**No info.**
11. Dust production during building activities.	**Low**	**Possible**	**Low**	**They are okay with it, because it is for a good purpose.**
KAWAMHAKAN **Emotional distress**				
12. Worries and stress about generating the finances for the projects.	**Low**	**Likely**	**Low**	**There is some worry about finances.**
13. Temporary distress due to project building activities.	**Low**	**Possible**	**Low**	**They are okay with some temporary distress.**
KAWAMHAKAN **Gender inequality**				
14. Gender inequality in the ability to pay for and maintain services.	**Low**	**Unlikely**	**Low**	**Some women receive child benefits from French-Guyana and they are willing to create potential for income by 'hustling' and selling food and fish to tourists.**
15. Gender inequality in potential job creation.				**No info.**

Table 28: Risk analysis of Kumakapan

Small settlement: KUMAKAPAN	Risk analysis			
Key Risk indicators	Potential negative impact rating.	Likelihood.	Potential risk rating.	Comments.
KUMAKAPAN Socio-cultural community issues				
1. Indecision about community ownership models.	Medium	Possible	Low	No questions have been asked about ownership models in Krutu format. Their captain died 4 years ago. The leader of the settlement wants to become appointed as basja. On the other hand, there will likely be no indecision due to the small amount of people actively inhabiting the village.
2. Temporary displacement due to project building activities.	Low	unlikely	Low	N.A. Is unlikely to occur.
KUMAKAPAN Social isolation				
3. Unequal distribution of water, energy or telecom services.	Low	unlikely	low	N.A.
4. Lack of local capacity and expertise to sustain maintenance or operation of the systems.	High	Likely	substantial	Due to the small amount of people active in the village (7 people). The younger people are not present in the village on a daily basis.
5. Lack of trust due to past false promises.				Not answered.
KUMAKAPAN Socio-economic distress				
6. Lack of paid jobs or employed villagers to upkeep ongoing costs.	High	Likely	Substantial	There is a Chinese store in the village but all the younger people go to school in French-Guyana.
7. Inability to buy freezers, electronic devices or other electrical tools.				Not answered.
KUMAKAPAN Physical distress				
8. Physical injury while supporting project objectives.	Low	Possible	Low	N.A. right now, but may occur.
9. Noise disturbance at critical locations.				Not answered.
10. Distance for fetching water too far, especially for the elderly.				No info.
11. Dust production during building activities.				Not answered.

KUMAKAPAN **Emotional distress**				
12. Worries and stress about generating the finances for the projects.				**Not answered.**
13. Temporary distress due to project building activities.				**Not answered.**
KUMAKAPAN **Gender inequality**				
14. Gender inequality in the ability to pay for and maintain services.				**Not answered.**
15. Gender inequality in potential job creation.				**Not answered.**

Table 29: Risk analysis of Pelelu Tepoe.

Village: Pelelu Tepoe	**Risk analysis**			
Key Risk indicators	**Potential negative impact rating.**	**Likelihood.**	**Potential risk rating.**	**Comments.**
PELELU TEPOE **Socio-cultural community issues**				
1. Indecision about community ownership models.	**Low**	**Unlikely**	**Low**	**Unlikely, the villagers already have solar panel, water infrastructure (crane) and telecom in place. (The water infrastructure, however, was not working at the time of the interview) For the opportunity of additional systems, the group of men, said for those who need to make use of the facilities but can't pay, the village should look how to help these people. The captain has said that creating a "kas (setting money aside)" for these people, is an option.**
2. Temporary displacement due to project building activities.	**Low**	**unlikely**	**Low**	**Is unlikely to occur.**
PELELU TEPOE **Social isolation**				
3. Unequal distribution of water, energy or telecom services.	**Low**	**unlikely**	**low**	**N.A.**
4. Lack of local capacity and expertise to sustain maintenance or operation of the systems.	**Medium**	**Very likely**	**substantial**	**The locals are already sustaining their solar and telecom systems. Their water crane is not working. The women have been fetching water from the river despite their water infrastructure. This might indicate a lack of local capacity to fix the problem.**
5. Lack of trust due to past false promises.	**Low**	**Unlikely**	**Low**	**No info.**

PELELU TEPOE **Socio-economic distress**				
6. Lack of paid jobs or employed villagers to upkeep ongoing costs.	**Low**	**Possible**	**Low**	**There is income in the village, but people are still worried.**
7. Inability to buy freezers, electronic devices or other electrical tools.	**Low**	**Unlikely**	**Low**	**They have some income and they also already have some freezers already available in the village.**
PELELU TEPOE **Physical distress**				
8. Physical injury while supporting project objectives.	**Low**	**Possible**	**Low**	**N.A. right now, but may occur.**
9. Noise disturbance at critical locations.	**Medium**	**Possible**	**Moderate**	**They are okay with it, but would rather not have disturbance in the middle of the village, close to the school or at the Krutu oso. The men said that active building work could be done on one end of the airport strip.**
10. Distance for fetching water too far, especially for the elderly.				**No info.**
11. Dust production during building activities.	**Medium**	**Possible**	**Moderate**	**They are okay with it, but would rather not have disturbance in the middle of the village, close to the school or at the Krutu oso. The men said that active building work could be done on one end of the airport strip.**
PELELU TEPOE **Emotional distress**				
12. Worries and stress about generating the finances for the projects.	**Low**	**Likely**	**Low**	**There is some worry about finances.**
13. Temporary distress due to project building activities.	**Low**	**Possible**	**Low**	**They are okay with some temporary distress.**
PELELU TEPOE **Gender inequality**				
14. Gender inequality in the ability to pay for and maintain services.	**Medium**	**Likely**	**Moderate**	**The women said they do not have a lot of income streams to be able to pay. The men say they trade in fish, animals and crafts and do government work.**
15. Gender inequality in potential job creation.	**Medium**	**Likely**	**Moderate**	**Both the men and women were interested in becoming rangers.** **There still is some inequality in job creation as the men have more paid jobs than the women. The women also still carry water from the river despite their current water crane, because it is not working.** **There could be options for women in the field of tourism or in the field of bio economy.**

Table 30: Risk analysis of Palumeu

Village: PALUMEU	Risk analysis			
Key Risk indicators	Potential negative impact rating.	Likelihood.	Potential risk rating.	Comments.
PALUMEU **Socio-cultural community issues**				
1. Indecision about community ownership models.	Medium	likely	Moderate	They noted that their level of income is low and that they would look for outside funding. They also mentioned that they will need to talk amongst themselves about their payment models. Furthermore, they said: "For older people without income, we can find a way to pitch in. How, we don't know yet."
2. Temporary displacement due to project building activities.	Low	unlikely	Low	Is unlikely to occur.
PALUMEU **Social isolation**				
3. Unequal distribution of water, energy or telecom services.	Medium	Likely	Moderate	Only the tourism lodge and in the past, the school, had access to a clean water well. The rest of the village has a Duro tank to collect water from ACT.
4. Lack of local capacity and expertise to sustain maintenance or operation of the systems.	Medium	Very likely	Substantial	The locals are already do minor gardening maintenance around their telecom network. The generator was broken for 2 years and they did not have local expertise or means to get outside experts in sooner. Getting outside technical experts to their village takes money and time. Their main income source, tourism, has significantly decreased since covid-19.
5. Lack of trust due to past false promises.	Low	Possible	Low	There have been false promises made by the government.
PALUMEU **Socio-economic distress**				
6. Lack of paid jobs or employed villagers to upkeep ongoing costs.	high	Likely	Substantial	Their main source of income, tourism, has significantly decreased. They have some other income such as seasonal income by selling food to Paramaribo, government work, arts and crafts. That income is most likely not enough. They say they would ask for outside funding to help them cover the costs.

7. Inability to buy freezers, electronic devices or other electrical tools.	Medium	possible	Moderate	There are already freezers in the village, but the generator has not been operational for some time. The freezers can't be used because of this. Since the technical visit of outside experts to fix their generator, the acuteness of this risk has most likely been resolved.
PALUMEU Physical distress				
8. Physical injury while supporting project objectives.	Low	Possible	Low	May occur.
9. Noise disturbance at critical locations.	Medium	Possible	Moderate	They would not be okay with noise disturbance close to the school yard or in the middle of their village.
10. Distance for fetching water too far, especially for the elderly.				No information.
11. Dust production during building activities.	Medium	Possible	Moderate	They would not be okay with dust production close to the school yard or in the middle of their village.
PALUMEU Emotional distress				
12. Worries and stress about generating the finances for the projects.	Medium	Likely	Moderate	Yes, they are worried.
13. Temporary distress due to project building activities.	Low	Possible	Low	They are okay with some temporary distress, just not close to the school or in the middle of the village.
PALUMEU				
Gender inequality				
14. Gender inequality in the ability to pay for and maintain services.	Low	Likely	Low	Both the men and women said they do not have a lot of income streams to be able to pay for the services.
15. Gender inequality in potential job creation.	Low	Likely	Low	Tourism was their main source of income for both the men and the women. Both the men and the women are willing to join the ranger's team. There could be options for women in the bio economy field.

Table 31: Risk analysis of Amotopo

Village: AMOTOPO	Risk analysis			
Key Risk indicators	Potential negative impact rating.	Likelihood.	Potential risk rating.	Comments.
AMOTOPO Socio-cultural community issues				
1. Indecision about community ownership models.	Low	Unlikely	Low	They are pretty clear on a community ownership model where they will gather money in a village money pot to cover costs.

2. Temporary displacement due to project building activities.	Low	unlikely	Low	Is unlikely to occur.
AMOTOPO Social isolation				
3. Unequal distribution of water, energy or telecom services.				NA
4. Lack of local capacity and expertise to sustain maintenance or operation of the systems.	Medium	Very likely	Substantial	Because the villagers have no electricity or water infrastructure they have to develop maintenance and operation from scratch.
5. Lack of trust due to past false promises.	Low	Possible	Low	There have been false promises made by the government and political parties. One person talked to them before about drilling a water well before.
AMOTOPO Socio-economic distress				
6. Lack of paid jobs or employed villagers to upkeep ongoing costs.	high	Likely	Substantial	Currently there is not a lot of income generating opportunity in the village. The women sell fish, but there is no real market place and their community is small. In the past they used to sell things to tourists.
7. Inability to buy freezers, electronic devices or other electrical tools.	Medium	Very Likely	Substantial	They need freezers, but do not have electricity and income. .
AMOTOPO Physical distress				
8. Physical injury while supporting project objectives.	Low	Possible	Low	N.A. right now, but may occur.
9. Noise disturbance at critical locations.	Low	Possible	Low	They are okay with some noise.
10. Distance for fetching water too far, especially for the elderly.	Low	Possible	Low	Someone fetches water for the elderly in the village.
11. Dust production during building activities.	Low	Possible	Low	They are okay with some dust.
AMOTOPO Emotional distress				
12. Worries and stress about generating the finances for the projects.	Medium	Likely	Moderate	Yes, they are very worried about the maintenance costs.
13. Temporary distress due to project building activities.	Low	Possible	Low	They are okay with it.
AMOTOPO Gender inequality				

14. Gender inequality in the ability to pay for and maintain services.	Medium	Possible	Moderate	The men say that can gather some income. The women say there is currently low potential for work. Overall, both genders say there is a low potential for income generating activities in the village. In the past the women were able to sell to tourists.
15. Gender inequality in potential job creation.	Low	Likely	Low	Both the men and women have potential for income in the tourism and bio economy field.

Table 32: Risk analysis of Coeroeni

Village: COEROENI	Risk analysis			
Key Risk indicators	Potential negative impact rating.	Likelihood.	Potential risk rating.	Comments.
COEROENI Socio-cultural community issues				
1. Indecision about community ownership models.	Low	Unlikely	Low	They are clear on paying together as a community.
2. Temporary displacement due to project building activities.	Low	unlikely	Low	Is unlikely to occur.
COEROENI Social isolation				
3. Unequal distribution of water, energy or telecom services.				NA
4. Lack of local capacity and expertise to sustain maintenance or operation of the systems.	Medium	Likely	Moderate	Villagers are very willing to learn about operation and maintenance and have given up their names to contribute to building and project work (see capacity gap analysis). However, there is no technical capacity present in the village.
5. Lack of trust due to past false promises.	Low	Possible	Low	There have been false promises made by the government and political parties. SWM did research to find water sources, and would come drill these but have never come back to do so.
COEROENI Socio-economic distress				
6. Lack of paid jobs or employed villagers to upkeep ongoing costs.	high	Likely	Substantial	They don't know with what income they are going to cover the costs yet.
7. Inability to buy freezers, electronic devices or other electrical tools.	Medium	Likely	Moderate	They need freezers, but don't know what income generating activities could help them.
COEROENI Physical distress				
8. Physical injury while supporting project objectives.	Low	Possible	Low	N.A. right now, but may occur.

9. Noise disturbance at critical locations.				**No information.**
10. Distance for fetching water too far, especially for the elderly.				**No information.**
11. Dust production during building activities.				**No information.**
COEROENI Emotional distress				
12. Worries and stress about generating the finances for the projects.				**No information.**
13. Temporary distress due to project building activities.				**No information.**
COEROENI Gender inequality				
14. Gender inequality in the ability to pay for and maintain services.	**Medium**	**Possible**	**Moderate**	**The women were not interviewed.**
15. Gender inequality in potential job creation.	**Low**	**Likely**	**Low**	**The women were not interviewed.**

8.3 Results Environmental assessment: potential impact analysis

The following tables show the positive impact rating and analysis per village.

Table 33: Positive impact analysis of Alalapadu

Village: ALALAPADU	Positive impact analysis	
Key Performance Indicator (KPI):	Potential impact description: High/medium/low.	Comments:
1. Forest and biodiversity protection.	Medium.	There is one ranger in the village. Men are willing to become forest rangers.
2. Clean water.	High.	The positive potential impact of better access to a higher quality water and easier access to water, is high.
3. Cleaner energy.	High.	They currently do not have energy, but have used a generator that runs on fuel in the past.
4. Waste management systems.	N.A.	They do not have adequate waste management systems in place.
5. Use of natural resources.	Medium.	They are willing to help find natural resources and materials for project building objectives.
6. Environmental awareness.	Low.	They are aware of the contamination problems of their water source, the creek: they realize that dead fish and stool in the creek make them sick and that the creek is the source of breeding for malaria mosquitos. They have been advised to cook their water and follow this advice as much as possible. Recycling: The villagers recycle what they can. They use old zinc plates to collect rainwater. They use old gas tanks to barbeque and smoke or dry meat.
7. Gender equality	N.A.	Only the men that have no income are willing to become forest rangers. None of the women are interested.

Table 34: Positive impact analysis of Apetina

Village: APETINA	Positive impact analysis	
Key Performance Indicator (KPI):	Potential impact description: High/medium/low.	Comments:
1. Forest and biodiversity protection.	Medium.	There are already rangers in their village. Both men and women are willing to be trained as rangers.
2. Clean water.	High.	Water is their most urgent environmental issue to be solved: they don't have clean drinking water for the entire village.
3. Cleaner energy.	High.	They use a diesel generator. Solar panels will be sure is a greener way to generate electricity.
4. Waste management systems.	N.A.	They do not have adequate waste management systems in place. They have a trash ditch where they throw batteries or old motors.

5. Use of natural resources.	Medium.	They are willing to help find natural resources and materials for project building objectives. Some would like to get paid for this.
6. Environmental awareness.	Low.	Overall low. They do recycle old fuel carriers.
7. Gender equality	Medium.	Both the men and women are willing to be trained as rangers.

Table 33: Positive impact analysis of Sipaliwini

Village: SIPALIWINI	Positive impact analysis	
Key Performance Indicator (KPI):	Potential impact description: High/medium/low.	Comments:
1. Forest and biodiversity protection.	Medium.	There are already rangers in their village. More men are willing to be trained as rangers.
2. Clean water.	High.	Water is their most urgent environmental issue to be solved: they don't have clean drinking water for the entire village.
3. Cleaner energy.	High.	They use a diesel generator. Solar panels will be sure is a greener way to generate electricity.
4. Waste management systems.	N.A.	They do not have adequate waste management systems in place. They do have a specific spot where all waste is thrown.
5. Use of natural resources.	Medium.	They are willing to help find natural resources and materials for project building objectives. They would like to get paid for this.
6. Environmental awareness.	Low.	They recycle what they can: the villagers use old fuel carriers as barbeque frames (a frame they put over fires for drying or cooking meat).
7. Gender equality		The women were not interested in becoming rangers.

Table 35: Positive impact analysis of Kwamalasamutu

Village: KWAMALASAMUTU	Positive impact analysis	
Key Performance Indicator (KPI):	Potential impact description: High/medium/low.	Comments:
1. Forest and biodiversity protection.		None of the male or female Krutu participants want to become rangers. The men want to be able to sell animals freely.
2. Clean water.	High.	Sometimes they have no clean water from 6pm onwards.
3. Cleaner energy.	High.	They have an irregularly working diesel generator. Solar panels are a greener and cleaner energy option.
4. Waste management systems.		They do not have adequate waste management systems in place.

5. Use of natural resources.	Medium.	They are willing to help find natural resources and materials for project building objectives. They are not willing to carry heavy items.
6. Environmental awareness.	Low.	They upcycle, find new uses for old things: Men use lead from batteries as fishing weights. They store the parts of old motors or repair it if possible. Old batteries are used as counter weight for pressing cassava. However, the men also sometimes they throw batteries in the forest or bury it in the ground.
7. Gender equality	Medium.	One woman, named Zen was interested in becoming a ranger.

Table 36: Positive impact analysis of Kawemhakan

Village: KAWEMHAKAN	Positive impact analysis	
Key Performance Indicator (KPI):	Potential impact description: High/medium/low.	Comments:
1. Forest and biodiversity protection.	N.A.	None of the Krutu participants (male and female) are willing to become rangers. They absolutely do not want rangers in the village.
2. Clean water.	High.	Easier access to water and high-water quality is urgent for the villagers. Children drink unsanitary water and get seriously ill. There is a risk for mercury in their water due to upstream gold extraction so a filtration system would solve major environmental and health issues.
3. Cleaner energy.	High.	They have a diesel generator. Solar panels are a greener and cleaner energy option.
4. Waste management systems.	N.A.	They do not have adequate waste management systems in place. They burn old batteries and old motors.
5. Use of natural resources.	Medium.	They are willing to help find materials for project building objectives.
6. Environmental awareness.	Low	They upcycle, find new uses for old things: They reuse old fuel carriers to smoke meat and fish. Their overall environmental awareness is low.
7. Gender equality	N.A.	N.A. The women were not interested in becoming rangers.

Table 37: Positive impact analysis of Kumakapan.

Village: KUMAKAPAN	Positive impact analysis	
Key Performance Indicator (KPI):	Potential impact description: High/medium/low.	Comments:
1. Forest and biodiversity protection.	Low.	Villagers protect their cultural artifacts in the ground. There are no rangers in the area. The area used to be a stopping area for travelers and gold prospectors.
2. Clean water.	High.	The villagers need better quality drinking water. Their river water is most likely contaminated with mercury and is polluted during the rain season.
3. Cleaner energy.	High.	They have a broken generator. Solar energy would significantly improve their food saving abilities. An older man has been dealing with dangerous snakes at night; he has no electricity or light at night.
4. Waste management systems.	N.A.	They do not have adequate waste management systems in place.
5. Use of natural resources.	No information.	No information.
6. Environmental awareness.	No information.	No information.
7. Gender equality	No information.	No information.

Table 38: Positive impact analysis of Pelulu Tepoe.

Village: PELULU TEPOE	Positive impact analysis	
Key Performance Indicator (KPI):	Potential impact description: High/medium/low.	Comments:
1. Forest and biodiversity protection.	High	They already have solar panels. But they do have a backup generator. With more solar panels they would protect the environment even more so. There are enough rangers in the village. ACT already has a waste management system with a dedicated local team who checks the recycle process.
2. Clean water.	High.	The villagers need better quality drinking water. Their river water is most likely contaminated with mercury and is polluted during the rain season.
3. Cleaner energy.	High.	They have a broken generator. Solar energy would significantly improve their food saving abilities. An older man has been dealing with dangerous snakes at night; he has no

		electricity or light at night.
4. Waste management systems.	Medium.	ACT already has a waste management system with a dedicated local team who checks the recycle process. They recycle old batteries. With improved water access they could improve further on their waste management systems.
5. Use of natural resources.	Medium.	They are willing to help find natural resources for project objectives.
6. Environmental awareness.	Medium.	They are aware that the village recycles batteries. There already are dedicated recycle teams in place.
7. Gender equality	Medium.	Both men and women were interested in becoming rangers. They said that there are enough rangers in the village.

Table 39. Positive impact analysis of Palumeu.

Village: PALUMEU	Positive impact analysis	
Key Performance Indicator (KPI):	Potential impact description: High/medium/low.	Comments:
1. Forest and biodiversity protection.	High.	There already have rangers in the village. Both male and female Krutu participants are willing to join the existing ranger team.
2. Clean water.	High.	The tourism lodge has a water infrastructure that is connected to a water well. This system used to be connected to the school. The source of water for the rest of the village is rainwater and river water. If the river water is not cooked properly they tend to get sick.
3. Cleaner energy.	High.	They have a diesel generator that has not worked for 2 years. Solar panels would have less negative impact on the environment.
4. Waste management systems.	N.A.	They do not have adequate waste management systems in place.
5. Use of natural resources.	Medium.	They are willing to help find natural resources and materials for project building objectives. They would like to get compensated for this.
6. Environmental awareness.	Low.	There was no significant environmental awareness noted from the Krutu participants. On the other hand, all participants showed a willingness to become or learn more about being a ranger. The rangers still need to be trained to do water quality measurements.
7. Gender equality	Medium.	Both the men and the women are willing to become rangers.

Table 40. Positive impact analysis of Amotopo

Village: AMOTOPO	Positive impact analysis	
Key Performance Indicator (KPI):	Potential impact description: High/medium/low.	Comments:
1. Forest and biodiversity protection.	Medium.	There are already rangers in the village. Some men showed some minor interest to join.
2. Clean water.	High.	They use rainwater or river water.
3. Cleaner energy.	High.	They have no source of energy.
4. Waste management systems.	N.A.	They do not have adequate waste management systems in place.
5. Use of natural resources.	Medium.	They are willing to help find natural resources and materials for project building objectives. They are willing to build a house from scratch to accommodate project workers.
6. Environmental awareness.	Low.	They throw away old batteries or use the battery powder to start fires.
7. Gender equality	N.A.	The men say they might join. The women were not willing.

Table 41. Positive impact analysis of Coeroeni

Village: COEROENI	Positive impact analysis	
Key Performance Indicator (KPI):	Potential impact description: High/medium/low.	Comments:
1. Forest and biodiversity protection.	High.	They already have rangers present in the village but they say they are limited because there is no boat or gas to travel. All of the male Krutu participants were interested in learning more about being a ranger.
2. Clean water.	High.	Clean water is their biggest worry. "a water system needs to come as soon as possible. 2024 is too long of a wait, maybe we won't be able to make it until that time." The fish that they catch is in low tide water and there is a lot of slime in the water. If they don't wash their fish properly they get sick.
3. Cleaner energy.	High.	They already have a solar panel system. They say they would like to expand on that system.
4. Waste management systems.	N.A.	They do not have adequate waste management systems in place.
5. Use of natural resources.	Medium.	They are willing to help find natural resources and materials for project building objectives. They think it is a great idea.
6. Environmental awareness.	Low.	They find new uses for old things: - They use old batteries as fishing weights.
7. Gender equality	No information.	No information. Only the men were interviewed due to lack of time.

8.4 Results Environmental assessment: risk analysis

The following tables show the risk rating and analysis per village.

Table 42: Risk analysis of Alalapadu.

Village: ALALAPADU	Risk analysis			
Key Risk indicator.	Potential negative impact rating.	Likelihood rating	Potential risk rating.	Comments.
1. Climate: heavy rainfall.	High	Likely	Substantial	• Heavy rainfall creates a flood risk. • In the rain season the villagers experience flooding. • Flooding contaminates their waters, but can also be a potential risk for solar panels or telecom constructions.
2. Deforestation and biodiversity loss.	Low	Very likely	Low	• The villagers are not worried about deforestation in relation to project objectives. • Some smaller biodiversity might be lost with project building objectives but is very likely not significant and only at the direct building or drilling locations.
3. Noise disturbance.	Low	Likely	Low	Their hunting grounds and animals will most likely not be disturbed.
4. Air pollution: dust production.	Low	Likely	Low	Dust production will most likely not pollute the air significantly.
5. Water pollution: Gold extraction.	Low	Possible	Low	There are no nearby gold extraction activities known.
6. Lack of waste management.	Very high	Very likely	High	• They reuse what they can but there is no proper waste management system in place. • Electrical waste management is not established yet. • The water is polluted with wastes and the need for proper waste management to secure clean drinking water is high. People tend to get sick with diarrhea and vomiting.
7. Lack of environmental awareness.	Medium	Possible	Moderate	• They are aware that water can be contaminated due to stool, dead fish or gold extraction. • "That is why we don't do gold extraction because we don't want to pollute our waters." • They reuse what they can but there are no waste management plans in place.
8. Gender inequality.	Medium	Likely	Moderate	None of the women are interested in becoming rangers. The tuhka nut factory does allow them to sustainably work with nature.

Table 43: Risk analysis of Apetina.

Village: APETINA	Risk analysis			
Key Risk indicator.	Potential negative impact rating.	Likelihood rating	Potential risk rating.	Comments.
1. Climate: heavy rainfall.	High	Likely	Substantial.	• Heavy rainfall creates a flood risk. • In the rain season the villagers experience flooding. • Flooding contaminates their waters, but can also be a potential risk for solar panels or telecom constructions. • Construction workers should consider the area of flood risk.
2. Deforestation and biodiversity loss.	Low	Very likely	Low	• The villagers are okay with some deforestation for the purpose of sustainable development of the village. • Some smaller biodiversity might be lost with project building objectives but is very likely not significant and only at the direct building or drilling locations.
3. Noise disturbance.	Low	Likely	Low	Their hunting grounds and animals will most likely not be disturbed.
4. Air pollution: dust production.	Low	Likely	Low	Dust production will most likely not pollute the air significantly.
5. Water pollution: Gold extraction.	Very high	Likely	High	There are nearby gold extraction activities, north of the village.
6. Lack of waste management.	Very high	Very likely	High	They throw away batteries and old motors in a designated land ditch.
7. Lack of environmental awareness.	Medium	Possible	Moderate	• They have not mentioned pollution of their waters due to mercury or gold extraction methods. • They are aware of their low water quality due to sickness like diarrhea and vomiting, especially when the river water is not cooked. • Some villagers still drink uncooked water. • They reuse what they can but there are no waste management plans in place.
8. Gender inequality.	Low	Possible	Low	Both the men and women are willing to be trained as rangers.

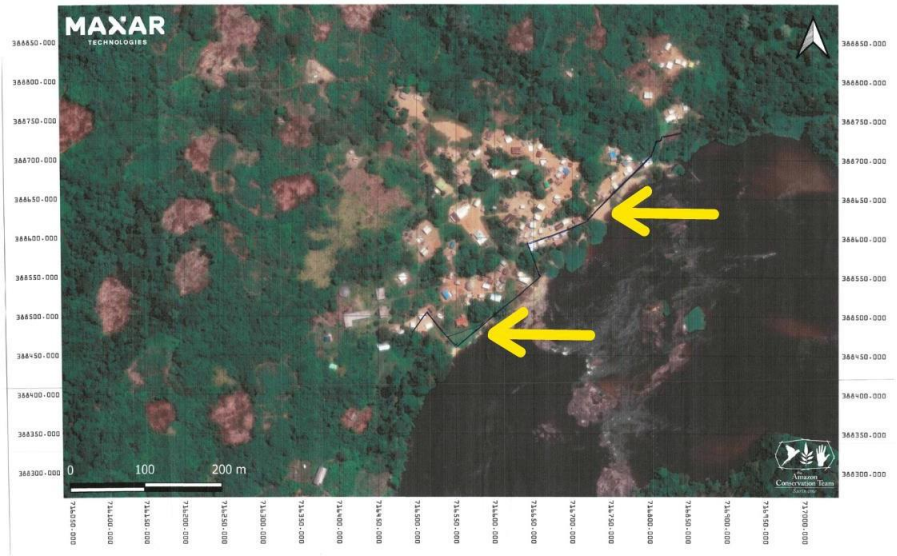

Figure 2. Apetina flood map: areas with high risk of flooding.

Table 44: Risk analysis of Sipaliwini

Village: SIPALIWINI	Risk analysis			
Key Risk indicator.	**Potential negative impact rating.**	**Likelihood rating**	**Potential risk rating.**	**Comments.**
1. Climate: heavy rainfall.	**High**	**Likely**	**Substantial.**	• **Heavy rainfall creates a flood risk.** • **In the rain season the villagers experience flooding.** • **In Sipaliwini they have experienced flooding close to the river and near the airport.** • **Flooding contaminates their waters, but can also be a potential risk for solar panels or telecom constructions.**
2. Deforestation and biodiversity loss.	**Low**	**Very likely**	**Low.**	• **The villagers are okay with some deforestation for the purpose of project goals.** • **Some smaller biodiversity might be lost with project building objectives but is very likely not significant and only at the direct building or drilling locations.**
3. Noise disturbance.	**Low**	**Likely**	**Low**	**Their hunting grounds and animals will most likely not be disturbed.**
4. Air pollution: dust production.	**Low**	**Likely**	**Low**	**Dust production will most likely not pollute the air significantly.**
5. Water pollution: Gold extraction.	**Low**	**Possible**	**Low**	**There are no nearby gold extraction activities, north of the village.**
6. Lack of waste management.	**Very high**	**Very likely**	**High**	**There is no adequate waste management system in place.**

7. Lack of environmental awareness.	**Medium**	**Possible**	**Moderate**	• **They have not mentioned pollution of their waters due to mercury or gold extraction methods.** • **They are aware of their low water quality due to sickness like diarrhea and vomiting, especially when the river water is not cooked.** • **Some villagers still drink uncooked water.** • **They reuse what they can but there are no waste management plans in place.**
8. Gender inequality.	**Low**	**Possible**	**Low**	**Both the men and women are willing to be trained as rangers.**

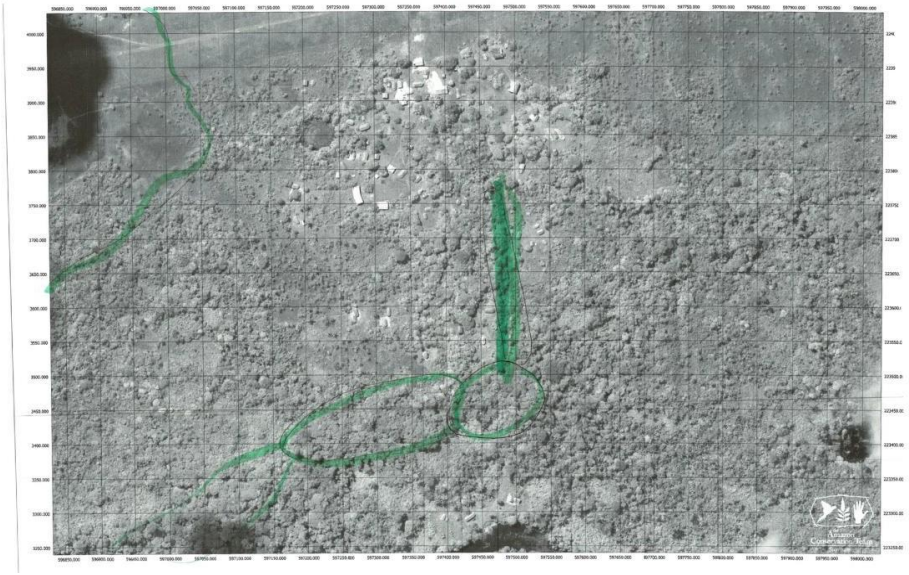

Figure 3:. Sipaliwini flood map: areas with high risk of flooding

Table 45: Risk analysis of Kwamalasamutu

Village: KWAMALASAMUTU	**Risk analysis**			
Key Risk indicator.	**Potential negative impact rating.**	**Likelihood rating**	**Potential risk rating.**	**Comments.**
1. Climate: heavy rainfall.	**High**	**Likely**	**Substantial.**	• **Heavy rainfall creates a flood risk.** • **Female Kwamalasamutu villagers note that they especially notice floods near their creek, river and agricultural plots. The men say that floods can happen everywhere.** • **Flooding contaminates their waters, but can also be a potential risk for solar panels or telecom constructions.** • **Construction workers should consider areas with flood risk.**
2. Deforestation and biodiversity loss.	**Low**	**Very likely**	**Low**	**The villagers are okay with some deforestation for the purpose of project goals.** **Some smaller biodiversity might be lost with project building objectives but is very likely not significant and only at the direct building or drilling locations.**

3. Noise disturbance.	Low	Likely	Low	Their hunting grounds and animals will most likely not be disturbed.
4. Air pollution: dust production.	Low	Likely	Low	Dust production will most likely not pollute the air significantly.
5. Water pollution: Gold extraction.	Low	Possible	Low	There are no nearby gold extraction activities, north of the village.
6. Lack of waste management.	Very high	Very likely	High	They do not have an adequate waste management system in place. Sometimes they throw batteries in the forest or bury it in the ground.
7. Lack of environmental awareness.	Medium	Possible	Moderate	-They reuse what they can but there are no waste management plans in place. -Batteries are thrown in the forest or buried in the ground possibly contaminating their land. Lead from the batteries is used as fishing weights, possibly contaminating their water. -The men do not want to become rangers because they want to be able to sell animals freely.
8. Gender inequality.				Most of the women and women are not willing to be trained as rangers. The men want to be able to sell animals freely. One woman named Zen was willing to become a ranger.

Table 46: Risk analysis of Kawemhakan.

Village: KAWEMHAKAN	Risk analysis			
Key Risk indicator.	Potential negative impact rating.	Likelihood rating	Potential risk rating.	Comments.
1. Climate: heavy rainfall.	Low	Possible	Low	They do not experience flooding in the rain season like the other villages. They say their village is higher up/on a higher altitude.
2. Deforestation and biodiversity loss.	Low	Very likely	Low .	• The villagers have no problem with some deforestation for project purposes. • Some smaller biodiversity might be lost with project building objectives but is very likely not significant and only at the direct building or drilling locations.
3. Noise disturbance.	Low	Likely	Low	Their hunting grounds and animals will most likely not be disturbed. The villagers say that animals are already far away from the inhabited village area.
4. Air pollution: dust production.	Low	Likely	Low	Dust production will most likely not pollute the air significantly.
5. Water pollution: Gold extraction.	Very high	Very likely	High	There are nearby gold extraction activities at the Lawa river, upstream of their village known. This is also the fishing ground for the male villagers.
6. Lack of waste management.	Very high	Very likely	High	They do not have an adequate waste management system in place. Sometimes they throw batteries in the forest or bury it in the ground.
7. Lack of environmental awareness.	High	likely	substantial	• They absolutely do not want rangers in the village impeding with potential to engage with the villagers on environmental issues. • They burn old batteries and old motors

8. Gender inequality.				N.A. Both men and women are unwilling to be rangers.

Table 47: Risk analysis of Kumakapan

Village: KUMAKAPAN	Risk analysis			
Key Risk indicator.	Potential negative impact rating.	Likelihood rating	Potential risk rating.	Comments.
1. Climate: heavy rainfall.	Very high	Likely	High	They experience heavy flooding in this area. People had to start building their houses on areas with a higher altitude because of the extreme flooding.
2. Deforestation and biodiversity loss.	Low	Very likely	Low	Some smaller biodiversity might be lost with project building objectives but is very likely not significant and only at the direct building or drilling locations.
3. Noise disturbance.	Low	Likely	Low	Their hunting grounds and animals will most likely not be disturbed.
4. Air pollution: dust production.	Low	Likely	Low	Dust production will most likely not pollute the air significantly.
5. Water pollution: Gold extraction.	Very high	Very likely	High	There are nearby gold extraction activities at the Lawa river, upstream of their village known. This is also the fishing ground for the male villagers.
6. Lack of waste management.	Very high	Very likely	High	They do not have an adequate waste management system in place.
7. Lack of environmental awareness.				No information. There are no rangers in the area.
8. Gender inequality.				No information. There are no rangers in the area.

Table 48: Risk analysis of Pelulu Tepoe.

Village: PELULU TEPOE	Risk analysis			
Key Risk indicator.	Potential negative impact rating.	Likelihood rating	Potential risk rating.	Comments.
1. Climate: heavy rainfall.	High	Likely	Substantial	• They have flooding during the rainy season. • Flooding contaminates their waters, but can also be a potential risk for solar panels or telecom constructions. • Construction workers should consider areas with flood risk.
2. Deforestation and biodiversity loss.	Low	Very likely	Low	Some smaller biodiversity might be lost with project building objectives but is very likely not significant and only at the direct building or drilling locations.
3. Noise disturbance.	Low	Likely	Low	Their hunting grounds and animals will most likely not be disturbed.
4. Air pollution: dust production.	Low	Likely	Low	Dust production will most likely not pollute the air significantly.
5. Water pollution: Gold extraction.	Low	Possible	Low	There are no nearby gold extraction activities known.

6. Lack of waste management.	**low**	**possible**	**low**	**They have a waste recycling system in place.**

7. Lack of environmental awareness.	**Low**	**Possible**	**Low**	**There is some environmental awareness. They have environmental teams and rangers in place that oversee and check the recycling process.**
8. Gender inequality.				**Both the men and the women were interested in becoming rangers, but there are enough rangers in the village.**

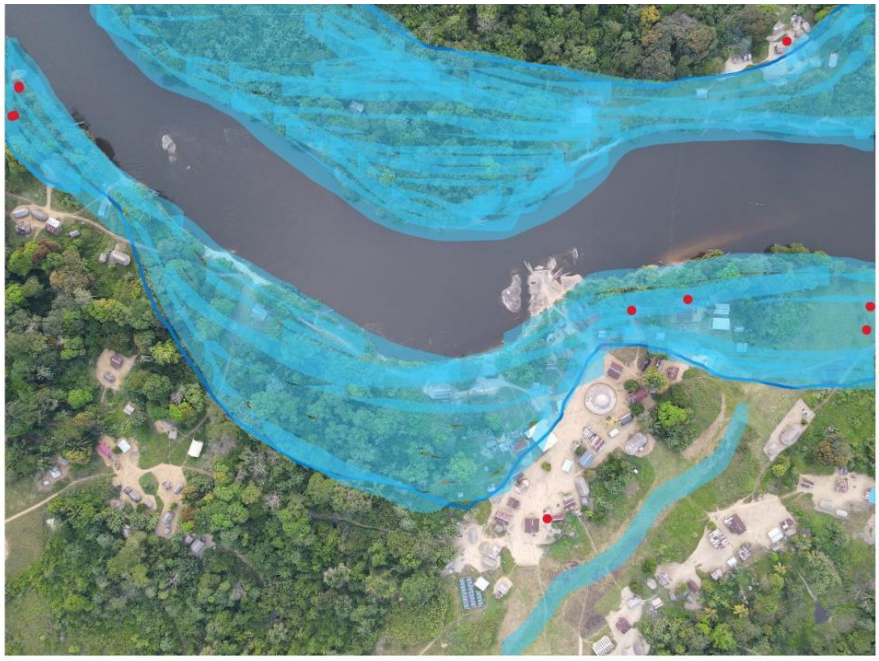

Figure 4. Tepoe flood map: the blue areas represent areas with high risk of flooding and the red dots are strategically placed water tap points.

Table 49: Risk analysis of Palumeu

Village: PALUMEU	Risk analysis			
Key Risk indicator.	Potential negative impact rating.	Likelihood rating	Potential risk rating.	Comments.
1. Climate: heavy rainfall.	High	Likely	Substantial.	• Heavy rainfall can cause a flood risk. • Flooding contaminates their waters, but can also be a potential risk for solar panels or telecom constructions. • Construction workers should consider areas with flood risk.
2. Deforestation and biodiversity loss.	Low	Very likely	Low	The villagers are okay with some deforestation for project building purposes.
3. Noise disturbance.	Low	Likely	Low	Their hunting grounds and animals will most likely not be disturbed.
4. Air pollution: dust production.	Low	Likely	Low	Dust production will most likely not pollute the air significantly.
5. Water pollution: Gold extraction.	Low	Possible	Low	There are no nearby gold extraction activities, north of the village.
				*They say there is a lot of slime in the water, and if they do not wash their fish properly they get sick.
6. Lack of waste management.	Very high	Very likely	High	They do not have an adequate waste management system in place. They throw away old batteries and motors in a ditch.
7. Lack of environmental awareness.	Medium	Possible	Moderate	• There are no waste management plans in place. • They have not mentioned significant recycling or upcycling use.
8. Gender inequality.				Both the men and women are willing to become rangers.

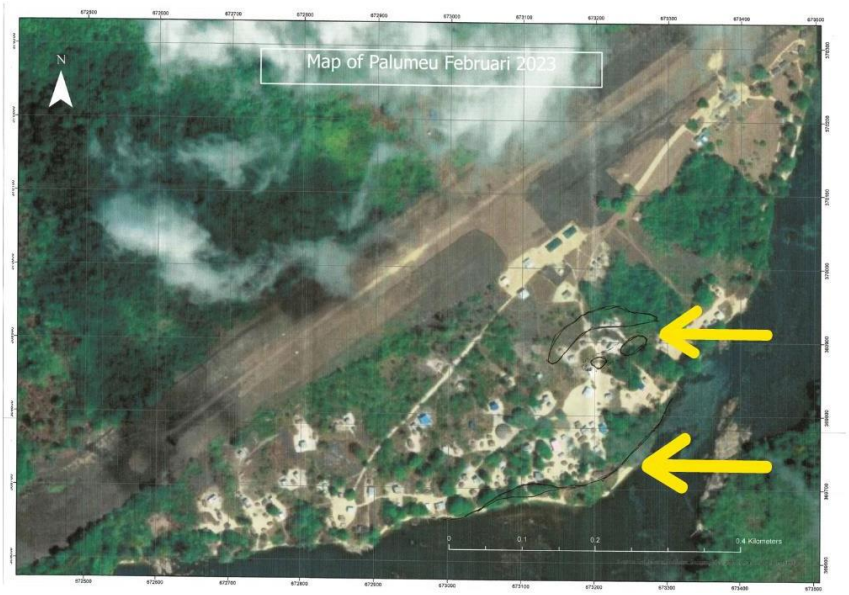

Figure 5: Palumeu flood map: areas with high risk of flooding

Table 50:. Risk analysis of Amotopo

Village: AMOTOPO	Risk analysis			
Key Risk indicator.	Potential negative impact rating.	Likelihood rating	Potential risk rating.	Comments.
1. Climate: heavy rainfall.	Low	Possible	Low	They do not experience flooding. The village is on a higher altitude.
2. Deforestation and biodiversity loss.	Low	Very likely	Low	The villagers are okay with some deforestation for project building purposes.
3. Noise disturbance.	Low	Likely	Low	Their hunting grounds and animals will most likely not be disturbed.
4. Air pollution: dust production.	Low	Likely	Low	Dust production will most likely not pollute the air significantly.
5. Water pollution: Gold extraction.	Low	Possible	Low	There are no nearby gold extraction activities, north of the village.
6. Lack of waste management.	Very high	Very likely	High	• They do not have an adequate waste management system in place. • They throw away old batteries and motors in a ditch. • They use old batteries to start fires.
7. Lack of environmental awareness.	Medium	Possible	Moderate	• There are no waste management plans in place. • They have not mentioned significant recycling or upcycling use.
8. Gender inequality.				Both the men and women are willing to become rangers.

Table 51: Risk analysis of Coeroeni

Village: COEROENI	Risk analysis			
Key Risk indicator.	Potential negative impact rating.	Likelihood rating	Potential risk rating.	Comments.
1. Climate: heavy rainfall.	High	Likely	Substantial.	They experience floods by the river. Flooding contaminates their waters, but can also be a potential risk for solar panels or telecom constructions. Construction workers should consider areas with flood risk.
2. Deforestation and biodiversity loss.	Low	Very likely	Low	The villagers are okay with some deforestation for project building purposes.
3. Noise disturbance.	Low	Likely	Low	Their hunting grounds and animals will most likely not be disturbed.
4. Air pollution: dust production.	Low	Likely	Low	Dust production will most likely not pollute the air significantly.
5. Water pollution: Gold extraction.	Low	Possible	Low	There are no nearby gold extraction activities, north of the village.
6. Lack of waste management.	Very high	Very likely	High	They do not have an adequate waste management system in place.
7. Lack of environmental awareness.	Medium	Possible	Moderate	• There are no waste management plans in place. • They use batteries in the water which may pollute their water that they use for drinking.
8. Gender inequality.				No information. The women were not interviewed.

9 Identification of mitigations in accordance with the Mitigation Hierarchy

The Environmental and Social (E&S) Impact Category, according to the IDB classification and in accordance with the E&S Framework Policy, is Category B and will be validated during due diligence. The direct negative E&S potential impacts are moderate and related to the construction and operation of small-scale energy, water, and telecommunication works. These potential impacts include workplace accidents, exposure to electrical systems and hazardous materials, and negative interactions between workers and local communities. While the bio economy investments will not lead to expansion of the agriculture frontier, a Biodiversity Action Plan will be prepared to achieve net gains for critical habitat values. Given that the project beneficiaries are indigenous communities, the Borrower will demonstrate Free, Prior, and Informed Consent of the participating communities and prepare an Indigenous Peoples Plan. The E&S Risk Rating is High due to the contextual risks of interventions in remote indigenous communities. The Disaster and Climate Change Risk is Moderate due to riverine flood risk and the low levels of criticality of the small-scale infrastructure investments.

The identification of mitigations in accordance with the Mitigation Hierarchy are outlined in the following paragraphs and tables.

9.1 Social Risk Rating and Culturally Appropriate Mitigating Measures / Action Plan

Table 52: Potential positive social impact rating: an overview

Social Key Performance Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawamhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
Socio-cultural community										
1.optimizing their way of life.										
2.engagement method in place.										
3.cultural heritage and -territories maintained.										
Social participation										
4.easy access to the city for family.										
5.feeling supported.										
6.willing to accommodate workers to achieve project goals.										
7.willing to be trained for operation and maintenance.										
8.increased personal development.										
9.increased sense of equal rights.										

10.willing to learn new technologies.										
Socio-economic wellbeing										
11.willingness to work in operation and maintenance.										
12.increased business opportunity.										
13.elevation of existing businesses.										
14.use of new tools.										
Physical wellbeing										
15.improved medical care.										
16.improved health and nutrition status.										
17.improved food security.										
18.improved sense of leisure.										
Emotional wellbeing										
19.improved sense of safety.										
20.less stress.										
Gender equality										
21.More business opportunity for women.										
22.improved physical wellbeing for women.										
23.men having more time for family or household activities.										

Table 53: Positive impact color legend

Legend	
	High positive potential impact.
	Medium positive potential impact.
	Low positive potential impact.
	Not Applicable.
	No information.

Opportunities to enhance positive social impact

Table 54: Opportunities to enhance positive social impact

Potential positive social impact analysis overview.		
The scope that was assessed is whether the KPI's benefit the social group and/or solve a major issue they are dealing with, as verbally stated during Krutu sessions and by socio-cultural assessment of the location in question.		
Key Performance Indicator	**Positive social impact analysis: an overview.**	**Opportunities to enhance this positive impact**
Socio-cultural community		
1. Optimizing their way of life.	-Alalapadu's energy and water needs would be especially optimized. -Apetina water's needs would be especially optimized. -Sipaliwini's energy and water needs would be especially optimized. -Kwamalasamutu would like to optimize in their energy water and telecom systems. -Kawemhakan water needs would be especially optimized. -Kumakapan's electricity, water and energy needs would be especially optimized. -Pelelu Tepoe's water needs would be especially optimized -Palumeu's water needs would be especially optimized -Amotopo's energy and water needs would be especially optimized. - Coeroeni's water needs would be especially optimized	The water needs could be significantly optimized by filtering the mercury from the water in Apetina, Kawemhakan and Kumakapan (consult the environmental safeguards report for more information on this topic).
2. Engagement method in place.	The traditional Krutu is the best practice engagement method for all villages.	The Krutu setting can be used to communicate with the villagers during project building grievances or guidelines for the villagers and their leaders.
3.Cultural heritage and -territories maintained.	Territories for building purposes will be chosen by villagers themselves. No cultural heritage sites will be disturbed. Most villages would still use wood to cook food, except for Kawemhakan where they would prefer quicker electrical cooking. In Alalapadu they would like the following territories not to be entered or used: the cemetery, the school, and the spot reserved for a second landing strip. In Sipaliwni, territories they would not like to be entered are the nature reserve and the cemetery. In Kumakapan they have cultural artefacts in the ground that need to be considered.	Being mindful of territories that are not allowed to be used or entered is an important social safeguard.
Social participation		
4.Easy access to the city for family.	Alalapadu inhabitants noted that calling or reaching family more easily is why they would like the project to be executed as soon as possible. They have family members that live in the city of Paramaribo. In Apetina they already have phones and easy access to the family. In Sipaliwini all the men have phones and half of the women have phones. In Kwamalasamutu they have phones and access to family via ACT's WIFI/telecom.	

	In Kawemhakan they have phones and access via Digicel and telesur. In Kumakapan there is reception but no electricity to charge phones. In Pelelu Tepoe they have phones and access to family via Telesur. In Palumeu they already have phones and access to family via Telesur. In Amotopo not everyone has phones, there is no energy access to charge them. They would like to call family members. In Coeroeni all the male Krutu participants already have phones.	
5. Feeling supported	All villages would feel very supported. They have all been made false promises by various political parties or the government. There is no info on Kumakapan.	False promises made is something to consider when constructing FPIC forms and during project information sessions with villagers.
6.Willingness to accommodate workers to achieve project goals.	All villages are willing to accommodate workers to achieve project goals. However, the men of Alalapadu have made clear they do not want to be deceived and lied to. In Amotopo, the men were very enthusiastic and mentioned they would build a new house specifically to accommodate workers of the IDB project.	
7. Willing to be trained for operation and maintenance.	They are all willing to be trained. Alalapadu and Sipaliwini is open to online training. Most villagers would like to be compensated for minor maintenance services.	Compensating their villagers for maintenance work can be discussed in the village ownership model plan.
8. Increased personal development.	New opportunities for development can occur during training for operation and maintenance of the services. New opportunities for personal development are also there with freed up time from physical manual labor that is necessary to carry water and to hunt for food. All the villages were eager to learn. Pelelu Tepoe and Palumeu noted that they could be even more productive with longer energy access (light at night).	
9. **Increased sense of equal rights.**	The question was hard to answer in Apetina, Sipaliwini, Kwamalasamutu and Palumeu. There was no Krutu in Kumakapan, to gather info. In Kawemhakan, Amotopo and Coeroeni they strongly agree that they would have an increased sense of equal rights. In Pelelu Tepoe they did not find this question applicable, since they already have telecommunications connection and solar power.	
10. Willing to learn about new technologies.	All villages are open to learning new technologies. Apetina is already familiar with the concept of online training. Alalapadu, Sipaliwini, the men of Kwamalasamutu are open to online training. The women of Kwamalasamutu and the people of Coeroeni are neutral about online training. There is no info on Kumakapan. The remaining villages are not open to online training.	In training models, Alalapadu, Sipaliwini and Kwamalasamutu modes of online training or communication could be possible if needed.
Socio-economic wellbeing		

11. Willingness to work in operation and maintenance.	All villages are willing to work for operation and maintenance. In Kawemhakan and Coeroeni there have been Krutu participants that have already volunteered to help (see capacity gap analysis). In Kwamalasamutu they do not want to carry heavy items themselves and would like modern machines like ATV's for that.	Operation and maintenance by local villagers increase community ownership.
12. Increased business opportunity.	With the right support, tourism could be (re-) developed for all villages. In Kumakapan there is an additional potential to become a historical archaeological site and rare tourist attraction. There is also potential for archaeological research.	Tourism and archaeological research can be included in socio-economic models to sustain long term maintenance of the project building objectives.
13. Elevation of existing businesses.	In all villages, improved energy, water and telecom access could improve their businesses. This is because with those services, tourism could be developed that could increase the sales of their local products. They could expand their current businesses such as honey from stingless bees, tea production, woodworks for arts and crafts, ground pepper production and traditional medicine (only in Kwamalasamutu and Pelelutepoe).	
14. Use of new tools.	The women of Alalapadu mentioned they would buy a rice cooker if they had the funds. The men of Kwamalasamutu say they would buy circular saw and a planer to make planks all day. With improved energy and water access all villages would have a better potential for developing tourism. Tourism could sell food to tourists by using tools such as a rice cooker or an electrical cooking stove to more efficiently cook food if needed. Or to have clean water access ready to cook the traditional way.	
Physical wellbeing		
15. Improved medical care.	All villages have a health clinic of the Medical Mission. Only in Kumakapan the people need to go to Kawemhakan's health center. With improved telecom they could reach the Medical Mission quicker. With access to night light, they can better respond to medical emergencies such as births. Improved water access and quality could improve their medical care.	
16. Improved health and nutrition status.	With improved water quality and access they would have improved physical wellbeing (less stomach aches and diarrhea. With closer water access the women would not have to fetch water from the creek or river. There are no freezers in Palumeu, Amotopo and Coeroeni. With improved energy access they could save food in the fridge instead of smoking or barbacotting it.	Apetina has a freezer house. This is a great example of a community ownership model.
17. Improved food security.	They would have improved food security with fridges/ energy access. With quicker access to cleaner water, they could create better food security and safety.	

18. Improved sense of leisure.	Most women would experience an improved sense of leisure with closer water access as they are the ones that fetch water for their families. The women of Sipaliwini already feel a sense of leisure; they used to spend 5 hours fetching water. The men might hunt less with better food security. In general people would like to hear or see the news so they can be up to date with current affairs of other villages and the rest of the world.	ACT-S's initiative of Tareno Media, a radio station for peoples of South Suriname can be broadcasted for the village locations for improved sense of leisure.
Emotional wellbeing		
19. Improved sense of safety.	In general, people would feel safer at night to prevent accidents and to see potentially dangerous animals such as snakes. In Palumeu the Krutu participants stated that they already feel safe. In Kawemhakan they already feel safe at night when they go to bed. In Kumakapan an elderly man feels unsafe because snakes enter his camp and there is no electricity or light at night. Pelelu Tepoe already has light at night, and it makes them feel safer.	
20. Less stress.	Especially the women who fetch water would have less stress with improved water access and less drinking water-related illnesses. Some men say they would also experience less stress if there was better food security.	
Gender equality		
21. More business opportunity for women.	With the right support and mindfulness of project investors and other organization, the following business opportunities could be created for women: • Direct business opportunity: The women are willing to work for operation and maintenance of the projects. If the women are actively included in gender-environment nexus during project building work and are given compensation for contributing to the waste management and recycling team of building workers or other site workers. • Indirect business opportunity: Improved energy and water access could potentiate the development of tourism which could lead to more business opportunity for women. They could serve as tour guides, sell their arts and crafts, honey products or cook meals. Improved energy and water access could lead to investment opportunities in the field of bio economy, such as processing teas or the processing of cinnamon bark into bottled essential oils.	Women empowerment can improve community ownership models.
22.Improved physical wellbeing for women.	In Sipaliwini women do not have to fetch water. Improved water quality improves their health. There is no info on Kumakapam. Kwamalasamutu has tap water. There is no info on the women of Coeroeni.	
23. Men having more time for family or household activities.	Applicable already in Tepoe. Where they have light at night which lead to the men doing wickerwork and other household activities.	

Table 55: Social Risk analysis rating: an overview

Social Key RIsk Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawamhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
Socio-cultural community issues										
1.Indecision about community ownership models.										
2.Temporary displacement due to project building activities.										
Social isolation										
3.Unequal distribution of water, energy or telecom services.										
4.Lack of local capacity and expertise to sustain maintenance or operation of the systems.										
5.Lack of trust due to past false promises.										
Socio-economic distress										
6.Lack of paid jobs or employed villagers to upkeep ongoing costs.										
7.Inability to buy freezers, electronic devices or other eletrical tools										
Physical distress										
8.Physical injury while supporting project objectives.										
9.Noise disturbance at critical locations.										
10.Distance for fetching water too far, especially for the elderly.										
11.Dust production during building activities.										
Emotional distress										
12.Worries and stress about generating the finances for the projects.										
13.Temporary distress due to project building activities.										
Gender inequality										
14.Gender inequality in the ability to pay for and maintain services.										
15.Gender inequality in potential job creation.										

Risk analysis colour legend:

Table 56: Risk analysis colour legend

Legend	
	High risk.
	Substantial risk.
	Moderate risk.
	Low risk.
	Not Applicable.
	No information.

Recommended safeguard policies and social best practices

For all risks assessed the recommended risk mitigation strategy is to absorb or transfer the risk by reducing these to ALARP by following the recommended safeguard policies and social best practices outlined in table 57 on the next page.

Table 57: Recommended safeguard policies and social best practices

Potential risk analysis.		
The scope that was assessed is whether the KPI's damage the social group, as verbally stated during Krutu sessions and by socio-cultural assessment of the location in question.		
Social KRI	**Risk analysis: an overview.**	**Recommended safeguard policies and social best practices.**
Socio-cultural community issues		
1.Indecision about community ownership models.	In Alalapadu there is a moderate risk for indecision; they already have community model where they gather money to buy diesel oil for the generator, however they need more Krutus to decide if everyone should pay or only the financially strong ones. In Apetina there is a low risk for indecision; they said they will pay together. In Sipaliwni there is a low risk of indecision. They want to see if they can pay first, if not they would go to ACT or the government for help. In Kwamalasamutu there is moderate risk for indecision; some say only those that use it have to pay for it, others say everyone will have to pay. The women say they would need a social affairs person to gather and manage the money. In Kawamhakan there is a moderate for indecision: they said they would need some further discussions to decide whether every household would help pay. There is no info on Kumakapan. In Pelelu Tepoe there is a low risk for indecision. They already have a solar panel. For additional systems they would like to set money aside for people that cannot pay. In Palumeu there is a moderate risk for indecision. They say that they have low level of income and would need to look for outside funding. They said for the elderly without income could not pay but they would cover it as a community. In Amotopo there is low risk for indecision; they will gather money in a village money pot to cover the costs. In Coeroeni there is a low risk for indecision: they are clear on paying together as a community.	Krutus are needed on a village level to discuss financial ownership models that fit their village. Consent forms that state that they are aware that the operation and maintenance costs are their responsibility, use audio recording if possible. In general, community financial ownership models seem the best fit for most villages.
2.Temporary displacement due to project building activities.	Is unlikely to occur, the local Indigenous peoples will lead the projects workers to the locations in the village where they could do building work.	

Social isolation		
3.Unequal distribution of water, energy or telecom services.	In Apetina UNICEF prioritized water for the school. In Palumeu only the tourism lodge has access to a clean water well. In general, there is no local technical expertise present.	Inclusion of every household, sex and age would be a recommended good practice as a social safeguard. Water connection at the household level would be ideal. At minimum, be mindful of the distance of water tap sites for the weaker persons in the village. To increase ownership and long-term sustainability of the projects it is recommended to put significant effort into training programs for both men and women focusing on capacity building.
4.Lack of local capacity and expertise to sustain maintenance or operation of the systems.	In Apetina they have people for minor maintenance for their generator and telecommunications service. They already get technical expertise from the city. In Kawamhakan there might be some solar panel expertise and lot of Krutu participants want to help with the solar panel building and maintenance. In Kumakapan there are not a lot of (young) people in the village. In Pelelu Tepoe, they have strategically placed water tap points. However, it was not working at the time of the interviews. This indicates a lack of local capacity to fix the problem. In Palumeu their generator was broken for two years and they did not have the means or expertise to fix it.	Substantial efforts need to be put into training programs for women and men.
5.Lack of trust due to past false promises.	There is no info on this in Kumakapan and Pelelu Tepoe. In general, at most locations false promises were made by political parties and government bodies. The lack of trust is substantial in Alalapadu where they made the following statement: “We have a new law; if people come here and lie to us, we will put them back on the plane.”	Within the informed consent process, considerable effort needs to be taken to inform the inhabitants of the project phases and what they can expect to happen next.
Socio-economic distress		
6.Lack of paid jobs or employed villagers to upkeep ongoing costs.	In most villages, the inhabitants have expressed that there might not be enough income-generating activities to meet the potential maintenance and operations costs. Worries about these finances are significant.	Stimulating the local economy and creating new livelihoods with improved energy, water and telecommunications access will ensure the long term sustainability of the project building objectives.
7.Inability to buy freezers, electronic devices or other eletrical tools.	Some villages have freezers present, albeit not with enough capacity to freeze food for the entire population. In Apetina there has been a solution where they designed a freezer house where people pay a fee to make use of it.	The Apetina freezer house model is interesting to develop with fundraising as a model in each village.

Physical distress		
8.Physical injury while supporting project objectives.	Physical injury during building work is not applicable right now, but could occur. In Kwamalasamutu they are not willing to carry heavy items, they say they need an ATV car for that.	Within the FPIC mechanism, what they could expect to include with physical manual labor during project building objectives is recommended.
9.Noise disturbance at critical locations.	In Apetina they would not be okay with noise disturbance close to the school or church during active hours. Sipaliwni. Low. Are okay. In Kwamalasamutu they would like no noise disturbance during school time. In Pelelutepoe they would not like noise distrubance in the middle of the village, close to the school or at the Krutu oso. The men say building work can be done on one end of the airstrip. In Palumeu they would not be okay with noise disturbance close to the school yard or in the middle of the village. There is no info on Kumakapan and Coeroeni. The inhabitants of the rest of the locations are okay with some noise disturbance.	Grievance mechanisms are expressed via Krutus. The noise disturbance limits are recommended to be considered during project building work.
10.Distance for fetching water too far, especially for the elderly.	In Amotopo they have noted that they actively fetch water for the elderly in the village. In Apetina they would not be okay with dust production close to their school. In Kwamalasamutu they would not like dust production close to a person that is ill. In Pelelu Tepoe they would not like dust production close to the school or at the Krutu oso. In Palumeu they would not allow dust production close to the school or in the middle of the village. There is no info on Coeroeni and Kumakapan. The inhabitants of the rest of the locations are okay with some dust production.	Including and considering all households, including the elderly, is recommended.
Emotional distress		
12.Worries and stress about generating the finances for the projects.	Most villages have worries about covering the potentials costs. There is no info on Kumakapan and Coeroeni.	In the FPIC process, worries of villagers and their leaders should be addressed. It is recommended to give an estimate of the potential maintenance and operational costs.
13.Temporary distress due to project building activities.	Most villages are okay with some temporary distress to achieve project outcomes. There is no info on Kumakapan and Coeroeni.	The pleminary FPIC process has shown that they would be okay with some temporary distress due to project building objectives.

Gender inequality		
14.Gender inequality in the ability to pay for and maintain services.	Gender equality is an ongoing process and is something to be taken into account for all villages. In relation to project building objectives, not all villages have female rangers that could join the waste management teams during project building objectives. Indirectly though, with improved energy, telecom and water access there could be potential job creation in the field of tourism and bioeconomy such investors in tea or ground pepper production. Additionally, most women spend a lot of time fetching water (not in Sipaliwini) the men tend to have more job opportunities. Improved water access would give women more opportunities to earn money.	Gender equality and women empowerment is recommended to be built-in in all project phases. Creating jobs and compensating women during the project work is recommended. Stimulating women's livelihoods that can be potentiated with improved energy, water and telecommunications access is recommended.

9.2 Social safeguards: a three-phase model

From the SIA and SRA, a three-phase social safeguards model has been designed to ensure the long-term sustainability of the solar, water and telecommunications infrastructure projects. Within this model, the relevant safeguards have considered: action plans, ownership models and social best practice.

The social safeguard model includes the following phases:

Phase 1. Free Prior and Informed Consent (FPIC) safeguards.

A. *Early FPIC responses.*
B. *False promises and informed consent forms.*
C. *Dust production and noise disturbance.*
D. *Safeguarded territories.*
E. *Grievance mechanism.*
F. *Potential physical injury.*

Phase 2. Community Capacity Building (CCB) safeguards: technical capacity.

G. *Capacity gap analysis.*
H. *Technical capacity training programs.*
I. *Gender equality: women empowerment.*

Phase 3. CBB safeguards: socio-economic capacities and ownership models.

J. *Socio-economic factors to consider willingness to pay potential, current potential to pay and future opportunities that can be potentiated with improved energy, water and telecommunications access.*
K. *Financial ownership models to sustain operation and maintenance costs.*

Ad Phase 1. Free Prior and Informed Consent (FPIC) safeguards

A. Early FPIC responses

The principle of Free, Prior and Informed Consent (FPIC) refers to the right of Indigenous peoples to give or withhold consent for any action that would affect their lands, territories or rights. Legally speaking there is no official recognition in Suriname's land law that states that native groups own the land they live on. However, a constitutional amendment and a draft Law on Collective Rights of Indigenous people and Tribal groups is composed by a land rights management team consisting of representatives of the government and traditional communities of Indigenous people and Maroons which addresses their right to self-determination, cultural integrity, FPIC and the composition of traditional authorities.

By starting the FPIC process early in the engagement process, community ownership and responsibility is encouraged and built-in early on. In this report, early FPIC analysis has been analyzed via the positive impact analysis report with an overview of 23 KPI's in table 58. In general, all inhabitants showed significant willingness to participate in IDB's solar, energy and telecommunications projects, are excited about the opportunity and think that the projects would have a significant beneficial effect on their social group. Table 58 shows a quick overview of the preliminary FPIC considerations per village as stated during initial Krutu sessions.

Table 58: Preliminary FPIC per location

Preliminary FPIC	
Village	**FPIC**
Alalapadu	The villagers are very excited about the project goals. They strongly agree that solar energy, water and telecommunications networks will be good for them and their village. However, they noted that they do not want people to come to their village and make false promises anymore.
Apetina	They say they want and need cleaner water alternatives than creek or river water and would prefer around-the-clock electricity. They strongly agree that the projects (solar panels and water infrastructure improvement) will be good for their villages.
Sipaliwini	They agree that the projects would be good for their village.
Kwamalasamutu	They strongly agree that the projects would be good for their village.
Kawemhakan	The villagers are very excited about potential project outcomes and would feel very supported. They strongly agree that these projects would be good for their village.
Kumakapan	The villagers want and need electricity and clean drinking water.
Pelelu Tepoe	They agree that the projects will be good for their village. They want and need better water quality and access and around the clock energy.
Palumeu	They agree that the projects could improve their lives.
Amotopo	They strongly agree that the projects will be good for their village although they are worried about the costs. The men were very enthusiastic and mentioned they would build a new house specifically to accommodate workers of the IDB project.
Coeroeni	They agree that access to energy would be good.

B. False promises and informed consent forms

Table 59: False Promises rating

Social Key Risk Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawamhakan	Kumakapan	Pelelutepoe	Palumeu	Amotopo	Coeroeni
5. Lack of trust due to past false promises.										

From KRI number 5 it is clear that especially in Alalapadu the inhabitants have been marked by previous false promises of political parties and government bodies. To minimize social conflict, it is recommended to clearly explain the project phases and objectives to the inhabitants and their leaders and to explain the project's conditions. The consent form in table 60 is a model to be used during Krutu FPIC discussions before starting project building.

The traditional leaders make the final decisions and would need to decide if the local government board supervisors should be included in the FPIC process. In addition, it is recommended to actively inform villagers in a Krutu setting or, at minimum, to interview a sample percentage of villagers to test their informed consent about their head captains' final decision.

Table 60: Model consent form

Krutu/interview date:		
I hereby declare that: **I have been informed about the nature, methods and purpose of the IDB projects.** **that the inhabitants of [*location name*] have been informed about the nature, methods and purpose of the IDB projects.** **(Optional) Krutu date:** **Location:** **I hereby give [*organization name/ person's name*] consent to install solar panels, telecommunication networks and/or water infrastructure in [*location name*]** **I will allow project workers to enter the village for the discussed time frame to perform building work.** **I understand that operational and maintenance costs are not covered by IDB/ project investors and their working partners [*organizations name/ person's name*].**		
Location:		
Name(s) of translator(s):		
Signature of translator(s):		
Name.	**Traditional leader role: Granman/ Captain/ Basja.**	**Signature.**
Name.	**Governmental bodies: Board supervisor/ assistant** **board supervisor.**	**Signature.**
Name of inhabitant. **"I hereby declare to have been informed on IDB's project goals".**		**Signature.**
Notes of discussions		

C. *Dust production and noise disturbance*

Table 61: Dust production and noise disturbance rating

Social Key Performance Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawamhakan	Kumakapan	Pelelu Tepoe	Palumeu	Amotopo	Coeroeni
9. Noise disturbance at critical locations.										
11. Dust production during building activities.										

KRI number 9 and 11 have shown the following instructions from inhabitants in relation to possible dust and noise production: In Apetina they would not be okay with dust production or noise disturbance close to their school during active hours. In Kwamalasamutu they would not like dust production close to a person that is ill. In Pelelu Tepoe they would not like dust production or noise disturbance close to the school or at the Krutu oso. In Palumeu they would not allow dust production or noise disturbance close to the school or in the middle of the village. There is no info on Coeroeni and Kumakapan. The inhabitants of the rest of the locations are okay with some dust production or noise disturbance.

D. *Safeguarded territories*

In Alalapadu they would like the following territories not to be entered or used: the cemetery, the school, and the spot reserved for a second landing strip. In Sipaliwni, territories they would not like to be entered are the nature reserve and the cemetery. In Kumakapan they have cultural artefacts in the ground that need to be considered.

E. *Grievance Mechanism*

In all village the traditional engagement method is the Krutu format. In the occasion of grievances during site visits, the inhabitants stated that they would notify project workers via their traditional leaders.

Table 62: Grievance mechanism per village as stated during Krutu sessions

Grievance mechanism	
Village	Grievance
Alalapadu	The villagers will let the captain or basja know if grievances should occur.
Apetina	The villagers would let the head captain know and then the remaining captains or basjas.
Sipaliwini	They would notify the traditional leaders, first the captain, then the basjas.
Kwamalasamutu	They would let the granman know.
Kawemhakan	They would let the granman or the head captain know.
Kumakapan	Not answered, but most likely the current village leader who wants to become appointed as Basja (their head captain died 4 years ago).

Pelelu Tepoe	They would let the captain know, then the village management.
Palumeu	They would let the captain know.
Amotopo	They would let the captain and the traditional leaders know. The captain will see if everyone agrees, and the traditional leaders will decide in the end.
Coeroeni	They would let the captain know and he would express the concerns to the builders.

F. Potential physical injury

Table 63: Potential physical injury rating

Social Key Performance Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawamhakan	Kumakapan	Pelelu Tepoe	Palumeu	Amotopo	Coeroeni
Physical distress										
8. Physical injury while supporting project objectives.										

KRI number 8 shows that the inhabitants of all locations are mostly willing to help with project building objectives. In Kwamalasamutu they do not want to carry heavy items themselves. In the case of medical emergencies, there is a Medical Missions per village that will need to be contacted (except for Kumakapan).

Ad Phase 2. Community Capacity Building (CCB) safeguards: technical capacity

Table 64: Community Capacity Building (CCB) safeguards: technical capacity rating

Social Key Performance Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawamhakan	Kumakapan	Pelelu Tepoe	Palumeu	Amotopo	Coeroeni
4. Lack of local capacity and expertise to sustain maintenance or operation of the systems.										

G. Capacity gap analysis

From KRI number 4 it is clear that there is a gap in local technical capacity (see the overview in table 65).

Table 65: Local capacity gap analysis for solar, water and telecommunications infrastructure

Capacity gap analysis				
village	**Solar energy**	**Water**	**Telecommunications**	**Comments**
Alalapadu				There is no technical capacity already present among villagers.
Apetina	Roy Meliwa does the maintenance of the village generator voluntarily.		Kenneth Welisiwen is responsible for telecom maintenance and Gilbert Koemaja for electrical maintenance. They only do cleaning maintenance. Systematic technical maintenance is done by people from the city. Gilbert Koemaja is not in the village right now.	There is potential capacity for minor maintenance work for the solar and telecom projects.
Sipaliwini	There is a working solar panel in the village. Who maintains it, is unknown.		ACT maintains their WIFI/telecom connection.	
Kwamalasamutu				There is no known local technical capacity
Kawemhakan	"One of the villagers works for a small solar panel company in French-Guyana, he could help", Miep Doos, (Head Captain) In addition, Krutu participants Nasa, Allianna and Glenn would like to work on the solar panels as well.			
Kumakapan				There is no local capacity and there are no young people daily present in the village.
Pelelu Tepoe			There is no local technical capacity for the telecom service, but they do clean maintenance in the area around the mast.	They already have solar and telecom systems. They have water infrastructure with water from a crane, however, was not working. Nobody in the village seems to be able to fix it and the women must carry water from the river again.

Palumeu **Amotopo**			Madena Senkerija does gardening maintenance around the telecom installations. ACT rangers, Anderson and Usari maintain the telecom system.	
Coeroeni		For the water system the following people would like to contribute: Lesley, Tukaram, Alvin, Eli, Alex Toehamji, Wono Saiseke.	For the telecom system, the following people would like to contribute: Telecom: Orfeo Nanasaike and Windel Sinkora.	

H. Training programs

It is recommended to absorb this risk but to increase ownership and long-term sustainability of the projects by putting significant effort into capacity building training programs for both men and women. These trainings can happen 'on the job' during project building work or during periodic refreshers to help build capacities further. Most villages prefer in person training, although inhabitants of Alalapadu and Sipaliwini are open to online training.

These trainings can include basic minor maintenance work such as cleaning the solar panel or telecommunications areas, but also technical maintenance work such as plumbing techniques, pipeline repairs and technical solar panel instructions.

I. Gender equality: women empowerment

Actively including women in all areas of project phases will increase community ownership and long term-sustainability of the projects. Since women carry water for the village, it is recommended to include them in the technical use of new water systems. Women can also be included in the gender-environment nexus by offering jobs for waste management and recycling work during site visits to minimize negative environmental impact.

Ad Phase 3. CCB safeguards: socio-economic capacities and ownership models

J. Socio-economic factors to consider

Table 66: Socio-economic factors rating

Social Key Performance Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawamhakan	Kumakapan	Pelelu Tepoe	Palumeu	Amotopo	Coeroeni
Socio-economic distress										
6.Lack of paid jobs or employed villagers to upkeep ongoing costs.										
7.Inability to buy freezers, electronic devices or other electrical tools.										
Emotional distress										
12.Worries and stress about generating the finances for the projects.										

The KRI number 6, 7 and 12 show that there are socio-economic factors that need to be addressed in order to sustain the projects long term. From the preliminary Krutu sessions, the following socio-economic factors were gathered: the willingness to pay, their current potential to pay and the potential future economic activities that can be potentiated.

Table 67: Socio-economic factors to consider

Socio-economic factors			
Village	**Willingness to pay**	**Current potential to pay: Main economic activities to cover operational costs.**	**Potential future economic activities and use of new tools with improved energy, water and telecom access.**
Alalapadu	They still need to figure out how they could pay for it.	Both men and women are employed at the Tuhka nut factory.	Tourism They do not see selling traditional medicine as a business opportunity. **Bio economy opportunities include: stingless beekeeping, tea farming and ground pepper production.**
Apetina	The men say that there are enough people in the village with income to help pay for the costs. If it is not enough they would ask ACT or the government for help.	The women say that they have income from arts and crafts, selling wild meat and fish and government official work, ranger work, traditional clinic assistants and work in tourism.	They already do tourism work but this can be developed further with improved water access and quality. They see selling medicinal products as a potential business opportunity. **Bio economy opportunities include: stingless beekeeping, tea farming and ground pepper production.**

Sipaliwini	Ideally, they said they would ask ACT, the government or other NGO's to help cover the costs, until enough villagers have income to manage it. They are worried about how much everything would cost and if they would be able to do it by themselves. Especially the women said they would work to try to cover the costs themselves.	Overall their means of income are via: ACT rangers, health assistants, government work (gardeners, station chef LVT, BO's, captains, basjas), artisans, tea production and animal trade.	The women said they could try to sell wild meat to help cover operational and maintenance costs. Villagers see selling medicinal products as a potential business opportunity. There is an opportunity to further develop tourism in the village. **Bio economy opportunities include: ground pepper production, stingless beekeeping and tea farming.**
Kwamalasamutu	They mentioned they would rather family members that come to visit them and tourists help pay for the operational and maintenance costs. On the other hand, they do not want to be dependent on outside funding.	Selling honey from stingless bees, tea production and selling traditional medicine.	Tourism would have an opportunity to elevate their business such as jewelry making for the women. But the women say tourist don't always want to buy from them, and tourists don't like to be without water and electricity for long. The men say they already sell medicine to people and they can come to their clinic to be treated. Wutah, Shaman; In 2008 somebody who had prostate cancer came from abroad (French Guiana) About 5 people per year call from the city. Maroons also called him for medicine. He then sends the medicine against payment. If people come for work, they seek him for medicine. He mentioned that in the last IDB mission he also gave advice and sold medicine to people. With improved access to clean water, electricity and telecom there is a good possibility more tourists will come and their ability to sell jewelry and medicine will increase. ● The men also say that with 24/7 electricity they would buy a circular saw and a planer to make planks all day. We want to work so we can support our kids. "We want learn more, we want to know more." ● Men would want to sell souvenirs like a bow and arrow, hunted game or hustle in other ways to make money. Bio economy opportunities include: other types of tea farming.

Kumakapan		There is a Chinese store in the village.	Kumakapan. Economic potential. ● There is a potential to become a historical archaeological site and rare tourist attraction. ● There is potential for archaeological research. ● There is also potential for redevelopment of the settlement as a stopping area for travelers.
Pelelu Tepoe	They are willing to pay for it if they have income. Especially the women. Because of a lack of income, they would prefer the projects to be subsidized.	There are income streams in the village, but for less than half of the villagers. The income streams are: Government people, trading in game and fish, trading in animals and arts and crafts, NGO workers, Stingless beekeepers, selling ground peppers and tea and traditional medicine. Government work, the men and women sell crafts. The men also trade animals and sell meat and fish to Paramaribo, but that is a seasonal occurrence.	● They are open to the development of tourism. But they say research must be done to see whether it is feasible to do on their own. ● They already sell medicinal products to outsiders. ● Tourism was their primary source of income before covid-19: There is tourism lodge and METS travels and tours has collaborated with the village before. However, since covid-19 business has slowed down significantly leading to less job opportunity in the field of tourism.
Palumeu	They are willing to contribute what they can. At the same time they do not want to depend on outside funding, because they know the government does not always have money available for them.	Both men and women say that there was more income when the METS was active. But due to covid-19 everything has stopped, so there is loss of income.	There is an opportunity for redevelopment of tourism in the village. ● Knowledge of traditional medicine is waning. Most of the villagers have no knowledge of the use of medicinal plants. The interviewed villagers are

K. Financial ownership models to sustain operation and maintenance costs

Table 68: Community ownership rating

Social Key Performance Indicator	**Alalapadu**	**Apetina**	**Sipaliwini**	**Kwamalasamutu**	**Kawamhakan**	**Kumakapan**	**Pelelu Tepoe**	**Palumeu**	**Amotopo**	**Coeroeni**
Socio-cultural community issues										
1. Indecision about community ownership models.										

From KRI number 1 it is clear that the villages need some more time to discuss the practical application of their ownership models. This risk can be reduced to ALARP (As Low as Reasonably possible) by presenting the following 4 solutions to the village inhabitants and their traditional leaders:

1. Community ownership: It is recommended that villagers use a community ownership model where the costs are shared by all households and managed in a community fund or money pot. The money is recommended to be primarily allocated towards small and technical maintenance of the systems, preferably by locals and additional technical maintenance from expertise in Paramaribo. By giving estimates of potential costs per year, a minimum fee per household can be calculated. The fund can also serve as savings for a community freezer house that could ensure food security options for villagers.
2. A fixed percentage of the profits from local livelihoods such as beekeeping, arts and crafts and various tea farming practices and traditional medicine clinics could be allocated towards the community funds to sustain the operation and maintenance costs.
3. If the villages are still without enough financial means to cover the costs, partial risk transference can be lobbied for at governmental agencies. Diesel oil for village generators are usually funded by the government, therefore it could be discussed if this money could be used towards operational and maintenance costs instead.
4. Future developments to sustain maintenance costs could include a bio economy- tourism model in which the tourist would need to contribute a minimum fee to the village community funds.
5. ACT-G is currently working on a feasibility study for tourism in ACT-G collaborating villages.

Whether these community funds are managed via bank accounts or via cash, currency can be decided by the villagers and their traditional leaders. With cash currency there would need to be local administrative capacity and possibly, training.

9.3 Environmental Risk Rating and Culturally Appropriate Mitigation Measures / Action Plan

Table 69: Potential positive impact rating

Potential positive Impactrating	Description	Proceed with:
High potential positiveimpact.	Certain to benefit the environment and/orsolve big (socio-) environmental issues.	Guidelines to enhance or optimize this potential positive impact or opportunity should be formulated.
Medium potential positiveimpact.	May benefit the environment and/or mayminor (socio-) environmental issues.	Guidelines to enhance or optimize this potential positive impact or opportunity should be formulated.
Low potential positiveimpact.	Could benefit the environment but may notsolve (socio-) environmental issues.	Guidelines to enhance or optimize this potential positive impact or opportunity should be formulated.

A risk analysis was carried for these KRI's by:

- Rating the potential negative impact (table70).
- Rating the likelihood of this negative impact; likelihood is the level of probability that a risk willoccur (table 71).
- Evaluating the risk with a risk matrix (risk= potential negative impact x likelihood) (table 72). Thepotential risks are defined by 4 categories: low risk, moderate risk, substantial risk and high risk. The risk per category is described in table 57, with subsequent plan of actions.

Table 70: Potential negative impact rating description

Potential negative Impact rating	Description	Proceed with:
Very high potential negative impact	Irreparable damage to the environment and/orsocio-environmental indicators.	Risk analysis
High potential negative impact	Significant damage to the environment and/orsocio-environmental indicators.	Risk analysis.
Medium potential negative impact	Considerable damage to the environment and/orsocio-environmental indicators.	Risk analysis.
Low potential negative impact	No or insignificant damage to the environment and/or socio-environmental indicators.	Risk analysis.

Table 71: Likelihood rating description

Likelihood	Description
Very likely	Certain to occur.
Likely	Can occur.
Possible	May occur.
Unlikely	Almost never occurs.

Table 72: Risk matrix description

Likelihood- very likely	**Moderate**	**Substantial**	**High**	**High**
likely	**Low**	**Moderate**	**Substantial**	**High**
possible	**Low**	**Moderate**	**Moderate**	**Substantial**
unlikely	**Low**	**Low**	**Low**	**Moderate**
Negative impact	**Low**	**Medium**	**High**	**Very high**

Table 73: Environmental risk rating and mitigation measures / actions description

Risk rating	Description	Mitigating measures /Actions
High	**Solar energy, water or telecommunications infrastructure activities may cause irreparable direct or indirect damage to Indigenous peoples' land, air and water.** **The environment causes significant damage to project building objectives.** **The socio-environmental factors 'lack of environmental awareness' or 'gender inequality' impede with the delivery of mitigation measures.**	**Risk mitigation: The risk can be avoided, reduced to as low as reasonably practicable (ALARP), or transferred.** **The risk is not acceptable.** **Safeguards should be formulated.**

Substantial	**Solar energy, water or telecommunications infrastructure activities may cause significant direct or indirect damage to Indigenous peoples'land, air and water.** **The environment may cause significant damageto project building objectives** **The socio-environmental factors 'lack of environmental awareness' or 'gender inequality' can impede with the delivery of mitigation measures.**	**Risk mitigation: The risk can be avoided, reduced to as low as reasonably practicable (ALARP), transferred or retained.** **The risk may be acceptable.** **Safeguards should be formulated.**
Moderate	**Solar energy, water or telecommunications infrastructure activities may cause considerable direct or indirect damage to Indigenous peoples' land, air and water.** **The environment may cause considerable damage to project building objectives.** **The socio-environmental factors 'lack of environmental awareness' or 'gender inequality' may impede with the delivery of mitigation measures.**	**Risk mitigation: The risk can be avoided or reduced to as low as reasonably practicable (ALARP), transferred or retained.** **The risk may be acceptable.** **Safeguards should be formulated.**
Low	**Solar energy, water or telecommunications infrastructure activities cause no or insignificant damage to Indigenous peoples' land, air and water.** **The environment causes no or insignificant damage to project building objectives.** **The socio-environmental factors 'lack of environmental awareness' or 'gender inequality'do not impede the delivery of mitigation measures.**	**Further risk-reducing measures may not be needed.** **Guidelines could be formulated.**

9.4 Discussion of rated environmental KPIs per village

In this paragraph the environmental KPIs and KRIs will be discussed and an overview for potential positive environmental impact and risks will be given for all locations analyzed to formulate relevant safeguards and guidelines.

The following best practice environmental KPI's were relevant for the purposes of this project:

1. Forest and biodiversity protection.
2. Clean water.
3. Clean energy.
4. Waste management systems.
5. Use of natural resources.
6. Environmental awareness.
7. Gender equality.

The potential positive impact of solar energy, water and telecommunications infrastructure was assessed to see where there were opportunities for improvement. In the general scope of the analysisthe following is considered:

- The level of potential positive impact to the Indigenous peoples' environment, namely their land, airand water.
- The level of potential positive impact of socio-environmental factors, namely environmentalawareness and gender equality on project building objectives.
- Formulation of guidelines to enhance positive impacts.

Table 74: Potential positive environmental impact rating

Potential positive Impactrating	Description	Proceed with:
High potential positiveimpact.	Certain to benefit the environment and/orsolves big (socio-) environmental issues.	Guidelines to enhance or optimize thispotential positive impact or opportunity should be formulated.
Medium potential positive impact.	May benefit the environment and/or mayminor (socio-) environmental issues.	Guidelines to enhance or optimize thispotential positive impact or opportunity should be formulated.
Low potential positiveimpact.	Could benefit the environment, but maynot solve (socio-) environmental issues.	Guidelines to enhance or optimize thispotential positive impact or opportunity should be formulated.

For the assessment of the potential positive environmental impact, the following legend applies:

Table 75: Positive impact colour legend

Legend	
	High positive potential impact.
	Medium positive potential impact.
	Low positive potential impact.
	Not Applicable.
	No information.

Table 76: KPI 1-Forest and biodiversity protection

Key PerformanceIndicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
1. Forest and biodiversityprotection.										

Scope

The scope that was assessed with this KPI was whether there are active rangers in that region, or if interviewed villagers are interested in becoming rangers, could benefit the environment.

Active protection of their forests and land is a community activity. ACT offers a ranger program that guides and supports the Indigenous peoples in the protection of their forests and biodiversity, such as endangered species. Project building activities might require some deforestation, therefore an existingranger team or willingness of the community to participate in forest protection is necessary to assess.

Potential positive environmental impact analysis

From Krutu sessions it was clear that villagers are aware of active ranger participants in Alalapadu, Apetina, Sipaliwini, Pelulu Tepoe, Palumeu, Amotopo and Coeroeni. In fact, in all of these villages, more people want to join the ranger team. Tepoe shines in their existing ranger team activities, as the villagers are aware that the rangers are recycling old batteries, cans and bottles with support of ACT-G.

In Kwamalasamutu and Kawemhakan, however, the interviewed villagers stated clearly that they have no interest in forest protection activities. Kwamalasamutu does have an ACT ranger team active, but none of the Krutu participants wanted to become rangers (male and female), the men want to be able to sell animals freely. In Kawemhakan both the men and women pressed that they absolutely do not want rangers in their village. Kumakapan did not have a Krutu interview, but personal interviews due to the small amount of people present at the settlement at the time of the interview.

Opportunities to enhance the positive impact.

IDB project and building workers can consult and ask for support from the local rangers in Alalapadu, Apetina, Sipaliwini, Palumeu, Amotopo, Coeroeni and Kwamalasamutu especially in Pelulu Tepoe where the local villagers already have the recycle 'know-how'. IDB can collaborate and consult with ACT-G and their ranger teams in order to enhance the positive impact of protecting Indigenous natural environment during building work and site visits.

Table 77: KPI 2 Clean water

Key Performance Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
2. Clean water.										

Scope

The scope that was assessed with this KPI is whether water infrastructure projects would benefit the environment or solve (socio-) environmental issues. Improvement in quality and access of water to the villagers is assessed as verbally stated by the villagers themselves during Krutu sessions and by observational assessment.

Potential positive environmental impact analysis

Clean water and sanitation are part of UN's sustainable development goals. Developing water infrastructure and increasing the quality and access of water would not only have a significant positive impact on the Indigenous peoples, but also on their environment. The rivers of the Amazon rainforest have significant biodiversity, many of which is yet to be discovered. Water pollution has severe effects on all living organisms.

In Kwamalasamutu there is tap water from spring water and in Tepoe there is a crane with taps at various points in the village. Despite this, the people still use river water or rainwater as their main source of drinking water. Palumeu has a water well for the tourist lodge, which is not accessible for the rest of the village and the people still depend on rain and river water like the remaining villages. The need for better quality of water was made very clear in the Krutu session with the men in Coeroeni. They say a water system needs to come as soon as possible. 2024 is too long of a wait, "Maybe we won't be able tomake it till' that time".

In general, most villagers say they can get sick from river water more easily than from rainwater. They get sick with stomach pains and diarrhea, especially when the river water is uncooked. Clean water systems are certain to benefit the environment and would solve a big socio-environmental issues of the Indigenous peoples.

Opportunities to enhance the positive impact

There is an opportunity to engage with rangers or other villagers to do water quality measurements during on site building work for the water infrastructure project to raise environmental and sanitation awareness. The ACT rangers have been trained to do this already, but on-site participation could enhance the positive environmental education effect of site visits.

Clean drinking water is the most acute need for most villages, however there are opportunities to improve their sanitation infrastructure for future projects. Sustainable nature toilets have a huge role in fresh water conservation. The location, depth and distance of the nature toilets to a water well can affect ground water quality. Water flushable toilets could be good for tourist development purposes but would be costlier. Water flushable sewage could also contaminate and pollute headwater ecosystems even further.

Dry nature toilets are already the existing standard for the villages, although stool can also occur in the river water. Open defecation is an important factor in the spread of diseases. A potential opportunity is the use of their existing nature toilets or low-cost composting toilets to create fertilizer for their agricultural plots to increase crop yields and food security. However, this would need social acceptance and significant expertise to be able to treat and test the 'human excrement turned fertilizer' properly.

Additionally, in the future there is an opportunity for the development of water irrigation systems for their agricultural plots in the dry seasons especially when tourism is developed in the villages.

Table 78: KPI 3: Cleaner energy

Key PerformanceIndicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
1. Cleaner energy.										

Scope

The scope that was assessed was whether placing solar panels in their village would have a positive impact that could benefit the environment and solve (socio-) environmental issues.

Diesel engines produce harmful emissions when burned, creating a high carbon footprint. The villagerstake need enough fuel for their boats to fetch the diesel fuel at nearby locations, creating an additional environmental footprint. Solar panels would significantly decrease this footprint which benefits the environment.

Potential positive environmental impact analysis

Even though the sources of electricity vary per village (see table 79) the addition of solar panel systems would have a high potential positive impact on all villages, and be certain to benefit the environment and solve socio-environmental issues.

Table 79: Energy sources per village

	Energy sources
Alalapadu	Broken generator and broken solar system.
Apetina	A working diesel generator.
Sipaliwini	Solar system for the school, church, Tukusipan and the main roads have solar powered lamps.
Kwamalasamutu	Working diesel fueled generator.
Kawemhakan	Working diesel fueled generator
Pelulu Tepoe	Active solar system, and a diesel fueled generator for backup energy.
Palumeu	Broken generator.
Amotopo	No electricity.
Coeroeni	Active solar panels.

Opportunities to enhance the positive impact

In Alalapadu there is a broken solar panel that could be repaired or reused.

Table 80: KPI 4- Waste management systems

Key Performance Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
4. Waste managementsystems.										

Scope

The scope that this KPI assesses is whether the village's existing waste management plan for old batteries or old motors benefits the environment. With this KPI their electrical waste management plan is assessed. During project building objectives, especially for the telecom project, electrical waste could beproduced.

Potential positive environmental impact analysis

Pelulu Tepoe has recycle solutions in place, guided by ACT's rangers. The other villages do not have a waste management system in place that could positively benefit the environment.

Even though they tend to save old motors in case someone can repair them, they harm the environment with the way they discard of batteries. They throw them in a trash ditch in the forest. In Kwamalasamutu the men bury old batteries in the ground. In Kawemhakan they burn old batteries and motors, in Amotopo they throw away or use battery powder to start fires and in Coeroeni they use old batteries as fishing weights.

Opportunities to enhance the positive impact

Waste management of electrical or personal recyclable waste is what is most acute in relation to the project objectives. However, sanitation services could be improved for future projects. Proper nature toilet treatment could improve groundwater quality long-term.

Table 81: KPI 5 Use of natural resources

Key PerformanceIndicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
5.Use of naturalresources.										

Scope

The scope that was assessed was whether helping to find natural materials for project building objectives could benefit the environment.

Potential positive environmental impact analysis

All villages have verbally stated during Krutu sessions to be willing to help find local materials for project objectives if needed, except for Kumakapan where there was no Krutu session to properly assess this KPI.

Opportunities to enhance the positive impact

When using the natural materials from Indigenous lands, compensation for use of materials and workersload can be considered.

Table 82: KPI 6 Environmental awareness

Key PerformanceIndicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
6.Environmentalawareness.										

Scope

The scope that this KPI assesses is whether the overall upcycle or recycle usage, comments made about protecting their forest, and attitude towards ranger work as verbally stated during Krutu sessions could positively benefit the environment. Awareness plays a big role in how villagers deal with their waste andenvironment.

Potential positive environmental impact analysis

Pelulu Tepoe has the ability to recycle batteries, while other villages have not stated this during Krutu sessions. In other villages they do have some creative ways of using new uses for old things: In Coeroeni they use old batteries as fishing weights, in Kawemhakan they reuse old fuel carriers to smoke meat and fish, in Kwamalasamutu they use old batteries as counter weight for pressing cassava. In Sipaliwini they use old fuel carries as barbacot frames for drying or cooking meat, in Apetina they recycle old fuel carriers, in Alalapadu they use old zinc plates to collect rainwater and old gas tanks to barbeque and smoke or dry meat. In Kumakapan there was no information on environmental awareness gathered.

Opportunities to enhance the positive impact

Environmental awareness is an ongoing process. The environmental department of ACT-G is working onsupporting and guiding this process with various activities such as creating posters and movie nights. Project workers can create environmental awareness by engaging with the local villagers and rangers.

Table 83: KPI 7 Gender equality

Key PerformanceIndicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
7. Gender equality										

Scope

The scope that this KPI assesses is whether both men and women were willing to join the ranger program, as verbally stated during Krutu sessions, could benefit the gender-environment nexus.

Gender inequality creates barriers to effective sustainable development. Livelihoods for women in the environmental field during project building objectives, and after building work is finished, could benefit the environment.

Potential positive environmental impact analysis

In Apetina, Kwamalasamutu, Pelulu Tepoe and Palumeu, women were willing to join the ranger team.

Table 84: Willingness to join the ranger team per village

Village	Men willing to join the ranger team	Women willing to join the ranger team.
Alalapadu	Yes	No
Apetina	Yes	Yes
Sipaliwini	Yes	No
Kwamalasamutu	No.	Yes, one woman.
Kawemhakan	No.	No.
Kumakapan	No info	No info
Pelulu Tepoe	Yes	Yes
Palumeu	yes	Yes
Amotopo	yes	No
Coeroeni	Yes	No info, only men were interviewed.

Opportunities to enhance the positive impact

Creating job opportunities for women during environmental building activities can be initiated during the project, and might have a lasting effect on the livelihood of the Indigenous women. The position ofwomen in Indigenous communities is a constant process. The ACT rangers are actively working to create opportunities for women to contribute in the gender-environment nexus.

Overview of Environmental KPI rating

Table 85: Environmental KPI rating: an overview

Key Performance Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
1. Forest and biodiversityprotection.										
2. Clean water.										
3. Cleaner energy.										
4. Waste managementsystems.										
5. Use of naturalresources.										
6. Environmentalawareness.										
7. Gender equality										

Table 86: Positive impact colour legend

Legend	
	High positive potential impact.
	Medium positive potential impact.
	Low positive potential impact.
	Not Applicable.
	No information.

Overview of scope, potential positive environmental impact analysis and opportunities to enhance positive impact analysis

Table 87: Summary of the positive impact analysis

Key Performance Indicator	Scope	Positive impact analysis: anoverview.	Opportunities to enhance thispositive impact.
1. Forest and biodiversity protection.	The scope that was assessed with this KPI was whether there are active rangers in that region, or ifinterviewed villagers are interested in becoming rangers, could benefit the environment.	Rangers are known and welcome in all villages, except for Kawemhakan where they do not want rangers and in Kwamalasamutu nobody seemed interested in the ranger program during Krutu sessions. There was no infofrom Kumakapan.	Consult with the ACT ranger department, especially in Pelulu Tepoe, to enhance the positive impact of protecting the Indigenous natural environmentduring building work and site visits.
Key Performance Indicator	**Scope**	**Positive impact analysis: anoverview.**	**Opportunities to enhance thispositive impact.**
2. Clean water.	The scope that was assessed with this KPI is whether water infrastructure projects would benefit the environment or solve (socio-) environmental issues.	All villages could benefit from clean water access andinfrastructure projects. Theirmain source of drinking water is rainwater and river water. If the river water is not cooked properly, they tend to get sick.	There is an opportunity to engage with rangers or other villagers to do water quality measurements during on site building work for the water infrastructure project toraise environmental and sanitationawareness. Sustainable compost nature toilet development in order to protect groundwater and river water. Development of water irrigation systems for agricultural plots in thedry season.
Key Performance Indicator	**Scope**	**Positive impact analysis: anoverview.**	**Opportunities to enhance thispositive impact.**

3. Cleaner energy.	The scope that was assessed was whether placing solar panels in their village would have apositive impact that couldbenefit the environment and solve (socio) environmental issues. Diesel engines produce harmful emissions when burned, creating a high carbon footprint. Solar panels would significantly decrease this footprint which benefits the environment.	All villages could benefit from the addition of solar panels, even though their current electricity varies pervillage.	Alalapadu has a broken solar system that could be repaired orreused.
Key Performance Indicator	**Scope**	**Positive impact analysis: anoverview.**	**Opportunities to enhance thispositive impact.**
4. Waste management systems.	The scope that this KPI assesses is whether the village's existing waste management plan for old	Tepoe can recycle due to ACT's support. the other villages have no adequate waste	Sanitation improvements such as dry compost nature toilet management.
	batteries or old motors benefit the environment. With this KPI their electrical waste management plan is assessed.	management system in place. There is no info from Kumakapan.	
Key Performance Indicator	**Scope**	**Positive impact analysis: an overview.**	**Opportunities to enhance this positive impact.**
5. Use of natural resources.	The scope that was assessed was whether helping to find natural materials for project building objectives could benefit the environment.	All villages were willing to help find natural resources.No info from Kumakapan.	Have compensation for use of theIndigenous use of land Impact with zero waste goals if practically possible. Consult the rangers for the areasof best and safe location.
Key Performance Indicator	**Scope**	**Positive impact analysis: an overview.**	**Opportunities to enhance this positive impact.**
6. Environmental awareness.	The scope that this KPI assesses is whether the overall upcycle or recycle usage, comments made about protecting their forest, and attitude towards ranger work as verbally stated during Krutu sessions could positively benefit the environment. Awareness plays a big role in how villagers deal with their waste and environment.	Tepoe has the highest environmental awareness.The other villages have some creative ways to findnew uses for old things. There is no info fromKumakapan.	Project workers can create environmental awareness by engaging with the local villagers and rangers.

Key Performance Indicator	Scope	Positive impact analysis: anoverview.	Opportunities to enhance thispositive impact.
7. Gender equality	The scope that that this KPI assesses is whether both men and women were willing to join the ranger program, as verbally stated during Krutu sessions, could benefit the gender-environment-nexus.	In Apetina, Kwamalasamutu,Pelulu Tepoe and Palumeu, women were willing to join the ranger team.	The ranger department of ACT isactively working to create opportunities for women to contribute in the gender-environment nexus.

9.5 Results Environmental assessment: risk analysis

An environmental risk analysis was done from the information of the Krutu sessions in each village. Risk indicators were extrapolated from the relevant best practice KPI analysis. Key Risk Indicators were used to measure potential risks for setting up solar, water and telecom infrastructure in the villages.

The following KRI's were identified:

1. Climate: heavy rainfall/flood risk.
2. Deforestation and biodiversity loss.
3. Noise disturbance.
4. Ari pollution: dust production.
5. Water pollution: gold extraction.
6. Lack of waste management.
7. Lack of environmental awareness.
8. Gender inequality.

In the general scope of the analysis the following is considered

- The level of damage to Indigenous peoples' land, air and water, environmental fact
- The level of damage the environment can cause to project building objectives.
- If the socio-environmental factors 'lack of environmental awareness' and 'gender inequality' could impede the delivery of risk mitigation measures. (see table 87 for complete risk rating).

Table 88: Risk analysis colour legend

Legend	
	High risk.
	Substantial risk.
	Moderate risk.
	Low risk.
	Not Applicable.
	No information.

Table 89: KRI 1 Climate: heavy rainfall/flood risk

Key Risk Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
1. Climate: heavy rainfall/ flood risk.										

Scope

The scope of this KRI assesses whether the villages have areas of flooding which could damage project building objectives.

Heavy rainfall could particularly cause damage to the solar panel construction. Finding the right location to build is crucial to ensure positive project outcomes. Knowing the climate of the locations is necessary to ensure minimal damage to the building work. Heavy rainfall has been an issue devastating several areas in the East of Suriname with significant flood risk, especially from March to June 2022, due to a climate shift that caused rain in the dry seasons.[6]

Risk analysis

The risk analysis shows that Kumakapan is at a high risk for flooding: the villagers have been forced to move and rebuild their houses to dryer, higher land. Alalapadu, Apetina, Sipaliwini, Kwamalasamutu, Pelulu Tepoe, Palumeu and Coeroeni have substantial risk for flooding. Flood maps have been made for Apetina, Pelulu Tepoe, Sipaliwini and Coeroeni (see chapter 8.4) to show that the flooding is usually close to certain areas of their rivers. Kawemhakan and Amotopo are situated on a higher altitude and the villagers did not report significant flooding due to heavy rainfall.

Safeguards

Heavy rainfall due to climate change can be unpredictable and is a risk that is recommended to be retained and absorbed by investors. This is due to the high positive impact that solar panels would have on the environment and Indigenous peoples' basic needs.

Absorbing the flood risk, would include reducing the risk to ALARP which could be achieved with the following mitigation measures and guidelines for all villages:

- It is highly recommended to avoid construction work and building locations close to rivers or creeks. Locations at higher altitude would be preferable.
- Instructing locals to shut down the solar system in the case of heavy rainfall or lightning storms.
- Investing in protective covering during lightning storms or heavy rainfall to ensure the long-term sustainability of the panels. Most villages are willing to use their natural resources in consultation with the traditional leaders. There could be an opportunity to use local natural resources to cover the solar system in cases of heavy rain or storms.

Table 90: Deforestation and biodiversity loss

Key Risk Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
2. Deforestation and biodiversity loss.										

Scope

The scope of this KRI covers whether the project building objectives would cause damage to the forest or other biodiversity in the area.

Risk analysis

Significant deforestation or biodiversity loss is not foreseen for the building activities. Some smaller biodiversity may be lost at building or drilling location sites, but those would have no or insignificant damage to the Indigenous peoples' land, air or water and related biodiversity.

Guidelines

There are no safeguards necessary at this point in time. In the rare cases of more significant deforestation than expected, consult with the local traditional leaders, villagers and rangers.

Table 91: KRI Noise disturbance

Key Risk Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
3. Noise disturbance.										

Scope

The scope of this KRI assesses whether project building objectives would cause noise disturbance that could damage the surrounding biodiversity or cause migration of game or other species on their huntinggrounds.

Risk analysis

Noise disturbance from project building activities will not create extreme ecosystem shifts and are a lowrisk.

Guidelines

There are no safeguards necessary for this KRI at this point in time, it could be something to consider when collaboratively choosing building locations with the local villagers and traditional leaders.

Table 92: KRI . Air pollution: dust production

Key Risk Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
4. Air pollution: dustproduction.										

Scope

The scope of this KRI assesses whether dust production causes damage to the local biodiversity.

Risk analysis

Dust production in relation to project building objectives are a low risk, they are not foreseen to cause significant damage to the local biodiversity.

Guidelines

There are no safeguards necessary for this KRI at this point in time, it could be something to consider when collaboratively choosing building locations with the local villagers and traditional leaders.

Table 93: KRI 5 Water pollution: gold extraction

Key Risk Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasam utu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
5. Water pollution:Gold extraction.										

Scope

The scope of this KRI covers whether the local water sources have potential significant mercury contamination due to surrounding gold extraction prospectors.

The water infrastructure is very important to villagers and would have a high potential positive impact on their overall wellbeing and their environment. Creating better access to water has to go hand in hand, ensuring a good quality of water.

Gold prospectors often use mercury in artisanal and small-scale goldmining. Mercury can cause neurological and behavioral disorders after inhalation, ingestion or dermal exposure of different mercury compounds. Symptoms of mercury poisoning include tremors, insomnia, memory loss, neuromuscular effects, headaches and cognitive and motor dysfunction. This applies not only to humans, but also to aquatic life and related biodiversity. In addition, humans drinking contaminated mercury can cause mercury to end up in nature toilet wastes and groundwater, possibly affecting nearby water wells.

Sometimes river, creek or rainwater is used as is, but most villages cook their water before use. Unfortunately, cooking does not remove mercury from the water and might in fact make it become more concentrated due to water evaporation.

Risk analysis

The Tapanahony river- close to Apetina, and the Lawa river- upstream of Kawemhakan and Kumakapan are known to have gold prospectors active. Therefore, they are high risk areas for mercury contaminated river water. The other villages could be considered low risk for significant mercury contamination.

Because clean water is UN's sustainable development goal number 6, it is recommended to retain and absorb this risk, but to follow safeguards to reduce the risk to ALARP for mercury contamination for the Indigenous peoples drinking water.

Safeguard

Absorbing the mercury contaminated water risk for Apetina, Kawemhakan and Kumakapan, would include reducing the risk to ALARP which could be achieved with the following mitigation measures:

- When drilling a water well, measuring whether the groundwater should be measured to see if it is affected by long-term mercury poisoning.
- When creating tap water infrastructure from river water, it is recommended to invest in a water filtration system for water infrastructure projects in Apetina, Kawemhakan and Kumakapan. Options for filtration systems include reverse osmosis systems, activated carbon filters, and water distillers.[9]

Table 94: KRI 6 Lack of waste management

Key Risk Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
6. Lack of wastemanagement.										

Scope

This KRI is a socio-environmental indicator and assesses what they do with old batteries or old motors in order to assess what the local waste management plan is.

A zero-waste approach during project building activities would seek to maximize recycling, minimize waste and would make sure products are reused or repaired. Engaging with the local environmental workers is key to ensure that personal waste or project building waste does not pollute the Indigenous environment.

Risk analysis

Tepoe is the only village where the villagers stated to be able to recycle wastes during Krutu sessions. The other villages did state some creative way of finding new uses for old things. However, it cannot be considered 'up' cycling, finding better uses that have less impact on the environment. In Coeroeni old batteries are used as lead for fishing weights which could possibly contaminate their waters further if the batteries leak out lithium. Using old fuel carriers to smoke meat and fish in Kawemhakan and Sipaliwini would require the proper disposal of leftover fuel in the carriers; most likely they were cleaned in the waters they drink out of. In Alalapadu they use old zinc plates to collect rainwater for drinking purposes, but zinc may corrode when exposed to air and water causing zinc contamination or at the minimum an unwanted taste in their drinking water. Although zinc occurs naturally in the environment, large amounts of zinc due to human activities can damage biodiversity and groundwaters.

In relation to project building objectives, especially for the telecom construction, the appropriate discarding of electrical waste is needed to minimize damage to Indigenous' land, air and water.

Safeguards

It is recommended that investors retain the 'lack of waste management' risk. For the retention of this risk, mitigation measures are needed to reduce the risk to ALARP. There are 2 recommended plans of action regarding this risk mitigation:

1. Transfer the risk to ACT-Guianas' waste management teams (rangers and Station Coordinators). They have the know-how to communicate with the local rangers and they have experience and connections with properly disposing of waste in the city Paramaribo. For Tepoe, this system is already in effect.
2. Absorb the risk for project workers: in Kawemhakan, rangers are not welcome, so it would be recommended to employ a specific local group to help create bins from local resources or have the project workers create bins themselves. Project workers can then carry the waste back to the city to be recycled further.

Table 95: KRI 7 Lack of environmental awareness

Key Risk Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
7. Lack of environmental awareness										

Scope

This KRI is a socio-environmental indicator, and the scope assesses whether the overall upcycle or recycle usage, comments made about protecting their forest, and attitude towards ranger work as verbally stated during Krutu sessions, could impede with the delivery of risk mitigation measures.

Risk analysis

Kawemhakan absolutely does not want rangers in their village, and they burn old batteries and motors releasing toxic chemicals in the air. There is no info on Kumakapan and Pelulu Tepoe has the most active recycle team. The environmental awareness in the remaining villages can be considered a moderate risk, they recycle what they can but do not seem aware of the exact environmental consequences.

Safeguards

Safeguards to follow are the same as the safeguards for 'lack of waste management'.

Table 96: KRI 8 Gender inequality

Key Risk Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotopo	Coeroeni
8. Gender inequality.				.						

Scope

This KRI is a socio-environmental indicator, and the scope assesses whether there is inequality of women in the environmental field could impede with the delivery with risk mitigation measures.

Why women in the environmental field? Gender equality is one of UN's sustainable development goals number 5 and women empowerment in the gender-environment-nexus is necessary and efficient, since they are the heart of the family household and can influence community environmental ownership.

Potential job creation for women in this field can enhance their overall wellbeing and the wellbeing of their families.

Risk Analysis

Information regarding gender equality in the environmental field was assessed in Krutu settings by seeing whether women were willing to join the ranger team. In Alalapadu, Sipaliwini, Kawemhakan and Amotopo, women were unwilling to be a ranger. In Kawemhakan the women made clear they do not want rangers in the village. Kawemhakan has a moderate risk that could impede the delivery of environmental mitigation measures.

Table 97: Men and women willingness to join the ranger team per village

Village	Men willing to join the ranger team	Women willing to join the ranger team.
Alalapadu	**Yes.**	**No.**
Apetina	**Yes.**	**Yes.**
Sipaliwini	**Yes.**	**No.**
Kwamalasamutu	**No.**	**Yes, one woman.**
Kawemhakan	**No.**	**No.**
Kumakapan	**No info.**	**No info, no Krutu held.**
Pelulu Tepoe	**Yes.**	**Yes.**
Palumeu	**Yes.**	**Yes.**
Amotopo	**Yes.**	**No.**
Coeroeni	**Yes.**	**No info, only men were interviewed.**

Safeguards

Gender inequality is ongoing process that can always be improved on. The recommendation for investors is to retain this risk and reduce to the risk to ALARP with the following mitigation measuresand guidelines for all villages:

- Give women opportunities to join the waste management teams for project workers environmental waste collection and, if physically possible, for building work waste management. Practically this could include collecting, overseeing, separating and delivery of recyclable waste to appointed persons back to the city Paramaribo. This risk could be transferred to ACT's environmental department or absorbed by investor's project workers themselves.
- If the risk is absorbed by investors, it is recommended to compensate women for their waste management work during project building site visits. Even though in Kwamalasamutu and Kawemhakan the women do not want to be rangers, the women have shown a willingness to create income streams.
- If women are willing to join the ranger team, include them in water quality measurements as an educational opportunity if reasonably practical. Women have been the ones responsible for water in the village household, so including them in this significant life change can empower them.

Overview Environmental KRI Rating all 10 villages

The following table 98 provides an overview of the risk analysis results per village.

Table 98: KRI rating: an overview

Key Risk Indicator	Alalapadu	Apetina	Sipaliwini	Kwamalasamutu	Kawemhakan	Kumakapan	Pelulu Tepoe	Palumeu	Amotop	Coeroeni
1. Climate: heavy rainfall. *flood risk										
2. Deforestation andbiodiversity loss.										
3. Noise disturbance.										
4. Air pollution: dustproduction.										
5. Water pollution:Gold extraction.										
6. Lack of wastemanagement.										
7. Lack of environmentalawareness.										
8. Gender inequality.				.						

Table 99: Risk analysis colour legend

Legend	
	High risk.
	Substantial risk.
	Moderate risk.
	Low risk.
	Not Applicable.
	No information.

9.6 Overview of environmental scope, risk rating, safeguard policies, and recommendations

Table 100: Summary of the risk analysis

Key Risk Indicator.	Scope.	Risk analysis: an overview.	Safeguard policies and recommendations
1. Climate: heavy rainfall. *flood risk	The scope of this KRI assesses whether the villages have areas of flooding which could damage project building objectives.	The risk analysis shows that Kumakapan is at a high risk for flooding: the villagers have been forced to move and rebuild their houses to dryer, higher land. Alalapadu, Apetina, Sipaliwini, Kwamalasamutu, Pelulu Tepoe, Palumeu and Coeroeni have substantial risk for flooding. Flood maps have been made for Apetina, Pelulu Tepoe, Sipaliwini and Coeroeni to show that the flooding is usually close to certain areas of their rivers. Kawemhakan and Amotopo are situated on a higher altitude and the villagers did not report significant flooding due to heavy rainfall.	Safegaurd necessary. Heavy rainfall due to climate change can be unpredictable and is a risk that is recommended to be retained and absorbed by investors. This is due to the high positive impact that solar panels would have on the environment and Indigenous peoples' basic needs. Heavy rainfall due to climate change can be unpredictable and is a risk that is recommended to be retained and absorbed by investors. This is due to the high positive impact that solar panels would have on the environment and Indigenous peoples' basic needs. Absorbing the flood risk, would include reducing the risk to ALARP which could be achieved with the following mitigation measures and guidelines for all villages: · It is highly recommended to avoid construction work and building locations close to rivers or creeks. Locations at higher altitude would be preferable. · Instructing locals to shut down the solar system in case of heavy rainfall or lightning storms. · Investing in protective covering during lightning storms or heavy rainfall to ensure the long-term sustainability of the panels. Most villages are willing to use their natural resources in consultation with the traditional leaders. There could be an opportunity to use local natural resources to cover the solar system in cases of heavy rain or storms.
2. Deforestation and biodiversity loss.	The scope of this KRI covers whether the project building objectives would cause damage to the forest or other biodiversity in the area.	Significant deforestation or biodiversity loss is not foreseen for the building activities. Some smaller biodiversity may be lost at building or drilling location sites, but those would have no or insignificant damage to the Indigenous peoples' land, air or water and related biodiversity.	There are no safeguards necessary now. In the rare cases of more significant deforestation than expected, consult with the local traditional leaders, villagers and rangers.

3. Noise disturbance.	The scope of this KRI assesses whether project building objectives would cause noise disturbance that could damage the surrounding biodiversity or cause migration of game or other species on their hunting grounds.	Noise disturbance from project building activities will not create extreme ecosystem shifts and are a low risk.	There are no safeguards necessary for this KRI at this point in time, it could be something to consider when collaboratively choosing building locations with the local villagers and traditional leaders.
4. Air pollution: dust production.	No safeguard necessary.	Dust production in relation to project building objectives are a low risk, they are not foreseen to cause significant damage to the local biodiversity.	There are no safeguards necessary for this KRI now, it could be something to consider when collaboratively choosing building locations with the local villagers and traditional leaders.
5. Water pollution: Gold extraction.	The scope of this KRI covers whether the local water sources have potential significant mercury contamination due to surrounding gold extraction prospectors.	The Tapanahony river- close to Apetina, and the Lawa river- upstream of Kawemhakan and Kumakapan are known to have gold prospectors active. Therefore, they are high risk areas for mercury contaminated river water. The other villages could be considered low risk for significant mercury contamination. Because clean water is UN's sustainable development goal number 6, it is recommended to retain and absorb this risk, but to follow safeguards to reduce the risk to ALARP for mercury contamination for the Indigenous peoples drinking water.	Safeguard necessary. Absorbing the mercury contaminated water risk for Apetina, Kawemhakan and Kumakapan, would include reducing the risk to ALARP which could be achieved with the following mitigation measures: · When drilling a water well, measuring whether the groundwater should be measured to see if it is affected by long- term mercury poisoning. · When creating tap water infrastructure from river water, it is recommended to invest in a water filtration system for water infrastructure projects in Apetina, Kawemhakan and Kumakapan. Options for filtration systems include reverse osmosis systems, activated carbon filters, and water distillers.

6. Lack of waste management.	This KRI is a socio-environmental indicator and assesses what they do with old batteries or old motors is in order to assess what the local waste management plan.	Tepoe is the only village where the villagers stated to be able to recycle wastes during Krutu sessions. The other villages did state some creative way of finding new uses for old things. However, it cannot be considered 'up' cycling, finding better uses that have less impact on the environment. In Coeroeni old batteries are used as lead for fishing weights which could possibly contaminate their waters further if the batteries leak out lithium. Using old fuel carriers to smoke meat and fish in Kawemhakan and Sipaliwini would require the proper disposal of leftover fuel in the carriers; most likely they were cleaned in the waters they drink out of. In Alalapadu they use old zinc plates to collect rainwater for drinking purposes, but zinc may corrode when exposed to air and water causing zinc contamination or at the minimum an unwanted taste in their drinking water. Although zinc occurs naturally in the environment, large amounts of zinc due to human activities can damage biodiversity and groundwaters. In relation to project building objectives, especially for the telecom construction, the appropriate discarding of electrical waste is needed to minimize damage to Indigenous' land air and water.	Safeguards necessary. It is recommended that investors retain the 'lack of waste management' risk. For the retention of this risk, mitigation measures are needed to reduce the risk to ALARP. There are 2 recommended plans of action regarding this risk mitigation: 1. Transfer the risk to ACT-Suriname's waste management teams (rangers and station coordinators). They have the know-how to communicate with the local rangers and they have experience and connections with properly disposing of the waste in the city Paramaribo. For Tepoe, this system is already in effect. 2. Absorb the risk for project workers: in Kawemhakan, rangers are not welcome, so it would be recommended to employ a specific local group to help create bins from local resources or have the project workers create bins themselves. Project workers can then carry the waste back to the city to be recycled further.
7. Lack of environmental awareness.	This KRI is a socio-environmental indicator and the scope assesses whether the overall upcycle or recycle usage, comments made about protecting their forest, and attitude towards ranger work as verbally stated during Krutu sessions, could impede with the delivery of risk mitigation measures.	Kawemhakan absolutely does not want rangers in their village and they burn old batteries and motors releasing toxic chemical in the air. There is no info on Kumakapan and Pelulu Tepoe has the most active recycle team. The environmental awareness in the remaining villages can be considered a moderate risk, they recycle what they can but do not seem aware of the exact environmental consequences.	Safeguards to follow are the same as the safeguards for 'lack of waste management'.

8. Gender inequality.	This KRI is a socio-environmental indicator and the scope assesses whether there is inequality of women in the environmental field could impede with the delivery with risk mitigation measures.	Information regarding gender equality in the environmental field was assessed in Krutu settings by seeing whether women were willing to join the ranger team. In Alalapadu, Sipaliwini, Kawemhakan and Amotopo, women were unwilling to be a ranger. In Kawemhakan the women made clear they do not want rangers in the village. Kawemhakan has a moderate risk that could impede with the delivery of environmental mitigation measures.	Safeguard necessary. Gender inequality is ongoing process that can always be improved on. The recommendation for investors is to retain this risk and reduce to the risk to ALARP with the following mitigation measures and guidelines for all villages. · Give women opportunities to join the waste management teams for project workers environmental waste collection and, if physically possible, for building work waste management. Practically this could include collecting, overseeing, separating and delivery of recyclable wastes to appointed persons back to the city Paramaribo. This risk could be transferred to ACT's environmental department or absorbed by investor's project workers themselves. · If the risk is absorbed by investors, it is recommended to compensate women for their waste management work during project building site visits. Even though in Kwamalasamutu and Kawemhakan the women do not want to be rangers, the women have shown a willingness to create income streams. · If women are willing to join the ranger team, include them in water quality measurements as an educational opportunity if reasonably practical. Women have been the ones responsible for water in the village household, so including them in this significant life change can empower them.

10 Environmental and Social Management Plan

10.1 Environmental and Social Impacts and Mitigations Measures

The Environmental and Social Management Plan as outlined in Table 101, describes recommended mitigation actions to address the environmental and social impacts identified

Table 101: E&S mitigation measures

Impact Description	Mitigation/Enhancement Measures	Responsibility
ENVIRONMENTAL IMPACTS		
Planning Phase		
Forest and biodiversity protection.	Consult with the ACT ranger department, especially in Pelulu Tepoe, to enhance the positive impact of protecting the Indigenous natural environment during building work and site visits.	Contractor
Deforestation and biodiversity loss.	There are no safeguards necessary now. In the rare cases of more significant deforestation than expected, consult with the local traditional leaders, villagers and rangers.	Contractor
Clean water.	There is an opportunity to engage with rangers or other villagers to do water quality measurements during on site building work for the water infrastructure project to raise environmental and sanitation awareness. Sustainable compost nature toilet development in order to protect groundwater and river water. Development of water irrigation systems for agricultural plots in the dry season.	Contractor
Cleaner energy.	Alalapadu has a broken solar system that could be repaired or reused.	Contractor
Waste management systems.	This should be considered for different waste types: Liquid Waste, Solid Waste, Hazardous Waste and Construction Waste Sanitation improvements such as dry compost nature toilet management.	Contractor
Lack of waste management.	Safeguards necessary. It is recommended that investors retain the 'lack of waste management' risk. For the retention of this risk, mitigation measures are needed to reduce the risk to ALARP. There are 2 recommended plans of action regarding this risk mitigation: 1. Transfer the risk to ACT- Guianas' waste management teams (rangers and station coordinators). They have the know-how to communicate with the local rangers and they have experience and connections with properly disposing of the waste in the city Paramaribo. For Tepoe, this system is already in effect. 2. Absorb the risk for project workers: in Kawemhakan, rangers are not welcome, so it would be recommended to employ a specific local group to help create bins from local resources or have the project workers create bins themselves. Project workers can then carry the waste back to the city to be recycled further.	ACT-G and Contractor
Use of natural resources.	Have compensation for use of the Indigenous use of land. Impact with zero waste goals if practically possible.	Ministry of NH (Natural Resources) and Contractor

	Consult the rangers for the areas of best and safe location.	
Environmental awareness.	Project workers can create environmental awareness by engaging with the local villagers and rangers.	Contractor
Lack of environmental awareness.	Safeguards to follow are the same as the safeguards for 'lack of waste management'.	ACT-G and Contractor
Climate: heavy rainfall. *flood risk	Safeguard necessary. Heavy rainfall due to climate change can be unpredictable and is a risk that is recommended to be retained and absorbed by investors. This is due to the high positive impact that solar panels would have on the environment and Indigenous peoples' basic needs. Absorbing the flood risk, would include reducing the risk to ALARP which could be achieved with the following mitigation measures and guidelines for all villages: · It is highly recommended to avoid construction work and building locations close to rivers or creeks. Locations at higher altitude would be preferable. · Instructing locals to shut down the solar system in case of heavy rainfall or lightning storms. · Investing in protective covering during lightning storms or heavy rainfall to ensure the long-term sustainability of the panels. Most villages are willing to use their natural resources in consultation with the traditional leaders. There could be an opportunity to use local natural resources to cover the solar system in cases of heavy rain or storms.	Contractor and Ministry of ROM
Noise disturbance.	There are no safeguards necessary for this KRI at this point in time, it could be something to consider when collaboratively choosing building locations with the local villagers and traditional leaders.	Contractor
Air pollution: dust production.	There are no safeguards necessary for this KRI now, it could be something to consider when collaboratively choosing building locations with the local villagers and traditional leaders.	Contractor
Water pollution: Gold extraction.	Safeguard necessary. Absorbing the mercury contaminated water risk for Apetina, Kawemhakan and Kumakapan, would include reducing the risk to ALARP which could be achieved with the following mitigation measures: · When drilling a water well, measuring whether the groundwater should be measured to see if it is affected by long- term mercury poisoning. · When creating tap water infrastructure from river water, it is recommended to invest in a water filtration system for water infrastructure projects in Apetina, Kawemhakan and Kumakapan. Options for filtration systems include reverse osmosis systems, activated carbon filters, and water distillers.	Contractor
Gender equality	The ranger department of ACT is actively working to create opportunities for women to contribute in the gender- environment nexus.	Contractor

Gender inequality.	Safeguard necessary. Gender inequality is ongoing process that can always be improved on. The recommendation for investors is to retain this risk and reduce to the risk to ALARP with the following mitigation measures and guidelines for all villages. · Give women opportunities to join the waste management teams for project workers environmental waste collection and, if physically possible, for building work waste management. Practically this could include collecting, overseeing, separating and delivery of recyclable wastes to appointed persons back to the city Paramaribo. This risk could be transferred to ACT's environmental department or absorbed by investor's project workers themselves. · If the risk is absorbed by investors, it is recommended to compensate women for their waste management work during project building site visits. Even though in Kwamalasamutu and Kawemhakan the women do not want to be rangers, the women have shown a willingness to create income streams. · If women are willing to join the ranger team, include them in water quality measurements as an educational opportunity if reasonably practical. Women have been the ones responsible for water in the village household, so including them in this significant life change can empower them.	Contractor

10.2 Contractors Environmental Management Plan

Introduction

The Contractors will be responsible for environmental management at the construction sites and will be required to prepare an Environmental Management Plan (EMP) to identify practical measures to ensure that construction activities do not negatively affect the environment and to ensure that health and safety is not compromised. The EMP will outlined measures to address noise, dust, hazardous materials management, etc. In addition, as part of the EMP, specific Plans will be included to address the following:

Health and Safety Plan

This Plan will outline measures to be adopted by the Contractors to adhere to the national laws and requirements regarding occupational health and safety and will include provisions for the use of PPE, orientation of construction workers, adequate signage within work zones, and code of conduct for construction workers.

Waste Management Plan

This Plan would identify category of waste and the handling, storage and disposal methods along with the disposal frequency for each waste type.

Post Construction Restoration Plan
This Plan would identify the approach to restoration where construction or rehabilitation works at the health facilities has resulted in disturbances to natural sites and areas. In such instances these areas are to be restored and re-vegetated. This also includes materials stockpiles and excavation areas. The approach to restoration should be to allow natural re-vegetation with native species and without the application of pesticides or agri-chemicals.

Emergency Response and Contingency Plan
The Emergency Response and Contingency Plan will include a description of possible emergency situations and the necessary response procedure and contingencies. Situations to be covered in this Plan include accidents and injuries; fuel spills, fires; flooding; disruption to utilities; and structural collapse. Such a Plan should include:

- Emergency Contact Details;
- Emergency Procedures;
- Authority of Control;
- Roles and Responsibilities;
- Emergency Response Equipment;
- Scenario Description and Response; and
- Incident Reporting.

Through this Plan it is expected that all contractors‟ personnel should be aware of potential risks and take steps to cope with hazards in their work area. In addition, all contractors‟ personnel are expected to alert the correct personnel if they discover an accident, fire or spill.

Environmental Responsibility
The Contractor will be required to assign the responsibility for environmental management to a senior staff member with the requisite experience and competence. This individual will also be responsible for conducting training and orientation of all construction workers on emergency response, spill response, waste management, health and safety and good housekeeping. The Contractor's environmental personnel will liaise routinely with the project's Environmental Specialist.
Lithium-ion batteries need special treatment to store and transport out of the remote villages. Leakage Considering the life cycle of batteries, a plan should be well designed to handle disposing them off. should be prevented and dropped at the recycling companies in town.

10.3 Monitoring and Review

This section provides a description of the methods that will be used to monitor performance against ESMP commitments.
Monitoring the performance of on-site personnel against the commitments of the ESMP is essential. Monitoring should be done on a daily, weekly and monthly basis.

Objectives:
The overall objective of monitoring is to make an evaluation of the process to:

- Ensure that adverse project impacts are effectively and efficiently mitigated, as set out in mitigation plans.

- Collect data for accountability to key stakeholders. These data will also serve as supporting material in case of grievances or concerns expressed by stakeholders. They will allow the Contractor to show Project stakeholders how and when mitigation measures have been implemented, and with what results.
- Enhance sustainability of the Project by early detection of conditions that necessitate additional mitigation measures, or unanticipated issues that jeopardize planned mitigation measures. Gather the views and feedback of beneficiaries and other stakeholders on Project impacts and mitigation measures at different times before, during and after the Project.
- Improve service delivery, planning and allocating resources.

Monitoring

The Contractor will ensure continuous documentation of the efficiency, effectiveness, impact and sustainability of mitigation measures. The data collected in the context of the ESIA study serves as the baseline against which change will be measured. Indicators for monitoring (as seen in the following tables) will cover process, outputs and impacts.

Table 102: Overview of Monitoring scheme

Monitoring Indicator	Basis for Indicator and enhancement opportunities
Optimizing their way of life.	The water needs could be significantly optimized by filtering the mercury from the water in Apetina, Kawemhakan and Kumakapan (consult the environmental safeguards report for more information on this topic).
Engagement method in place.	The Krutu setting can be used to communicate with the villagers during project building grievances or guidelines for the villagers and their leaders.
Cultural heritage and - territories maintained.	Being mindful of territories that are not allowed to be used or entered is an important social safeguard to be monitored.
Feeling supported	False promises made is something to consider when constructing FPIC forms and during project information sessions with villagers.
Willing to be trained for operation and maintenance.	Compensating their villagers for maintenance work can be discussed in the village ownership model plan.
Willing to learn about new technologies.	In training models, Alalapadu, Sipaliwini and Kwamalasamutu modes of online training or communication could be possible if needed.
Willingness to work in operation and maintenance.	Operation and maintenance by local villagers increase community ownership.
Increased business opportunity.	Tourism and archaeological research can be included in socio-economic models to sustain long term maintenance of the project building objectives.
Improved health and nutrition status.	Apetina has a freezer house. This is a great example of a community ownership model.
Improved sense of leisure.	ACT-S's initiative of Tareno Media, a radio station for peoples of South Suriname can be broadcasted for the village locations for improved sense of leisure.
More business opportunity for women.	Women empowerment can improve community ownership models.

Review

Contractor's feedback on performance will be communicated to the appropriate parties concerned. Any substandard performance will trigger a process that notifies the responsible party of the nature of the issue and indicates the actions that are required to rectify the situation. This will be followed up by further inspection and/or monitoring to ensure that the sub-standard performance has been corrected.

11 Summary of Public consultation process

The GoS, through the Ministry of NH and Ministry of ROM has the overall responsibility to effectively engage stakeholders so as to achieve the project's objectives. In order to secure the publics' support for the projects' interventions and to minimize disruptions during construction activities, public information, awareness and engagement would be critical. This could enhance public understanding and support for the project.

During project implementation a Public Participation and Communication Program should be developed and implemented. This Program should outline the mechanism for receiving and addressing grievances, point of contact, contact information, etc. The Program should also outline how the Ministry of NH or facilities management will communicate with stakeholders, for example, if there is going to be a disruption or an inconvenience, as well as to find out from stakeholders if there are any grievances or nuisance. This should be pursued considering the following interventions:

- Public Service Announcements (PSAs) on the project, its component and activities. The PSAs could be placed on print and electronic media.
- Provision of information on the Ministry of NH webpage.
- Notice Boards describing the projects' interventions in the villages.
- Information to the public in a timely manner on the disruption due to project activities.

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Annex II Waste management program outline

1.1 Energy, Water and Telecommunication

1.1.1 Type of waste

The ordering of equipment (panels, cables, batteries, inverter, metal pipes, etc.) will be through an agent in Paramaribo. There should be an adequate analysis if what type of waste will be generated on site, when the equipment, and accessories are unpacked and installed. A preliminary overview is provided below, of what may be expected. However, a thorough analysis should follow once the project moves to the phase of execution.

Table 1: Analysis of Waste generated during project implementation and maintenance

Type	Frequency	Weight	Local Use
Hazardous	Once	In kg	Repurpose options
Non-Hazardous	Every time replaced/ during maintenance		Prepare to send back to Paramaribo
Organic			
Recyclable			

The conditions created for 24x7 energy access, can lead to a spin effect, having more household appliances, etc.

Table 2: Secondary waste generated due to energy

Type that will be frequently generated	Weight	Local Use
Plastic	In kg	Repurpose options
Cans		Prepare to send back to Par'bo
Packaging material: cardboards and Styrofoam		
Electronics (household appliances, mobiles, etc.)		

1.2 Engagement

INVENTORY of Stakeholders and their role

Engage with *government authorities, NGOs, recycle business and other stakeholders* to understand their needs, concerns, and expectations regarding waste management practices. Especially when transportation is involved and repurposing of waste at the site would be the most practical way out. It is expected that some heavy weight investments will have to be removed from the villages when replaced. The most adequate partner to receive those should be identified and agreements signed. Specific guidelines to handle to should be provided to the management of the facilities for adequate awareness raising and packaging prior to transporting those to Paramaribo.

Waste Companies have been slowly emerged in Suriname, basically plastic and can recycling, paper and glass.

Electronic waste is also accepted, as well as batteries and metal. How will these companies accept (pressed, packed, cleaned, bulked), and at what pace (frequency), as well as weight. Are there incentives linked to the party that brings the waste?

Engaging communities, means to first gain insight into the cultural and social aspects that might influence waste management practices. With the communities specific repurposing program is advised to have application in households, but also on wide village scale. Some examples are shared below.

Table 3: two examples for rural repurposing of waste

	

DESIGN A SCHEME WITH THE PROJECT DEVELOPERS, LEADERSHIP AND A WASTE MANAGEMENT GROUP

In Tepoe a group was trained and provided incentives for waste separation and disposal plan. They also provide awareness. This core group further needs to be strengthened and educated in the new types of waste that will be generated due to this project. This core group can become the model for horizontal support to other villages in addressing the waste issue.

Project developers and the core group, should jointly develop a time scheme which reflects what type of waste will be generated at what time and how to handle those (before and after separation). How to repurpose on site and what to send back to Paramaribo. In doing, a comprehensive understanding of the timeline is needed. The logistics to fly out needs to be aligned as well as the companies engaged in waste understands what to expect and when.

They will also purchase the tools required to execute waste management as appropriate as possible. With having all infrastructure, tools and human resources of all villages on board, on the job training will be provided. Where and how to store the waste, after collected and meant to be brought out of the village. In the case of locally burning, digging holes or otherwise, suitable location will have to be identified, and mapped, after which a proper communication follows.

Table 4: Example of form to fill in for waste transportation per village

Type of waste	How packaged	Weight (kg)	Delivering to	Or Picked up by	Hazardous (Y/N)
			Company name		

Date:
Name: delivery agent
Carrier: (GumAir etc.)

1.3 Awareness raising strategy

Waste Collection

- Develop a waste collection strategy that includes regular schedules and routes for waste collection.
- Provide education and awareness campaigns to encourage proper waste segregation at the source.

Waste segregation and sorting

- Establish waste sorting centers equipped with solar-powered machinery to separate recyclables, organics, and non-recyclables
- Train workers on proper waste segregation and handling techniques

Recycling and Treatment

- Identify national facilities where recyclable materials can be sent
- Consider setting up small-scale recycling units for materials that can be processed locally, utilizing solar energy as a power source

Composting and organic waste management

Copy and adjust the organic waste method of Tepoe

Educate community about composting and its benefits for soil health

Hazardous Waste Management

Obtain protocols and translate in local language on proper handling, storage and disposal of hazardous waste- if applicable;

Explore special measures to be taken and communicate thoroughly

Monitoring and Evaluation

Regular review of methods and techniques implemented to improve the waste management plan and communicate accordingly with the stakeholders in and outside of the communities

Community Engagement and education

- *Conduct regular refreshment campaigns and educate the community of the importance of waste management, safety, recycling and benefits of the investments at village level. Encourage community participation through workshops, and demonstrations. Provide incentives.*