



PAPUA NEW GUINEA

PRE-IMPLEMENTATION SURVEY

Capacity Building to Strengthen Sustainable Implementation of Renewable Energy Technologies for Rural Energy Access

SURVEY REPORT

NOVEMBER – DECEMBER 2019

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Acronyms and Abbreviations

ACSE	Adapting to Climate Change and Sustainable Energy
ADB	Asian Development Bank
BRANTV	Barrier Removal for Achieving the National Energy Road Map Targets of Vanuatu
CCDA	Climate Change and Development Authority (PNG)
CPA	Central Provincial Administration
DFAT	Department of Foreign Affairs and Trade
DLLGPA	Department of Local Level Government and Provincial Affairs
DoE	Department of Education
EE	Energy Efficiency
EU	European Union
FREAGER	Facilitating Renewable Energy and Energy Efficiency Applications for Greenhouse Gas Emissions Reduction
FREF	Fiji Rural Electrification Fund
GE	Green Economy
GEF	Global Environment Facility
GGGI	Global Green Growth Institute
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
Hon	Honorable
HRD	Human Resource Development
KOICA	Korean International Cooperation Agency
LDC	Least Developed Countries
LLG	Local Level Government
M&E	Monitoring and Evaluation
NAMA	Nationally Appropriate Mitigation Action
O&M	Operation and Maintenance
PICs	Pacific Island Countries
PIDF	Pacific Islands development Forum
PNG	Papua New Guinea
POM	Port Moresby City
PSC	Project Steering Committee
RE	Renewable Energy
RESCO	Renewable Energy Service Company
SDGs	Sustainable Development Goals
TVET	Technical and Vocational Education and Training
UNDP	United Nations Development Programme
UPNG	University of Papua New Guinea

Chapter 1: Introduction and Background

To strengthen informed and inclusive decision-making by resource owners and local government officials for integration of green economy (GE) and renewable energy (RE) into local level planning and to strengthen implementation of renewable energy (RE) infrastructure for rural electrification, the Global Green Growth Institute (GGGI) and the Pacific Islands Development Forum (PIDF) partnership, with funding from the Korea International Cooperation Agency (KOICA), has led to the development of a project titled ***“Capacity Building to Strengthen Sustainable Implementation of Renewable Energy Technologies for Rural Energy Access Project”***.

As a pre-requisite to the successful implementation of the project a pre-implementation survey was conducted in the five selected villages in the Rigo and Kairuku-Hiri Districts of Central Province from 25th November to 5th December 2019 with logistic and technical support from the CPA and CCDA. The aim of the survey was to assess the knowledge gaps of locals in GE, RE and EE and also confirm the sites based on certain criteria's one of which is the distance of the sites to the nearest town or city. The results from the survey will be used to design ten (10) training modules tailored to meet the knowledge gaps of locals which will be used in the actual training phase of the project.

In carrying out the survey, officers from the Provincial and district administrations were involved who helped in mobilizing locals and carried out awareness on the project. The survey questions were structured in a way that generated answers from the different target groups in terms of the knowledge gaps of the different groups relating to RE & GE.

The project is aimed to build the knowledge capacity of 750 - 800 nationals from the different selected target groups by 2021 end of project. The different target groups targeted and interviewed during the project pre-implementation survey for this project include traditional and community leaders, women, youths, vulnerable groups, government officials, business people, and local technicians.

1.1 Pre-Implementation Survey Objectives

The main objectives of the Survey include;

1. To assess and identify the knowledge gaps of local communities in the area of GE, RE & EE
2. To visit, assess and confirm the selected sites based on site selection criteria
3. To visit sample target site locations of this project in order to interview approximately 10% of the project beneficiaries.
4. Collect necessary baseline data for this project

1.2 Survey Team

The survey was led by GGGI-PNG KOICA Project Coordinator and supported by CPA in partnership with CCDA and the district staffs. The following people were the members of the team:

1. Gibson Sil Gala – Team Leader and GGGI-PNG KOICA Project Coordinator
2. Benjamin Keni – CPA Climate Change Coordinator
3. Johnson Kilis – CCDA Senior Mitigation Officer
4. Tumai Ipou – CPA Disaster, Emergency and Climate Change Advisor
5. Moses Touai – CPA Driver and Mechanic
6. Kone Burana – Rigo LLG Manager
7. Alfred Kennedy – Hiri LLG Manager

1.3. Survey Schedule

Table 1.0: Project Pre-implementation Survey Schedule

No.	Date	Sites	Team Composition
1	25/11/19 – 26/11/19	Kalo	1.Gibson Gala 4. Tumai Ipou 2.Benjamin Keni 5.Mose Touai 3.Johnson Kilis 6. Kone Burana
2	27/11/19 – 28/11/19	Keapara	Same individuals who did Kalo
3	29/11/19 – 30/11/19	Imuagoro	Same individuals who did Kalo
4	2/12/20 -3/12/20	Edevu	Same individuals except Kone Burana was replaced by Alfred Kennedy
5	4/12/20 – 5/12/20	Brown River	Same individuals except Kone Burana was replaced by Alfred Kennedy

Chapter 2: Survey site locations

From the National stakeholders workshop held in Port Moresby on the 11th November 2019 a total of five sites were selected for the Pilot project and endorsed by CCDA. These sites were selected based on certain criterion as per below list of the selected sites and the pre-requisites they met to be selected.

Table 2.0. Detail list of the Five selected Project Sites

Villages	Distances (Km) from main City	Population	Households	District	Related RE Projects
Keapara	150	653	90	Rigo	-Simple solar home systems (3lighting) & street lighting supplied by local MP

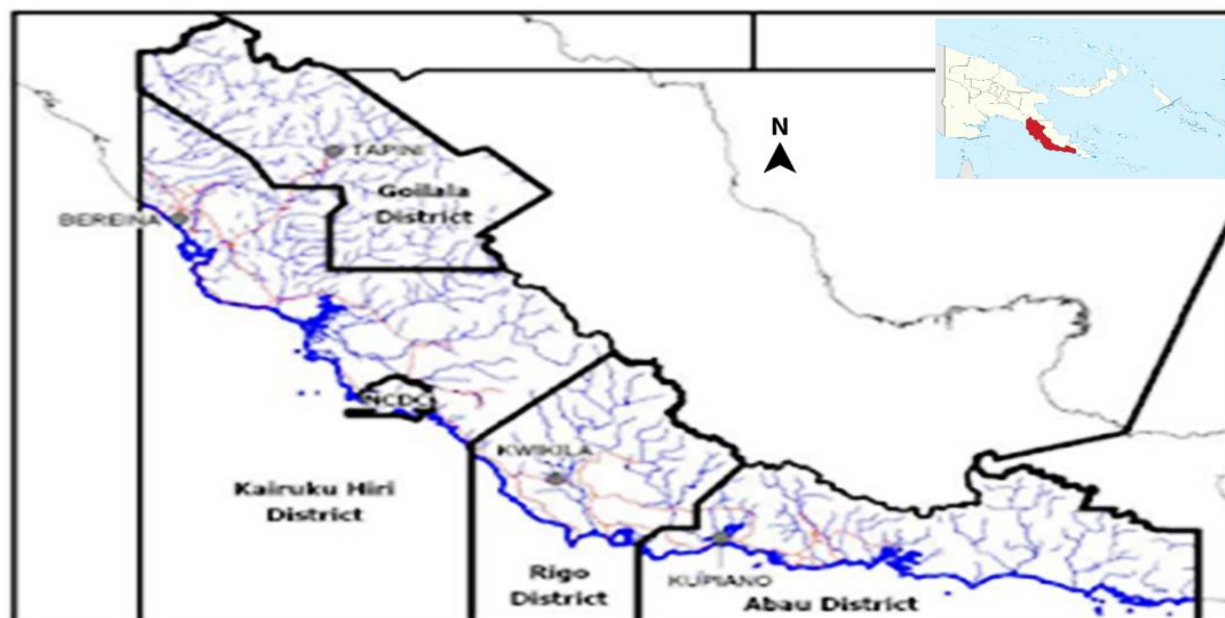
					<ul style="list-style-type: none"> -EU-GIZ funded solar streetlight and water pumping using solar -All households have small solar systems. -Close to main city and is accessible by road. Locals are engaged in simple economic activities. -Presence of basic government services (Education & Health) -Affected by the effects of Climate change. -Some houses have generators. Local church has a 4000 Volt generator.
Imuagoro	80	1024	113	Rigo	<ul style="list-style-type: none"> -Simple solar home systems (3lighting) & street lighting supplied by local MP -EU-GIZ funded solar streetlight and water pumping using solar -All households have small solar systems. -Close to main city and is accessible by road. Locals are engaged in simple economic activities. -Presence of basic government services (Education & Health) -Some houses have generators
Kalo	155	2438	368	Rigo	<ul style="list-style-type: none"> - EU-GIZ funded solar streetlight and water pumping using solar. -All houses have small solar systems -Solar systems supplied by local MP including street lighting. -Accessible by road. -Access to government services -NGO & government Presence -Accessible by sealed road & close to POM.
Edevu	90	414	95	Kairuku–Hiri	<ul style="list-style-type: none"> -Grid extension for new hydro under construction -Access to basic government services

					-Accessible by road & close to POM.
Brown River	90	2807	395	Kairuku - Hiri	Grid extension for new hydro under construction -Access to basic government services -Accessible by road & close to POM.

During the pre-implementation survey it was found that Keapara was a big village covering two other villages all located on the same landmass with no distinct geographical boundary. As such the survey covered the two villages as shown in the table below since the people are all from the same race and speak the same language.

Table 3.0. The two addition sites covered in the survey

Villages	Distances from POM (Km)	Population	Households	Ward	LLG	District
Karawa	158	660	94	22	Rigo Coastal	Rigo
Alukuni	155	388	56	21	Rigo Rural	Rigo



Map 1. 0: Map of Central Province outlining the two target district, Kairuku-Hiri and Rigo Districts.

Chapter 3: Communities Surveyed

The project pre-implementation survey conducted on the 25th of November 2019 to the 5th December 2020 for the five selected project sites including two additional sites indicated that each site were different in terms of its geography, demography, local religion, lifestyle, tradition/ customs but they all though have distinct native languages can all communicate and understand three main languages; Motu, English and Tok Pidgin. Also it was found that the target sites experience the typical tropical climate but with the effects of climate change seasons have changed indirectly affecting the agricultural and other community activities of locals.

Before visiting the selected sites contact was made with the local councilors (local government officials), chiefs, women & youth leaders in the villages to alert the community prior to our visit. Upon our arrival we did general introduction of the team and stated the purpose of our visit and the benefits so as the individual target groups we plan to get as much information from as they will be involved or trained in the project.

From the survey it was noted that in this area women had a fair or at least one representation in community decision making and were actively involved in community activities as per their traditions. This was observed for the three including the two additional sites surveyed in the Rigo district. Unlike the five sites in the Rigo district women and girls were not fairly represented in decision making due to cultural restrictions or beliefs but that is slowly changing given that people are now been educated on gender equity and inclusion and its importance in the society. It was also noted that people with special needs were not actively involved in decision making, while the old were involved given that by tradition it is understood that the old are wise and provide advice in decision making. Unfortunately, people living with disabilities in the communities were not actively involved and at most times forgotten.

During the survey it was noted that locals in all selected communities had some form of education and had access to basic government services like education at the primary level, health services and were all connected by road access making it easy for people to move daily to and from the main city and economic hub of PNG, Port Moresby city. As such there was a fair number of targeted audiences or groups in the selected sites.

Locals in all seven villages surveyed had simple small solar systems with three lights and a mobile charger. Only few who can afford had big solar home systems that's used to power television, fridge and more than three lights. This is because all these sites do not have grid extension but there are plans for extension with the two villages in the Kairuku-Hiri district already been connected to a new grid for a big hydro system still under construction.

It was found that locals in all sites surveyed were involved in some sort of agricultural, fishing and economic activities and there were small trade stores operating in the villages providing the basic goods to locals in attempts to balance the local diet.

The survey concluded that there is indeed a need to train locals in the area of RE, GE and EE given that many have limited information in these areas and were willing and happy that their villages were selected to conduct such a project.

3.1 Keapara village

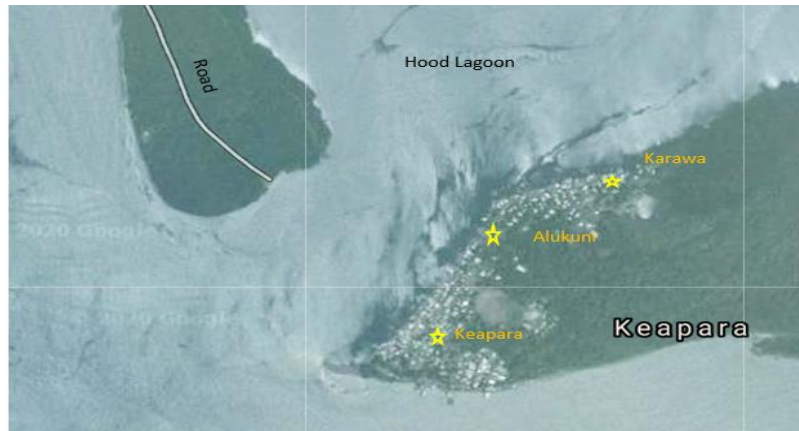


Image 1.0: Satellite image of Keapara Village outlining also Alukuni and Karawa Villages

Table 4.0: General Information of Keapara Village

GPS Location	10.0999° S, 147.8634° E
Population	653
Male	348
Female	305
Households	90
Point of Contact	Hon. Mape Iga, LLG Councilor, Ph: 7358 0043

Keapara in itself is a big village located in Hood lagoon Bay of Ward 23, Rigo coast LLG of the Rigo District, Central Province. The name covers three big villages Keapara, Alukuni and Karawa. Though the villages do not have distinct geographical boundaries and are in the same LLG they are separated by different ward numbers and have different ward councilors due to the high population in each village. Alukuni is in ward 21 while Karawa is in ward 22. The district headquarters and the nearest government station is Kwikila located approximately 34 km but most locals prefer to travel to POM due to the cost of items and for economic and other business or work activities.

The village is accessible by road which covers an approximate distance of 102 km from POM to the point of the lagoon where vehicles are left on the mainland and a 5 minute ferry by boat leads to the village. The lagoon is one of the richest in the country in terms of marine resources as it is surrounded by reef at the sea front and thick mangrove forests on the mainland meeting the sea.

These three villages are famous for producing some of PNG's most learned individuals and though they have different ward councils, they share the same culture and traditions and also speak the same languages 'Motu, English and Tok Pidgin'. They also share most of the basic government services like health, education and church in the area.

They have a well-organized structure of leadership that plays an important role in providing the guidance and support to the development of the community which makes the village peaceful and unique in itself.

It was noticed during the survey that every household use mini solar kit systems supplied by the former local MP for lighting and powering devices such as phones. Few individuals who can afford or were small business owners had much bigger solar home systems and even small generators. They also have a big 4,000 volts generator and several street solar lighting systems in the villages installed as a project funded by the local former MP.

The local culture and tradition in the village and of the local people has a special place that encourages the involvement of women and girls in decision making. Many of the locals are literate and understand the importance of gender equity and involvement. The local culture also gives great respect to the old, but it is just the disabled that are at times overlooked and are not considered in especially decision making due to the fact that there are not many most probably less than five individuals in the village.

Surveying the village it was found that many of the locals depended on fishing and farming on the main land as their main source to earn an income from what they harvest and from the catch they sell. Unfortunately most of the fish caught are not stored for more than three to five days due to the fact that many do not have refrigerators that can hold fresh the catch and at most times they make a loss. It was also noted that there were several local business like trade stores operating but many did open markets on certain days as part of social or community gathering and the marketing was done mainly by the women and girls.

One important observation made was that many nearly all in the three villages actively participated in church or religious activities and that the church elders will play an important part in mobilizing locals to attend the trainings and even the church yard can be used to train locals during the project.



Image 2.0: Image of a solar powered street light in Keapara village.

A total of two days was spent in the village interviewing community leaders, local technicians, church, youth, school, women and local businesses. We interviewed 35 people altogether from the three villages combined.

Table 5.0: General Information of Alukuni and Karawa Villages

Alukuni Village		Karawa Village	
GPS Location	10.0977° S, 147.8586° E	GPS Location	10.0961° S, 147.8608° E
Population	388	Population	660
Male	199	Male	330

Female	198	Females	330
Households	56	Households	94

After the survey, feedback from the villages and those interviewed were positive and that they wanted such a project as they know very little about RE, GE and EE. Locals especially the women were a bit shy but showed interest in learning the techniques and skills involved in setting up solar which was deemed a men job over the years. Note the same contact person can be contacted for all three villages.

3.2 Kalo village



Image 3.0. Satellite view of Kalo Village

Table 6.0: General details of Kalo Village

GPS Location	10.046699°S, 147.790175°E
Population	2, 438
Male	1, 250
Female	1, 188
Households	368
Point of Contact	Hon. Guria Rawali, LLG Councilor, Ph: 73327047

Kalo village is a big coastal village that is situated at the mouth of the mighty Kemsell River with an estimated terrain elevation of 6 meters and lies further inland from the beach approximately 95km from POM. It is situated under ward 19 of the Rigo Coast LLG in the Rigo district of Central Province.

The village is accessible by sealed road with a small portion leading into the village is unsealed and is quite difficult to access during the rainy season. The village is one of those highly populated coastal villages in the Province and has a good representation of gender in decision making as they share similar cultures and traditions so as speak the common three languages like those in Keapara.

The village been situated on the mouth of one of the big rivers in the Province it suffers greatly from flood during the rainy season (November -March) when the river bust it banks but with the continuous change in season the place is mostly dried up making it even hard for people to gather water as most or nearly all villages depend on well and stored water.

Given the nutrient rich soil many locals are involved in agricultural activities and also fishing in which they sell to earn an income. There were less than five trade stores in the village with many involved in other small black markets. Some locals are supported by their working family members in the city in terms of cash or kind to help them meet their basic needs as such life is good at the village level to many.

During the survey it was noticed that many nearly all houses in the village were using small solar household systems supplied by the former local MP. The village also had solar street lighting systems a part of the same project implemented in Keapara village. It was noted that some of the street lights were no longer functioning and were not fixed because locals were not trained to fix those systems.

It was observed that the village in itself was well organized and locals were heavily involved in church / religious activities as such the church leaders will be essential members to involve in the project implementation phase as they will play a key role in mobilizing the local community. There is also a Primary school in the area and a health center in the area run by the local government.

There is a plan for grid extension by New Zealand Government, but it was not done because of local political interests in the community. There is also an incomplete Solar Water Project funded by EU GIZ due to local land disputes.

A total of 15 key community leaders, local technicians and individuals equally from both genders and age groups were interviewed during the survey and many showed great interest in the project and plan to be trained during the implementation phase of this project.

3.3 Imuagoro



Image 4.0. Satellite view of Imogoro Village

Table 7.0. General details of Imuagoro village

Village Name	Imuagoro Village
GPS Location	9.876422°S, 147.679886°E
Population	1, 024
Male	545
Female	479
Households	113
Point of Contact	Hon. John Kore, LLG Councilor, Ph:7088 9837

Imuagoro is a big rural village located in ward 14 of the Rigo Central LLG in the Rigo district of Central Province. The village is located on high grounds far from the coast as such the natural environment is quite different from the two previous sites surveyed. It was observed that the natural environment is composed mainly of tropical savanna and small grassland trees and experiences tropical climate same as the other villages.

The village is accessible by sealed road that stops at Kwikila station the district headquarters and from there a dirt road of approximately 20km leads into the village. The road condition is quite bad and is inaccessible during the rainy season accessible only by four wheeled drives thus forcing locals to walk.

The locals there have a slightly different culture from those of the other two coastal villages given the change in physical geography but they do speak and understand the three common languages spoken by the other two villages apart from their native language. One thing that stood out was that women and girls were not at most times involved in decision making and were submissive to the men as per their culture. But this is slowly changing with the increase in education locals now understand the importance of gender equity and involvement.

There is a good presence of basic government services in that the village has a long serving Primary school, an aid post and a big church that has served in service delivery to the locals for over 20 years. Locals are involved in church activities but there are some youths who go of hand but there is a strong law and order system in the community that deals and refer those that break laws to Police in Kwikila station otherwise the community is peaceful with a good law and order system emplaced.

During the survey it was observed that many nearly all households have and were using small solar systems with three lighting systems and an external port for charging devices like phones. These systems were issued to individual households as part of the same project initiated by the local MP in Kalo and Keapara villages as they all share the same electorate and local MP. There were also four streetlights installed in the center of the community but two were not functioning due to faults that locals were unable to fix or maintain. It was also observed that there is an ongoing project funded by EU-GIZ for solar street lighting and pumping of water using solar but that is currently on halt due to land and funding issues.

The locals as per questions asked were mainly involved in farming and hunting as their means to earn an income while some do small black-market sales and other SME activities to sustain their lives. Others get financial assistance from their family members working in the city. As observed, there were less than five trade stores operating in the village with many small black markets who knew very little about RE, GE and EE.

On our arrival we were met by local youth leaders and they took us to the community center, where we conducted the interview mostly for youth and local technicians. Not many elder men and women including local SME attended the interview. We interviewed 10 people.

The challenge here is to get people together, as most villagers are occupied with their daily household chores, mainly farming, fishing and gardening, which are on the mainland.

3.4 Edevu village



Image 5.0: Satellite view of Edevu Village

Table 8.0: General information of Edevu Village

GPS Location	9.197085°S, 147.301470°E
Population	414
Male	203
Female	211
Households	95
Point of Contact	Alfred Kennedy LLG Manager Ph:7412 9543

Edevu Village is located in ward 19 of the Koiari Rural LLG of the Kairuku-Hiri district of Central Province. The village is situated on a high elevation and way across the Province to where survey was conducted for the three Rigo villages about 28km from POM. The village is scattered moving further inland with the main village situated at the camp site of a logging company near the mighty Brown River. The village due to logging operations have a mixture of people from different races all living and working in the area but the land belongs to the Koiari people.

The logging company has been operating in the area for over 15 years and as such helped maintained road accessibility into the area and have also built a local primary school and aid post for the benefit of the locals. There is also a church run school in the area that serves the people.

Our first trip out to Edevu (*aka* Edebu) was a reconnaissance trip to meet the villagers and to carryout awareness and mobilize the community. After the awareness, we went again for the survey. During our visit it was observed that the villagers were strong Seven-Day Adventist church followers but also had strong cultural beliefs and traditions. The local traditions did not allow the involvement of women in decision making and there was little recognition given to the disabled as there were not many in the community.

The locals have a strong chieftainship tradition that is inherited and dominated by the males but that is slowly changing with many now been educated. From observations many houses are semi-permanent built from timbers and have simple solar systems. There is a new grid extension through the village with

a big hydro that is still under construction up-river expected to be completed in 2022. The logging camp have their on generator that powers electricity at certain time intervals.

As observed the locals earn most of their income from the land royalties and compensation paid by the logging and power companies operating in the area. The money is paid to the different tribes which is then shared to the individual tribe men and women. Apart from that locals also farm and sell to earn an income. Others are engaged in small black markets as there is only one trade store in the area.

It took us a day to interview 10 people in the village. Unfortunately, many leaders of the village were not present during the day of interview and so six women and four men present were interviewed– the ward councilor was in Port Moresby, so I called and interviewed him on the phone.

They have youth groups, church groups and traditional land groups which are registered under a Land-Owner Company called, “Central Sands System”.

3.5 Brown River community



Image 6.0. Satellite View of Brown River Community

Table 9.0: General Information of Brown River Community

GPS Location	9.200159°S, 147.236633°E
Population	2, 807
Male	1, 556
Female	1, 251
Households	395
Point of Contact	Alfred Kennedy LLG Manager Ph:7412 9543

Brown River community is located in ward 17 of the Hiri rural LLG in the Kairuku-Hiri district of Central Province. It is one out of the selected sites that is easily accessible by sealed road along the Hiritano Highway about 20km drive from POM. The community is big and is one of those highly populated in the LLG comprising of people from different races in PNG all living in the area but the land belongs to the Koiari people. Due to rural-urban drift the population is rapidly increasing.

Given that the community is highly populated and made up of a mixture of people there is no definite culture or tradition that governs the lifestyle of locals instead people live in a more open and modern type community where all men and women are evenly represented in decision making.

It was observed that a new grid extension is still under construction to the area that will be powered by the new hydro in Edevu. As such many local houses use simple solar systems for lighting and charging devices like mobile phones. Some have generators while few had big solar-home systems.

The locals main source of income was from the sale of agricultural produce to main markets in POM and from small black markets on the road side. At times some caught fish and sold to earn an income.

Brown river community has strong leadership that promotes community cohesion which supports RE and GE project activities. We were met by the community leaders and business owners and they took us to the community center, where we conducted the interview mostly for youth and local technicians. Not many elder men and women including local SME owners attended the interview.

However, we met our target for that community by interviewing 10 people which were mostly mothers and youths.

The big challenge for all the communities visited is to get people together, as most villagers were occupied with their daily household chores, mainly farming, fishing and hunting or SME activities – however, we managed to get information from those we interviewed.

3.6. Summary of Target groups interviewed

Table 10.0: Summary of the target groups interviewed during the survey.

District	Total interviewed	Males	Females	No. of youth	No. of vulnerable persons	No. of trad & Com leaders	No. of Gov. officials	No. of businesses	No. of local Technicians
Keapara	14	9	4	5	2	2	2	1	2
Alukuni	10	7	3	4	1	2	1	1	1
Karawa	11	8	3	5	1	2	2		1
Kalo	15	12	3	4	1	3	3	2	2
Imuagoro	10	8	2	6		1		1	2
Edevu	10	6	4	4	1	3	1	1	0
Brown River	10	9	1	3	1	2	1	2	1

Note: Vulnerable people in this survey referred to the old +60 years of age and the disabled but in all sites there was no one with special needs available for an interview and so many were the old who were interviewed in this category.

A summarized version of the five site information can be found in appendix 2

Based on information gathered during the survey certain recommendations with regards to accommodation and selection of sites for training in the five rural villages were identified as stated in table 11.0.

Table 11.0: Summary and recommendations for hosting future trainings in the selected sites

Sites	Prospective location of conducting trainings	Recommended location for accommodation of trainers	Recommended access route to community	Contact person
Kalo	Church or School	Community Centre or Councils house	Road	LLG Manager and Councilor
Imuagoro	School	School houses/ Kwikila guest house	Road	LLG Manager and Councilor
Keapara (including Alukuni and Karawa)	School and Church ground or community hall	Private accommodation for community leaders	Road and sea	LLG Manager, Ward Councilor and Youth Chairman
Edevu	Village (councilor's place)	Councilor's house or guest house at Brown River	Road	LLG Manager and Ward Councilor
Brown River	Brown River station	Guest House	Road	LLG Manager and Ward Councilor

Note that the two additional sites are also evenly mentioned because these villages have been overlooked for development in most instances hence the Provincial administrator for central Province suggested it would be ideal sites for consideration to trigger development. These villages are also beneficiaries of solar lighting systems funded by the former local MP.

Chapter 4: Defining Community Target Audiences/ Groups

The project is aimed at selecting and training at least 750 individuals from the different target groups in the different selected project sites in PNG. A similar figure of beneficiaries is expected from the other three Melanesian countries which will bring to a total of 3000 beneficiaries.

The following is a brief of the different target groups according to the Project KPIs.

4.1. Women, Youth and Vulnerable Groups

Women groups in this project is not a separate target group but has been specifically added as a KPI in order to ensure that the 4 target groups are inclusive of women participation. A KPI of this project in this category is that:

There must be at least 40% women participation from the total number of trainees (1200 out of 3000 trainees). It is understood well that women are often excluded from critical decision-making processes in the communities as men are mostly given priority. This KPI ensures that women are also empowered as they are equally affected by the local climate, energy and sustainability issues and hence equally have a lot more to contribute towards the betterment of the community.

Youth groups is not a separate target group for this project but has been specifically added in order to ensure that the youth group is clearly defined as part of the scope of this project. It is understood well that youths will be part of all 4 target groups of this project. As per the United Nations definition youths are persons between the ages of 15 and 24. The UN also recognizes that this varies without prejudice to other age groups listed by member states such as 18–30. For the scope of this project, youths will be defined as individuals between the ages of 18 to 35 years.

Vulnerable group as per the project is not a separate target group but has been specifically added as a KPI in order to ensure that the 4 target groups are inclusive of participation from the vulnerable. A KPI of this project in this category is to ensure that at least 20% participation from vulnerable groups from the total number of participants (600 out of 3000 trainees). For this project vulnerable groups will include the following groups;

1. Disability – further broken down into vision impairment, hearing impairment, mental health conditions, intellectual disability, acquired brain injury, autism spectrum disorder and physical disability
2. Women as vulnerable – While “women” have a separate KPI for inclusion into this project there is a further need seen to clarify their inclusion under the vulnerable group as well (It is fair to say that men can be vulnerable as well). Under the following circumstances;
 - Women with disabilities
 - Ethnic minority women
 - Women from rural and remote areas (applies to majority of the trainees of this project)
 - Women who suffered from or are at a greater risk at any form of violence
3. Elderly as vulnerable – for this project are defined as persons (male/ female) above the age of 55 as defined by the World Health Organisation (WHO). They are considered elderly or old and are vulnerable due to their;
 - Limited regenerative abilities
 - More susceptible to diseases, syndromes, injuries and sicknesses

4. Vulnerability in terms of climate change effects on individuals and entire communities - As the projects main target groups are located in remote rural communities, most of whom are located next to the ocean, it calls for recognition of this vulnerability and consequent inclusion of those individuals and communities who are being impacted by or are under threat of being impacted by the negative effects of climate change.

4.2. Local Government Officers

Local government officers in this case refers to government officers who are employed by the government to provide specific services to local communities and live either within the community or close to the community. In this case the survey involved two local government officers the LLG managers of the two target districts. Apart from the two it was observed that local councilors so as teachers and health workers were always present on ground and so some were interviewed. Other local government officers include; local magistrates, village police, Council Presidents, the district staffs that at times do routine patrols to the rural communities. They represent and are generally in-charge of their specific geographical regions and cannot pass or enforce laws that affect a wider area not in their jurisdiction.

Due to the focus on Renewable Energy and Green Economy of this project, a further clarification is provided here to train local government officials who are involved in decision-making with regards to local resource management, climate change, resilience and mitigation, in order assist them in making more informed decisions that are focused on long term benefits and development and has serious consideration of environment and sustainability at its core.

4.3. Community and Traditional Leaders

Community and traditional leaders in this project refer to individuals regardless of gender who are based full time in the village and are seen as figures of authority in the communities. They help maintain the community in terms of minimizing law and order issues, customary and religious obligations, relating and representing the needs of the communities to the government and or companies that have interest in their resources. They also help organize community activities and they are well respected in the community and especially the youths follow instructions given by them. This group of people include; local chiefs, religious leaders, women representatives, retired senior public servants and the generally the elderly. Involving and training these leaders on Renewable Energy, Green Economy and Inclusivity modules not only helps to ensure that there will be greater support and participation of the project, but also ensures that leaders themselves are aware of the environmental and sustainability issues at a level that enables them to better manage their local resources and work with (or pressure) the local governments to follow suit as well.

4.4. Local Business owners and Technicians

This group includes all the members of the target communities who are or would like to be involved in some form of business, be it in the form of small shops, commercial farmers, commercial fishermen, small but much permanent SME owners, agriculture/food processing for selling locally or exporting to mainland/overseas as well as individuals or committees who are responsible for revenue collection for

water, electricity etc. The benefit of training this group is to allow them to become more sustainable in their day to day business inputs and outputs, as well as provide knowledge and confidence to startup their own business and provide the tools necessary to improve their businesses with better bookkeeping and profitability.

Local Technicians general represents all the technically gifted minds in the community who are mostly involved in operation and maintenance of systems that require specific technical knowledge. These are the people who are usually called upon when “things stop working” in the community, and can include local electricians, technicians, mechanics, etc.

Chapter 5: Pre – Implementation Survey Results

In completing the survey a total of 80 people from the five selected project sites were interviewed for with a total of 60 people interviewed in the five villages of the Rigo district and 20 individuals the 2 sites in the Kairuku-Hiri district.

The findings from the survey are arranged in the order of the survey questionnaires and began with i) Increase inclusivity in decision-making on the use of natural resource and implementation of RE projects; ii) Improved knowledge of GE and RE options for local planning; iii) Sources of Energy; iv) Training on how to O&M RE System; v) Financial Management; vi) Improved Sustainability of rural RE installations; vii) Household income; viii) Information on the capacity of technicians.

Of the 80 heads interviewed, 20 (25%) were females (women and girls) and 60 (75 %) were males (men and boys). Most females did not participate in the survey. It was males who dominated because not many females play a leadership role in the community groups.

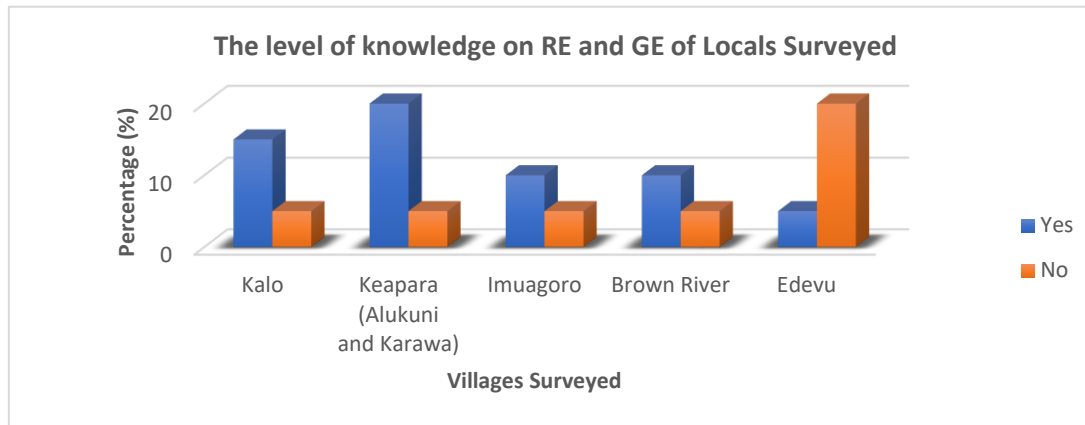
Out of the total 80 individuals interviewed 60% were elder men below age of 60 involved in decision making in their community followed by 25% boys (who are in their youth), 10% women, 5 % girls (who are in their youth)

5.1 Summary of Survey Results

5.1.1 Level of knowledge on GE and RE

Of the 80 heads interviewed, 60% of the respondents had fair knowledge about GE and RE. Out of his, 15% were those from Kalo village, 20% from Keapara (Alukuni and Karawa), 10% from Imuagoro, 10% from Brown River and 5 % from Edevu. Most of these respondents have ‘medium’ understanding of GE and RE. Generally, more people in Keapara (Alukuni and Karawa) knew about RE and GE than in the other villages. Although many people said they knew about RE (or said yes to this question). Many did not know in greater detail what RE or GE is

The following is a graphical representation of the above information on the responses of locals interviewed with regards to their knowledge on GE and RE.

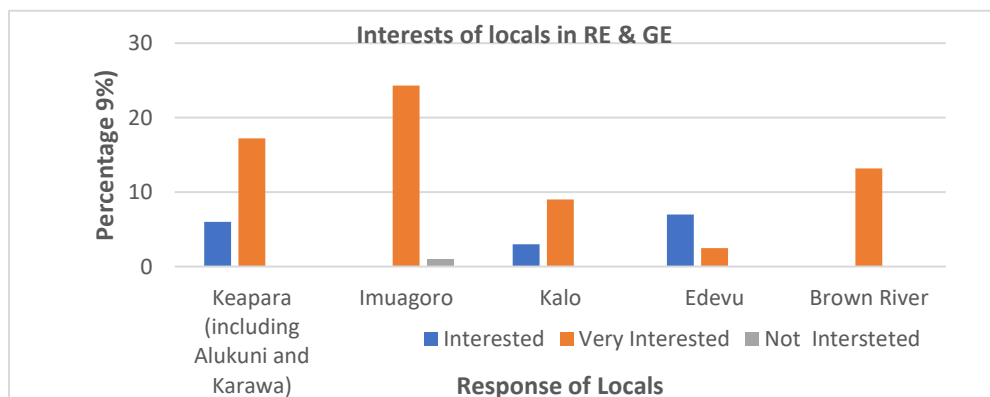


Graph 1.0. Graphical representation of the knowledge of locals surveyed on RE and GE.

5.1.2 Interest to learn more about GE and RE

Of the 80 heads interviewed, 83.2% of the respondents were interested to learn about RE and GE while 16.8% were not interested due to their gender and other interests. Of this, 23.2 % was those from Keapara (including Alukuni and Karawa), 25.3% from Imuagoro, 12% in Kalo, 9.5 % in Edevu and 13.2% in Brown River. Those respondents who were not interested did not give their reasons why they didn't want to learn about RE and GE, but obviously it was a personal choice.

The graph below shows a detail representation of the above information on the interests of locals relating to RE and GE



Graph 2.0: Graphical representation of the interests of locals relating to the subject of RE & GE.

5.1.3 Sources of Energy used at home

Regarding to the sources of energy used at home, over 70% noted firewood and solar as the major sources of energy in the communities, followed by 20% with diesel generators, and 10% with kerosene lamps, candles and more commonly battery powered torches.

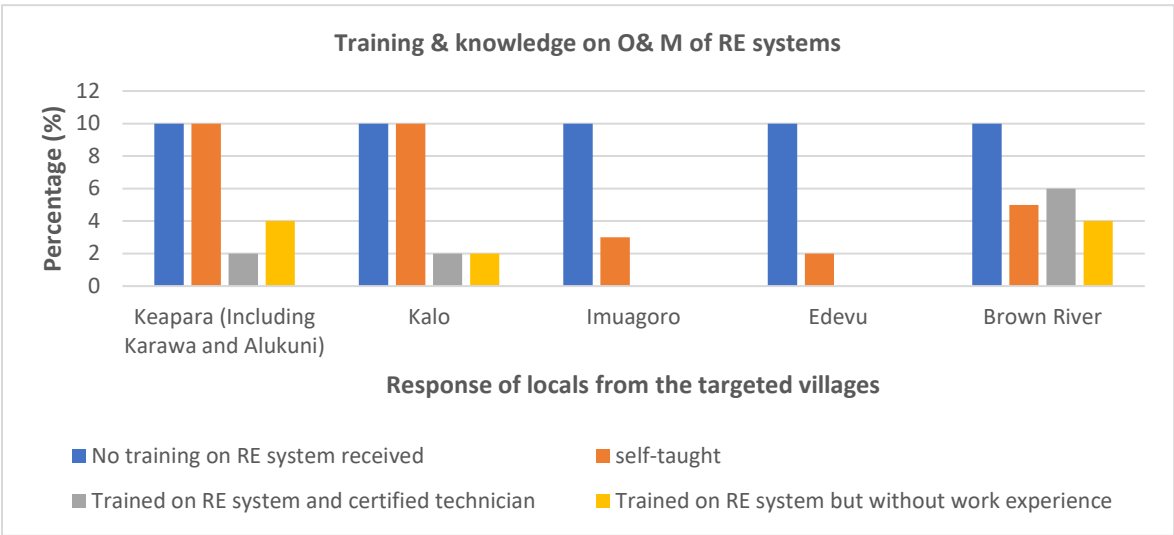
5.1.4 Use of Energy sources

On the use of energy, for cooking, firewood was the dominant fuel (98.0%). For lighting, solar use was the predominant source (95.9%), followed by other sources (2.7%). Portable generators were used for

refrigeration (50%) while solar and ‘other’ uses recorded 25.0% respectively. Music and television and charging of mobile phones and boom boxes use was popular regarding the uses of energy. To power tools, generators were used more by the respondents (60%) compared to solar (40%). The main use of electricity was lighting (87.7%), followed by cooking (10.8%) and music/TV/entertainment/powering devices like phone (1.5%). During the interview, all respondents agreed that electricity is good for their communities (100%).

5.1.5 Training on how to Operate & Maintain RE System

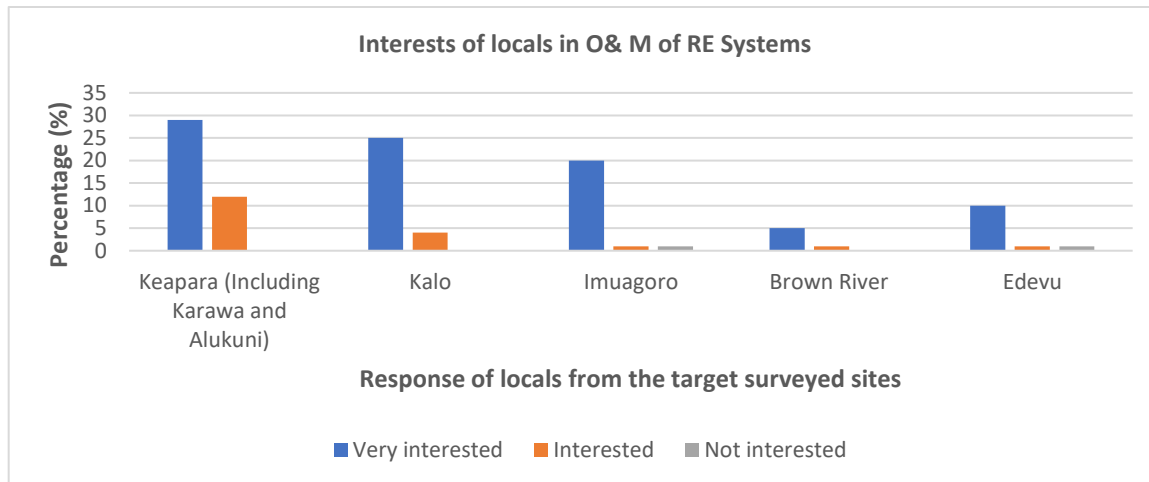
When asked if the locals have received any form of trainings on how to O&M their system; 50% said they have not received any training followed by, 30% who are self-taught, 20 % are trained and self-taught technicians, and 10% have received some training but without experience. These are the people who maintain RE and O&M system in the community. Most suppliers do not offer maintenance service.



Graph 3.0. Training and knowledge to operate and maintain RE Systems.

5.1.6 Interests of locals to attend training on O&M of RE system?

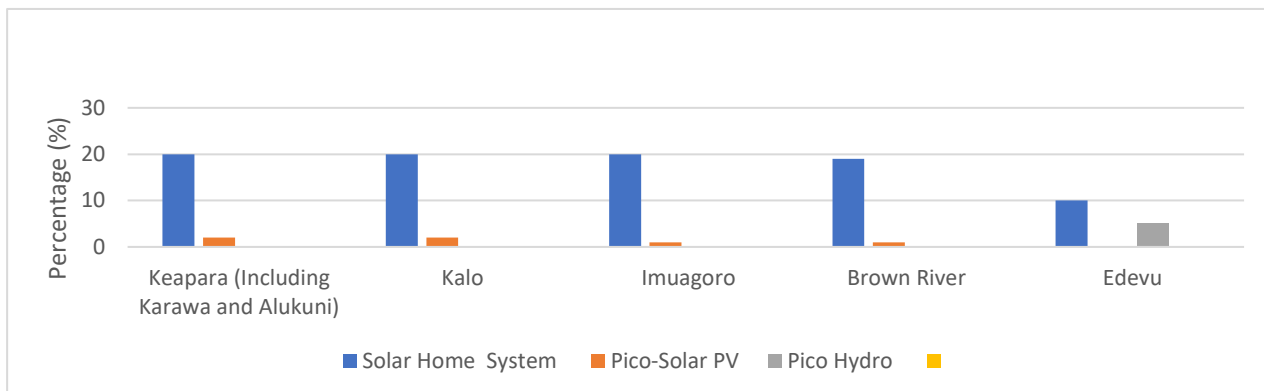
When asked if they would be interested to attend training on O&M of RE System; 79% were very interested, 19 % were interested and 2% were not interested. The 2% not interested were mostly young people from Imuagoro and Edevu villages



Graph 4.0: Graphical representation of the responses of locals with regards to their interest in O & M RE systems

5.1.7 Which module of RE would you like to be trained on?

Most respondent were interested to attend training on Solar Home Systems (89%) followed by Pico-Solar PV (6%) mainly because they have those systems. Some were even interested in the Pico Hydro system (5%). Generally, females were not sure of what systems to be trained on because they thought it would be technical.



Graph 5.0: Graphical representation of the RE modules preferred by locals to be trained.

5.1.8 Membership of cooperative business or ownership of business

When locals in the selected communities were asked whether they were members of a cooperative business or they own a business, 60 % responded “No” and 20% responded “Yes”. Of the 20% who responded yes, 10% were women. It was also noted that ownership of land and resources in Edevu and Brown River are equally distributed among elderly men and women.

5.1.9 What type of business do you have?

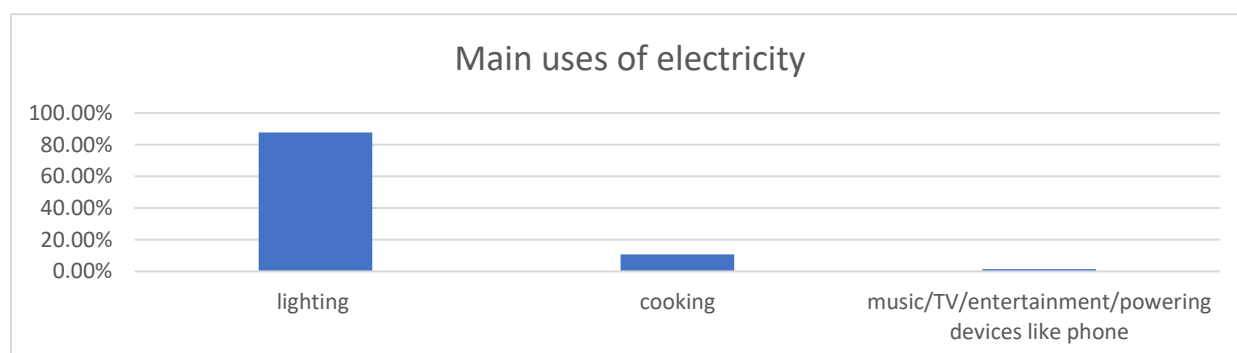
Most people interviewed own small trade store business (30%), selling fuel (10%) and fishing business (60%). Fishing business are found only in Keapara (including Karawa and Alukuni) and Kalo in Rigo district. Catching fish is only done by men and selling it is the responsibility of everyone in the family. People travel with boats to Port Moresby to sell their fish at Koki market.

5.2.0 Type of energy sources used for the business

When asked what type of energy source used for their business, 30% use solar energy, 20% use diesel/petrol generators, 25% use wood, 10% use solar torches, 5 % use the national grid and 10 % kerosene lamps and candles. In Rigo district, they mostly use solar energy, torches, kerosene lamp for fishing business. Whilst for Hiri, people use mostly solar for lights.

5.2.1 What do you use the energy source for?

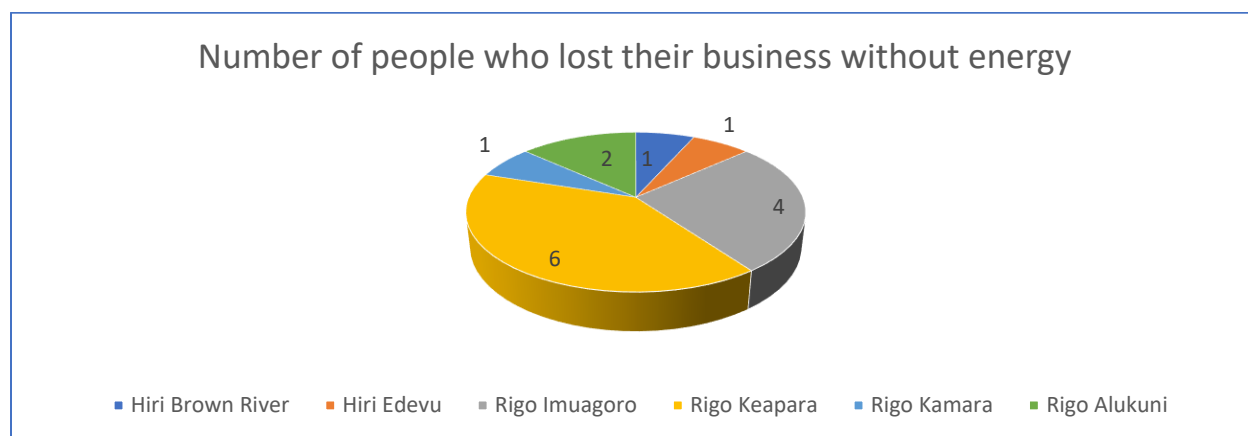
Generally, the energy sources are mainly used for lightning (100%) and cooling/freezing (15%) in both districts. However, some use it for computer/TV (10%) and water pumping especially in the main centers like Kwikila station and Brown River. We were not able to get more information on other electrical appliances used in these used apart from the once that were mentioned in the survey questionnaires.



Graph 6.0: Main Uses of Source of Energy or Electricity

5.2.2 The importance of energy source for business

About 96% responded that the energy sources used for their business is very important and without these sources, they can't do their normal business operations (See table below summarizes the responses). During the survey in was noted that 15 people in Rigo district and 2 in Kairuku-Hiri lost their business as a result of their energy sources infrastructure being spoilt.



Graph 7.0: Graphical representation of locals who lost business due to the lack of energy source.

Table 12.0. Summary of all details in IX, X, XI and XII.

What type of business do you have	Type of energy sources used for business	What do you use the energy source for	The importance of energy source for business
Trade store 60%	Solar energy 30%	lightning 100%	Very, without the energy source we cannot do business 96%
Fishing 40%	Diesel/petrol generators 20%	cooling/freezing (15%)	Somewhat, we can continue with other activities 4 %
Fuel selling (10%)	Wood 25%	computer/TV (10%)	Not so much, we can continue with business activities without the energy source
	Solar torches 10%		
	National grid 5 %		
	Kerosene and candles lamps 10%		

5.2.3 Financial Management

This survey found that 40% of the people have received training on financial management at various places conducted mainly by NGOs and Local Government officials. However, they have asked that more training on financial management must be conducted in their communities. The request was mostly given by mothers and girls.

5.2.4 What is the household's main source of income?

Table 13.0. The main source of income for the households as per the villages surveyed.

Sites	Main source of income
Keapara (including Alukuni and Kamara)	Agriculture/Farming, salaried employee, fishing
Imuogoro	Agriculture/Farming, salaried employee, fishing
Kalo	Agriculture/Farming, owner of business, fishing
Edevu	Casual laborer, Agriculture/Farming, Owner of business
Brown River	Traditional Trade, Casual laborer and Agriculture/Farming

5.2.5 How much do you as an individual spend in month based on items in table 14.0.

The table below summarizes their expense per month depending on their income. Most individuals responses were based on household expenditures because the communities live in families in a house.

Table 14.0. Estimated individual expenses monthly

Expenditures	Amount per month for individuals/ household (PGK)	Additional notes
Housing/Rent	0	People don't pay rent. Everyone in the village own their houses
Food	300 – 700	
Health care	100	
Clothes	200 -500	
Transport	100-200	
Family support	1000 – 200,000	And most comes from bride price payment – the highest paid by a father of a boy during our visit to Keapara is K100,000.
Energy/Fuel	100 - 1000	Mostly used for boat for fishing business
School fees and necessary items	1000 - 2000	This was estimated amount given after the free education policy was abolished by the current government.

5.2.6 Are there times in the year that you are not able to afford your main energy source used?

When asked this question, 70% of the respondents said it is 'sometimes' and doesn't happen frequently and 30% said that they 'never' came across such a situation. The 70% who said it sometimes happens is when there is disaster.

Chapter 6: Survey Results and Recommendations

6.1 Profiles of Target Groups in the Community

Below is a summary table of the target groups from the five villages surveyed highlighting the potentially number of participants to be trained for this project;

Table 15.0: Summary of Target groups surveyed highlighting potential participants from the five survey sites.

Community	Target Group	Sub-group	Sub-group Population	Gender (M/F)	Details
Name: Keapara Population: 1, 701 Male: 877 Female: 833 Households: 240	Community/ traditional leaders	Pastors	5	5/0	Dominant Religion is the United Church. There are 2 big Churches in the village.
		Women group leaders	12	0/12	6 women group leaders for community activities and 6 women group leader for church activities. That's 2 from each of the three villages under Keapara.
		Community leaders	21	12/9	9 traditional leaders 1. Keapara community 2. Alukuni Community 3. Karawa Community 12 community leaders with 4 from each villages
		Youth group leaders	14	9/5	Youths are led by youth group leaders who are very influential and the young in the villages look up to and follow them. 2 Youth groups for church activities & general Village activities
		Vulnerable People	8	4/4	Include the old and people with disabilities
		Other Prospects	250	150/100	250 plus people are expected to attend the training which will comprise of members from all target groups
	Local Government Officials	6	5	4/1	On ground were elementary & primary school teachers, nurses, local councilors, village magistrates, village police officers, and retired public servants
	Local Technicians	2	5	5/0	Certified local technicians based in the villages, retired & self-taught technicians based in the village.
	Small Businesses	2	4	3/1	Locally owned trade stores and other SMEs and black markets.
	Potential community trainees are inclusive of Alukuni & Karawa Villagers			192/132	Majority interviewed were males because many females were shy and also occupied with household chores & were unable for interview.

Community	Target Group	Sub-group	Sub-group Population	Gender M/F	Details
Name: Kalo Population: 2, 438 Male: 1,250 Female: 1, 188 Households: 368	Community/ traditional leaders	Pastors	4	4/0	2 Religious groups. 1. United and 2. Salvation army Religion in the village with a big church & have 2 pastors for each religion.
		Women group leaders	6	0/6	4 women group leaders for the 2 religion activities and 3 women group leaders for community activities. There could be more.
		Community leaders	8	5/3	3 traditional community leaders 1. Kalo Community 4 Community leaders but the number may increase on special occasions.
		Youth group leaders	7	4/3	2 village youth leader and 2 youth leader for each religious group.
		Vulnerable People	6	4/2	Old retired workers and other old people a disabled persons in the village. There are many old in the village.
		Other Prospects	300	180/120	300 people are expected to attend the training which will comprise of members from all target groups given the large population & interest of locals.
	Local Government Officials	6	9	5/4	On ground were elementary & primary school teachers, nurses, local councilors, village magistrates, village police officers, and retired public servants
	Local Technicians	2	4	4/0	Certified local technicians based in the villages, retired & self-taught technicians based in the village.
	Small Businesses	2	4	3/1	Locally owned trade stores and other SMEs and black markets.
Potential community trainees				209/139	Majority interviewed were males because many females were shy and also occupied with household chores & were unable for interview.
Community	Target Group	Sub-group	Sub-group Population	Gender M/F	Details
Name: Imuagoro Population: 1, 024 Male: 545	Community/ traditional leaders	Pastors	2	2/0	United Church is dominant religion
		Women group leaders	4	0/4	Women group leaders and Religious women group leaders.
		Community leaders	6	4/2	3 traditional community leaders 1. Immuti Community

Female: 479 Households:113					3 Community leaders but the number may increase on special occasions.
		Youth group leaders	6	4/2	2 village youth group leaders while others were ordinary youths in the community.
		Vulnerable People	5	3/2	Referred in this case are the old and disabled unfortunately none were available on site for the interview.
		Other Prospects	150	90/60	150 people even more are expected to attend the training from all target groups given the high village population. The closest village/ town is the district headquarters Kwikila Station with a population of 1, 500.
	Local Government Officials	5	8	4/4	Comprises of elementary & primary school teachers, nurses, police officer, and the village magistrates & retired public servants. Unfortunately none were present for interview.
	Local Technicians	2	3	3/0	Certified local technicians based in the villages, retired & self-taught technicians based in the village.
	Small Businesses	2	2	2/0	Locally owned trade stores and other SMEs and black markets.
Potential community trainees				112/74	Majority interviewed were males because many females were shy and also occupied with household chores & were unable for interview.
Community	Target Group	Sub-group	Sub-group Population	Gender M/F	Details
Name: Edevu Population: 414 Male: 203 Female: 211 Household: 95	Community/ traditional leaders	Pastors	2	2/0	1 common religion dominated by Seven day Adventist.
		Women group leaders	4	0/4	2 women group leader for each religious group. 2 women leaders to represent women in community activities at times the women religious leaders take all duties.
		Community leaders	8	5/3	3 Traditional community traditional leaders for the Koiari tribe. 2 representatives or officers of the logging company & other community leaders.
		Youth group leaders	4	2/2	2 youth groups Community & Religious youth leaders.

		Vulnerable People	5	3/2	There were many old as observed but no disabled person was seen during the survey.
		Other Prospects	100	60/40	100 people even more are expected to participate in the trainings from all target groups.
	Local Government Officials	6	4	3/1	Comprises of local councilors, teachers, village police, village magistrates, and nurses. The local LLG manager was interviewed.
	Local Technicians	2	1	1/0	Certified local technicians based in the villages, retired & self-taught technicians based in the village.
	Small Businesses	2	2	2/0	Locally owned trade stores and other SMEs and black markets.
Potential community trainees				78/52	Though many females were present for the interview many were shy for the interview due to traditional restrictions or other personal reasons.
Community	Target Group	Sub-group	Sub-group Population	Gender M/F	Details
Name: Brown River Population: 2, 807 Male: 1, 556 Female: 1, 351 Households: 395	Community/ traditional leaders	Pastors	4	4/0	3 religious' groups, Catholic, Seventh Day Adventist and Revival
		Women group leaders	7	0/7	Women community leader for the community, 3 women group leader for each religious groups. The number may increase on special occasions.
		Community leaders	7	5/2	3 community leaders are responsible & represent the community in gatherings & other activities. 2 Traditional Leaders 1. Koiari People 2. Goilala People
		Youth group leaders	6	4/2	Village youth leader and youth leaders for each religious group
		Vulnerable People	6	4/2	There were many old as observed but no disabled person was seen during the survey.
		Other Prospects	300	170/130	300 or even more locals are expected to attend as the village has a high population made up of different race of people who are very keen in the project.

	Local Government Officials	6	9	6/3	Comprises of local councilors, teachers, village police, village magistrates, and nurses. The local LLG manager was interviewed.
	Local Technicians	2	3	3/0	Certified local technicians based in the villages, retired & self-taught technicians based in the village.
	Small Businesses	2	2	2/0	Locally owned trade stores and other SMEs and black markets.
Potential Community Trainees				198/146	Though many females were present for the interview many were shy for the interview due to traditional restrictions or other personal reasons.
Grand Total – Potential PNG Project trainees by Gender (M/F)				789/543	1, 332 participants in total for the five (5) sites including the additional two villages surveyed are expected to be trained
Grand Total of Potential Community trainees with regards to estimated numbers considered under other Prospects.				1,100 People	1, 100 people in total from all five sites are estimated to attend the trainings as per the estimates of other prospective participants.

As per the results from the above summary table, it is expected that a total of 1,100 participants will be trained for this project out from the five sites selected for PNG. This number is just an estimate and will surely reach the targeted number of 750 participants to be trained for PNG as per the project log frame. This is because all five selected villages have high populations that when the project is actually been implemented many locals will be willing to be trained. Also those selected villages have nearby villages as such the knowledge can be transferred to individuals in those villages out of the targeted project communities.

The statistics is based on the five communities surveyed however two (2) communities in one of the sites (Keapara) is expected to also benefit from this project directly and there are other nearby villages to the other four sites that will also benefit from this project.

As per the statistics in the above table, it is be expected that 40% of the total participants would include women, meeting the 40% threshold for women participating in this project and this number is expected to increase.

As per the grand total of potential community trainees with regards to estimated numbers of potential training participants under other projects, it is estimated that a total of 1, 100 people are expected to participate and be trained in this project. This is just an estimate and the numbers may change in actual implementation. Note that the estimates were made based on the total number of population in each village and the interest shown by locals towards the project and that the estimated figures includes all target groups in the communities.

6.2 Confirmation of Project KPI's

Below is an estimated baseline for the key performance indicators (KPIs) that involves women and vulnerable groups inclusion in this project;

Table 16.0: Estimated Baseline KPIs that involves women & Vulnerable group inclusions.

Description	Indicator	Baseline
Training materials customized for Women and Vulnerable groups and ready for training delivery (KOICA version: Training materials suitable for women and Vulnerable groups)	*KPI: No. of women & persons from vulnerable groups providing inputs / participating in decision-making meetings, committees, etc.	90% of the respondents agreed that women do not participate in decision-making within their communities.
	Other: No. of local development policies/RE project making reference to gender inclusion	1 – The EU-GIZ water & RE Project in Keapara, Kalo & Imuagoro villages unfortunately it's behind schedule for implementation.
	KPI: No of suitable training materials and processes prepared and translated targeting women and vulnerable groups.	0
Trained women and vulnerable groups in GE and RE	Number of persons in women and vulnerable groups trained	0
	No. vulnerable persons trained	0
	No. of women trained	0
Training materials for GE and RE	KPI: Proportion of participants in training who agree that their knowledge of GE and RE has increased after attending the training	0 (Since no such trainings were conducted)
	Overall KPI 2 Number of suitable training materials and processes prepared and translated	0
Trained traditional/community leaders, small businesses, local government officials on GE and RE concepts	Number of trained traditional/community leaders, small businesses, local government official on GE & RE concepts.	0
O&M and financial management training materials and training completed	*KPI: Proportion of community members and local technicians trained in financial management and O&M basics for RE who agree that the training will assist in better O&M of their local RE installations.	0

	*KPI: Number of suitable training materials and processes prepared and translated for O&M and financial management	0
Communities trained on financial management of RE systems	- Number of persons trained on financial management of RE systems	0

During the survey, we separated each socio-demographic group basically to encourage each group to consider their own opinions and options, thus allowing the communities needs to be considered holistically. These ideas are then collated at the planning session. The socio-economic groups identified included:

- Women groups
- Widows and single mothers
- Youth groups
- Community leaders
- Persons living with disabilities
- Business Owners (SME's)
- Local technicians
- Ward Development Committee

The following is to be noted from the survey moving this project forward;

1. Out of the five selected project sites; there are two (Edevu & Brown River) have recent grid extensions and are expected to have access to hydropower from the two under construction hydro systems by 2022. The three sites in the Rigo district are also expected to have access to grid power in the near future once the main grid system is upgraded. Currently the three villages are heavily dependent on solar and small generators.
2. It is expected that additional communities will be part of the project and the knowledge on RE & GE been thought to locals during the rural trainings will be passed to locals in the other nearby villages as these villages speak the same language and share the same cultures and traditions. Unfortunately most nearby villages to the selected sites were not covered during the survey hence it is important these additional communities be identified in close consultation with the local elders and councilors of the respective districts or LLGs.
3. From the survey it is suggested that centralized school facilities (primary school) or church grounds can be used as training venues at the selected project sites. This would require permission from the school boards and churches however, the timing of the training may need to consider school term breaks in the process.
4. There is a substantial number of participants that will need translation of the training materials for the workshop(s) hence it would be ideal that training materials be translated, be practical, and simple to read with clear pictorials that includes applications in a tradition PNG community setting. The materials need to be also interactive whereby local experiences are discussed for better knowledge sharing. The Materials can be translated into Tok Pidgin and Motu as apart from English these are the two common languages of the Central Province People.
5. The context of vulnerable groups may need re-defining to increase the number of vulnerable person(s) in this survey. Also there are not many people with disabilities in the local communities as identified in the survey.
6. The provincial and district offices including the local ward councilors will be key partners in mobilizing of the local communities and logistical arrangements for the capacity building training at the local level. They will also provide the much needed information on the local communities and also help interact and introduce the team and project to a larger target group in the selected communities.

Chapter 7: Conclusion

The findings from the Pre-implementation survey on “Capacity Building to Strengthen Sustainable Implementation of Renewable Energy Technologies for Rural Energy Access” project are as follows:

- Most people in the communities were supportive of the program and a **“very interested”** to be trained on the green economy and renewable energy basics. From their feedback, they believed the project would be an opportunity for them to gain the knowledge and sustain their own existing renewable energy systems. This will enable them to involve in business that would increase their family income and improve living standards.
- All these communities are homogenous in their culture, religion, geography and therefore results from the survey for all communities were quite similar.
- The churches are very dominant and active partners in service delivery, implementing government policies and projects and therefore must be involved in the implementation of the project.
- A high proportion of the community did not know about O&M and how to use their RE system. Most have the RE system but there is no one to maintain it. Hence, most have shown interest in attending the training.
- The ward development committee must be involved in the implementation of the project as they are the community development arm of Local Level Government.
- Not many women and girls have shown interest in learning about O&M and RE system.
- The communities visited in Hiri and Rigo district agreed on an urgent need for the training so they will be equipped for the Edevu Hydro Project which will be opened in 2021. This hydro project will supply the communities we surveyed in Central Province.
- Most of the respondents especially the women have no background or training on Financial Management.
- These projects should benefit not only able-bodied persons but should also be inclusive of the needs of old people and persons with disabilities.
- Women involvement must be encouraged although there is a stereotyped structure in communities where women do not mostly take part in decision making.
- Past similar project failed because of careless, vandalism, lack of ownership and support from the government. Therefore, this project must seriously consider bottom up planning and involve the local government officials through CPA for sustainability purposes. It must also avoid political influences from individuals with political interests.
- All the communities visited use solar for lighting and charging other devices such as mobile phones but lack the knowledge to maintain these Renewable Energy Systems.
- The big challenge is to get people together, as most villagers were occupied with their daily household chores, mainly farming, fishing and gardening. Therefore, early awareness is important before the training takes place.

To conclude for this project to be successful in the community, there must be close consultation with the respective LLGs through CPA. In addition, clear roles and responsibility for the project on the part of households, communities, LLGs and provincial government assistance must be defined.

References

PNG National weather report 2018-2019

2011 National Census and <https://en.wikipedia.org/wiki/Central>

2011 National Population and Housing Survey, Ward Profile

Oral discussion with communities

Appendix A: Pre-implementation Survey Questionnaire Template

Capacity building to strengthen sustainable implementation of renewable energy technologies for rural energy access Project

Pre-implementation Survey Questionnaire

A. Increased inclusivity in decision-making on the use of natural resource and implementation of RE projects

	Question	Answer	Question Type
1.	Name		Open
2.	Title		Open
3.	Age		Open
4.	Gender	Male Female	Select one
5.	What is your profession/Work?		Open
6.	What is the location?	Island name Village name	Open Open
7.	How many members are in your household?		Open
8.	How many are men and how many women?		Open
9.	In which of these decision- making processes or groups are you involved?	None Household Education Church Youth Group Others, please specify Health Committee Provincial Government Chief Council	Select all that apply
10.	In what capacity are you involved in the above decision-making processes or groups?		Open

11.	How long have you served in this position/role?		Open
12.	Are you involved in any environment related/resource management policy or RE project development in your community? <i>Surveyor to translate into local language</i>	Yes No	Select one
13.	If Yes for Q12, how does the policy/RE project make reference to inclusion of women or other vulnerable groups in the community? Please explain		Open

B. Improved knowledge of GE and RE options for local level planning

	Question	Answer	Question Type
14.	A. What do you understand by the term “Green Economy”? <i>Surveyor to translate GE into local language</i>		Open
	B. Surveyor to judge level of knowledge of Green Economy from above answer.	None Low Medium High	Select
	C. Are you interested to know more about Green Economy?	Not interested Interested Very interested	Select
15.	A. What do you understand by “Renewable Energy”? <i>Surveyor to translate into local language</i>		Open
	B. Surveyor to judge level of knowledge of Renewable Energy.		Open

	C. Are you interested to know more about Renewable Energy?	None Low Medium High	Select
	D. What are the challenges, if any, in accessing or using Renewable Energy?	Not interested Interested Very interested	Select
16.	Have you received any training on GE, RE and EE before? If yes, state what you liked about the following:		Open
	A. Training		Open
	B. Content of training		Open
	C. Method of delivery		Open
	D. Usefulness of exercises		Open
	E. Examples used		Open
17.	Suggest ways how we can make our economy greener or more sustainable. <i>Surveyor to translate into local language</i>		Open
18.	Give us an example of Renewable Energy Sources.		Open

19.	What sources of energy do you use at home and who pays for it?	National grid Mini Off-grid Hybrid System Wind Diesel generator Solar Energy (single light system) Solar Energy (multiple light system) Solar Energy (SHS with inverter) Biogas LPG Torches Kerosene lamp Candles Charcoal Wood Other (specify)	Select all that apply
20.	What do you mainly use these energy sources for?	Lighting Cooking & water heating Cooling/refrigerating food Cooling the home Charging mobile phone Watching TV Listening to the radio Powering other devices Other (specify)	Select all that apply
21.	If Q19 indicates use of RE, do you know how to operate and maintain your RE system?	Yes No	Select and identify.
22.	If not, then who maintains your RE system? <i>Note to Surveyor: Interview RE System maintainer name here</i>		Open

23.	Would you be interested in attending training on O&M of RE Systems?	Not interested Interested Very Interested	
24.	Which module of RE would you like to be trained on?	Solar Home System Pico/Micro Hydro	Select all that apply
25.	Of the two RE systems (Solar Home System, Pico/Micro Hydro), which are more suitable for you and your community? And why?	Solar Home System Pico/Micro Hydro	Select all that apply and explain why?
26.	What do you know about being “Energy Efficient”? <i>Surveyor to translate into local language</i>		Open
27.	How do you practice being “Energy Efficient”?		Open
28.	If you have a business, what type of business do you have? Would you be interested in starting another one? What kind?		Open
29.	If you don’t have a business, are you interested in starting one? What kind?		Open

30.	What type of energy source do you use for your business?	National grid Off-grid Hybrid Wind Diesel generator Solar Energy (single light system) Solar Energy (multiple light system) Solar Energy (SHS with inverter) Biogas LPG Torches Kerosene lamp Candles Charcoal Wood Other (specify)	Select all that apply
31.	What do you use the energy source for?		Open
32.	How important (necessary) is the energy source for your business?	- Very, without the energy source we can't do business - Somewhat, we can continue with other activities - Not so much, we can continue with business activities without the energy source	Select
33.	What do you know about financial management?		Open
34.	Have you received trainings on financial Management?	Yes No	Select

35.	When did you receive the training? Which organisation delivered the training? And what kind of training did you receive?		Open
36.	Would you like to be trained or get additional training on financial Management? Why?		Open

C. Improved sustainability of rural RE installations

Part 1: Individuals

	Question	Answer	Question Type
37.	What is your household's main source of income?		Open
38.	Last month, about how much did you spend on the following? <ul style="list-style-type: none"> • Energy • Other items 		Indicate amount
39.	Are there times in the year that you are not able to meet your energy costs?	- Frequently - Sometimes - Never	Select

40.	Do you have access to the internet? If Yes, what do you use to access the internet?		Open
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Part 2: Local Technicians

	Question	Answer	Question Type
41.	Have you received any formal training on O&M of RE Systems?	Yes No	Select
42.	If yes to Q41, please state level of qualification and institution.		Open
43.	Would you be interested to attend training on O&M of RE systems?	No Yes, Solar PV Yes, Hydro Yes, both Solar and Hydro	Select

General

44.	What are your preferred days and time for attending this training? Are there any fixed exclusions and what are your major weekly, monthly and annual events that need to be avoided?		Open
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Appendix B: Summary for all information for the 5 selected sites with general comments

Target site locations	Reasons for selecting these in the pre-implementation sample	Comments/concerns
Imuagoro	<p>Solar for water pumping and street lighting</p> <p>Aware of the effects of climate change</p> <p>Small solar Pico system</p> <p>Accessible by road</p> <p>People are in agriculture farming There is health and education infrastructure</p> <p>There are economic activities in the village SMEs are also present</p> <p>The former local MP supplied simple (3 lighting) solar systems to individual homes.</p> <p>The former MP also put village solar light system for the community.</p>	<p>It had an issue on land disputes, so it did not work well although it meets the criteria very well.</p> <p>It's a potential site for project implementation if there is a good understanding established in the beginning</p> <p>The solar installment team installed the solar but it's not working anymore (must involve community as much as possible through LLG)</p> <p>Distance from the main government center (Kwikila station)</p> <p>Number of communities making up the different wards</p> <p>Failed existing projects such as EU GIZ</p> <p>Community is aware of climate change issues due to local effects</p>
Keapara (including Alukuni and Kawara)	<p>Solar for water pumping and street lighting</p> <p>Aware of the effects of climate change due to experience with cemetery being taken away by the sea</p> <p>Small solar system in household</p> <p>Accessible by road</p> <p>There is health and education infrastructure</p> <p>Fishing/hunting is main source of food and livelihood</p>	<p>It meets the criteria and it's an ideal location. Solar water system was constructed in Keapara.</p> <p>Keapara is safe and it is a good location for the project.</p> <p>Do more awareness in the community</p> <p>Identify social groups/ leaders in the community to work with them</p> <p>Identify existing solar projects</p> <p>A solar water pumping system being placed there by save the children, which failed after 3 months. Streetlights with battery installed very low that water got to it. It failed after 1 month.</p>

	The former local MP supplied simple (3 lighting) solar systems to individual homes. Also have solar street lighting systems.	Request to have regulation on quality of solar equipment being brought in country, since there was an incident with system catching fire with a person in wheelchair being rescued
Kalo	<p>Solar for water pumping and street lighting</p> <p>Small solar system</p> <p>Accessible by road</p> <p>Large population</p> <p>School and health facilities</p> <p>Sealed road</p> <p>Local MP distributed home solar kits</p> <p>NGO presence</p>	<p>There are issues in the community committing to visits and surveys, but the entry point could be through United church to mobilize the people. The only challenge in the community is land issues. Security is okay and its safe, but people fear sorcery (more spiritual thing).</p> <p>Road is usually in bad condition</p>
Edevu	<p>Grid extension for the new hydro built</p> <p>School and health facilities</p>	<p>Good community cooperation</p> <p>Road is usually in bad condition</p>
Brown River	<p>Grid Extension for the new hydro built</p> <p>NGO presence</p> <p>Sealed road</p> <p>School and health facilities</p> <p>Police presence</p> <p>Accessible by road</p>	<p>Good community cooperation</p>

	More presence of SME	
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