WAISISI PRELIMANARY ASSEMENT REPORT

Prepared by: Osborne Melenamu, Project Coordinator

Joseph N. Temakon, Principal Scientific Officer-Energy Efficiency

Executive Summary

This preliminary report focuses on the project site which was selected by the Ministry of Climate Change.

Firstly, the project gives an outline of the context of the proposed project site. These are basic description how they live, the geography, economy and some of the natural disasters which they are facing every day.

The report further provides a brief of the Waisisi Fishing Association (WFA) outlining some of the issues or challenges which they are facing at while the association is up and running.

The report also provides the process of selecting the installation sites and the criteria's which was used to locate the most potential installation sites. The potential installation sites/spots are also identified.

Finally, the report provides an appendix with the meeting minuet's and additions information on the project specification.

Introduction

The Adapting to Climate Change and Sustainable Energy (ACSE) Solar, Biogas and Climate Early Warning System project is funded by EU-GIZ through the Ministry of Climate Change and implementing by the Department of Energy. The Soar component of this focuses on installation of solar freezer and provide lighting in a fishing community.

The main outcome of this project is increasing access to sustainable, and affordable energy in rural communities

The objective is to contribute towards improved access to sustainable energy and reduced vulnerability to climate change through enhanced energy security and strengthened adaptive capacity. The Solar project will target only the electrical needs for the fishing community

This report is based on an inception visit done by Joseph Temakon (Department of Energy) and Osborne Melenamu, on the 6th – 11th January 2017, to Waisisi community. The purpose of the visit is to carry out site assessment at Waisisi community as it was selected as the potential site of the solar project. This assessment caters:

1. **Processes of Fishing Village selection**

The selection of Wasisisi fishing community was selected by the Government of Vanuatu through the ministry of Climate Change by stringent criteria's to allow the project to be most effective. This project was agreed in 2014 and after cyclone Pam in 2015 the project is seen as a recovery project. Given the greatest devastation, the island of Tanna was selected for the implementation of the ACSE project. Waisisi community has active Fishing Association and this was supported by data and information from the Department of Fisheries (DoF)

2. General overview of Proposed site

Village Context

Waisisi is a well-organized traditional community but isolated at the North Eastern part of Tanna. The community of Waisisi is made up of three main villages, namely; Natanu, Nawanbai and Kualip. The villages have respective chief and one highly chief who look after the three chiefs. Natanu village is the centre of Waisisi community were village meetings and community activities were organized. The table below show information on the three villages.

Table 1: Households in each village and access to public transports.

WAISISI COMMUNITY				
Village Name	**Households**	**Permanent House/building**	**Distance from the Sea**	**Access to Transport**
Natanu	38	No	40 Meter	Insufficient
Nawanbai	29	No	150 Meters	Insufficient
Kualip	11	Devine School - 2 class rooms	> 1000 Meters	Sufficient

All the houses in the villages were built using local materials; local tress as housing posts, coconut leaves and elephant grasses for roofing and walling, while some of the new houses have iron sheets for walling.

Fig 1: Local houses which are built with local materials. Every houses are locally made and have almost the same design.

The villages are separated by the landscape itself where one village is on sea-level, the other about 50 metres above sea level and the other is on the edge of the ridge encircling the entire Waisisi compound. An extension of the village is right next to the main road, more than 1 kilometre away from the main village.

Geography

Geographically, Waisisi is located on the coastal area with a high range of ridge surrounding the vicinity. This is a constraint which causes the sun to rise over the hills at around 8:30am-9:00am and sets at 5:00am. This allows the village to receive an average of about 6 sun hours a day in the shorter days, and expects to increase during the longer days. This average can be easily reduced due to the deposits from the volcano during the volcanic activity, or any random day when there is thick cloud discharged. .

Fig 2: High range surrounding the village. This influences the amount of sun light.

Tanna is a volcanic island with Waisisi in the vicinity of the Yasur volcano. This implies that all effects of the volcano is seen at Waisisi including ash falls, dense clouding, acid rain and the soil geology itself. Volcanic deposits can be very corrosive and eats through all sorts of metal. This is very evident in all areas around the volcano.

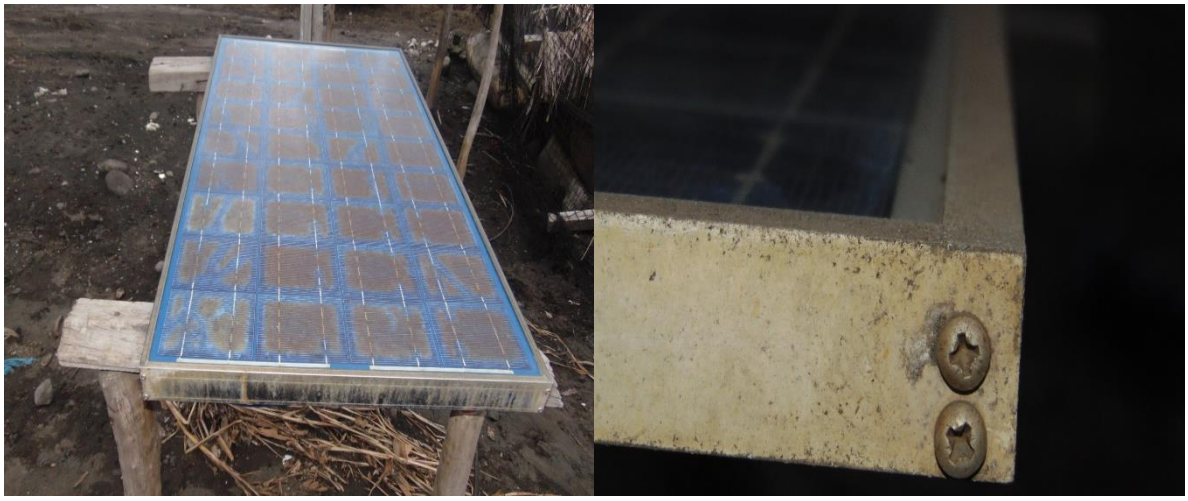


Fig 3: Volcanic ash eating through solar panel and metals.

Vegetation

Vegetation is moderate in all the three villages. Most of the trees are fruit and nut trees which are purposely for village consumption. A common three which is also found in all the 3 villages is the banyan tree which all have traditional values. Most of the trees cause excessive shading and are required to be trimmed for solar panels to be most effective.

Fig 4: This is the type of vegetation which is found in most of the village compounds. Tall trees growing around the community.

The vegetation in this community is important to hold the loose top soil in place, especially in the sloppy areas around and within the village.

Fig 5: The soil structure is quite loose and therefore some of the trees which keep the top soil from being washed away by rain. These trees have been conserved for decades just to keep the top soil from falling apart.

Soil Profile

Soil around Waisisi is estimated 80% fine volcanic ash and 20 % volcanic cores particles, which are loosed, unstable and poor for building foundations. Due to this permeable characteristic the soil structure is not stable and many natural disasters are prone to occur, such as flooding, landslides and dust storms. Infrastructures such as roads and permanent buildings foundations are also vulnerable.

Fig 6: The top soil is composed of volcanic ash (sand) and gravel. It is very loose that whenever it rains, it can be easily washed away. The picture on the right is the main access road to Waisisi. Whenever it rains, water from the hills are directed to the road digging very large holes/trenches making it impossible for all sorts of vehicles to use.

The scattered volcanic rocks are impossible to penetrate with the local digging tools, and so rocky parts of the village will be avoided.

Economy

Due to the soil conditions and the daily impacts of the Yasur volcano, root crops and greens do not grow well, so food is planted only for consumption. There is usually no spare to sell in the market to generate some income. The families usually trade for greens and root crops with seasonal fish.

Fig 7: Acid rain eats through young kumala shoots. Acid rain and ash fall is common in Waisisi.

Marine life on the other hand is flourishing and fish is the major source of income and fishing is the main economic activity in the community since the 1980's. All men and women in the village are involved fishing activities, or have some sort of talent to catch fish. This is basically the only way to get financial means to support their families and pay school fees for their children as well as sustaining themselves. With the long history of fishing activities and the dependency it was essential to keep improving the fishing activities at Waisisi community. They also have the only trained technician who maintains boat engines as well as fibreglass.

Fig 8: Experienced outboard motor technician. He is also preparing another young technician in case he retires.

There is a women's group which is functioning very well and they are usually hired to do work such as weeding gardens and transporting fish from Waisisi to the main road at the fixed price of 1000 VT.

Fig 9: Women's group carrying fish from the village to the Whitesands main road. The distance from Natanu to Kualip

There are 2 very small shops which sells the basic needs.

3. Waisisi Fishing Association (WFA)

WFA is one of the fishing associations in Tanna that supplies most fish around Tanna through the Lenakel Fish Market (refer to appendix 3). The WFA was first established in the early 1980's through a project from the Department of Fisheries (DoF) and was unsuccessful due to lack of maintenance. The project was again revived in 1999 with the rising fishing activity in Waisisi, the Vanuatu government through the (DoF) Planned to provide Solar freezer for the Waisisi WFA. The Fishing Association and the community built a house to keep the freezers. However, the implementation of the project was very slow and some of the materials never made it to Waisisi. The house was destroyed in 2015 by TC Pam and the materials are scattered everywhere in the village.

The WFA had a simple management mechanism that is currently dormant due to unavailability of storage, so fishermen operate privately, but engage the women's group in transporting the catch to the main road. The system was that, the fisherman sold their catch to the WFA and the WFA gets the fish and sell to customers or Lenakel fish market.

Currently, Waisisi Fishing Association has a stable market. The community uses a simple structure. When the catch is few (1 to 5) the fish is sold to the local communities or eaten. However, for good catches the fisherman must get his catch by public transport to Lanakel town and sell to the TAFEA cooperative and local businessmen.

Usually the fishermen go out early in the morning at around 3:00am and fish until lunch time. Just past lunch time, they start returning. They usually go to out 24 nautical miles to fish on sea mounts. Once they arrive, vehicles transport their catch to TAFEA cooperative. If the road condition is bad, the women's group carry the fish to the Whitesands main road and later taken by public transport to Lenakel.

While waiting for transport, some of the fish is sold to passer-by's. The problem is that pricing is hard because there is no scale to weight the fish before selling and so some of the catch can be sold at a lower price than actual market price.

During seasonal fish harvest, fish is traded with food from Middle Bush village and other neighbouring villages. This is known as the bartering system which was used before modern civilization.

There are many challenges faced by the WFA when there is no fish storage system. Listed are some of the major challenges;

i) The WFA has no storage capacity to store their catch. Also, they do not have ice machines to maintain fish quality once it is being surfaced. Usually, once a fish is surfaced, the head is being pieced to allow blood to flow out and instantly thrown into ice water. This is a standard procedure which is followed to ensure that fish quality and value is maintained;

ii) The second challenge is the WFA market is limited to Lenakel where the selling price is not too promising with the constantly rising cost of doing business as well as living. This is basically because the catch needs to meet the requirements of supplying customers in Port Vila where the price is good. This is also very discouraging for the fisherman, but they have no other option;

iii) Instantly transporting the catch to Lenakel can be very expensive because even if the catch is small, the fish needs to reach Lenakel in order to get some income from it. At times, a larger portion of the cash received will be spent on transporting the catch and fuel for next day;

iv) The roads are prone to heavy rains which wash away the roads creating large trenches in the roads which make it impossible for any vehicle to pass. This makes it harder and raises costs. The WFA usually utilizes the Women's group to carry the fish up to the main road where they could be transported by by-passing transports. Though it is good that it helps the women's group, if there was more fish, the process can be very slow and the fish can end up degrading past the consumption conditions.

v) All catch need to reach Lenakel for possible storage before selling them later to the public (if they are not purchased on the way). They are not able to sell their catch in the main road to remove the transportation costs in between;

Table 3: Fish types and related costs

	Prices		
Types of Fish	**Lanakel Town-Tefea Cooperative**	**Main Road**	**Waisisi Community**
Poulled	800VUV Per Kg	600VUV Per Kg	500VUV & 1000 Per Fish
Tuna	800VUV Per Kg	500VUV Per Kg	500VUV & 1000 Per Fish
Reef Fish	800VUV Per Kg	400VUV Per Kg	Free
Community exchange fish for food and goods			

1. The WFA future plan is to supply fish to Tanna and directly hotels and businesses in Port Vila. They have networks in place but to sell fish to hotels and businesses it have to meet certain qualities. The ice and the freezer will maintain that quality and help expanding WFA fish market.

Fig 10: Fish loaded and transported to Lenakel Town.

4. Installation Site

The installation site selection was selected by walking around the villages early in the morning when the sun rises and late in the afternoon when the sun sets. This to ensure that the selected locations are most exposed to the sun and receiving the longest hours of sun light during both orientation of the earth's axis. Given the village characteristics, this process was quite difficult and the team managed to select a few potential installation sites. All three sites have different priorities. However each installation sites have their advantages and disadvantages.

The systems are distributed according to the energy harnessing capability of each of the potential sites as well as their accessibility. Hence, the power capacity of each sites will be different from the original plan. This strategy will ensure that if a system is not functioning properly, there is a chance the other system will be up and running providing service. Each site is part of the big system and will be manned by 3 different people while the WFA will manage the three systems in parallel.

Some of the selection criteria's are:

i) Clear line of sight with the north direction;
ii) Spots where the sun rays hit first;
iii) Minimum shading;
iv) Available solid structured house to keep the freezers;
v) Solid soil structure;
vi) Trying to keep the panels close to the freezer houses to minimise costs;
vii) Keeping the cool storage in convenient areas;
viii) Keeping the system away from social areas;
ix) The site has to be agreed by the village chief and the community as a whole;
x) Safe from natural disasters such as flooding, land slide, cyclone and earthquakes.

There were 6 potential sites which were feasible, but 3 had some disadvantages which could not be improved or modified in order to fit the solar design. One of the areas is the Waisisi grave yard which is deemed to expand in just a couple of years. The other is on a slope with a very loose soil structure that may not be able to withstand the weight of the building and solar system. The third site is quite good, but it is in the midst of Nawanbai and not safe for the households around it.

Table 2: Table summarizing the storage and ice making capacity. Refer to Appendix 2 for distribution of panels and batteries for each site.

WAISISI COMMUNITY			
Village Name	**Households**	**Expected Solar Freezer to be installed**	**Reasons**
Natanu	38	3 200L Freezer Ice 1 500L Freezer Fish	Ice making area for supplying ice
Nawanbai	29	1 Freezer Ice 2 Freezer Fish	Waisisi Fishing association fish storage area.

Kualip	11	1 Freezer Fish	Cross-road to main community. Across the main road, school and is the local WFA fishing market location.

Site Specifications

Natanu

Natanu is the closest to the sea, hence it will be used as the ice factory and storage backup. Given that it is situated closer to the sea, it will house 3 ice-makers and 1 deep freezer. Each morning, the fisherman will collect ice and walk for just over 100 meters and boarding their boats and off to fishing. If ice is short, another ice maker is located at Nawanbai. The freezer will be used only if the storage in Nawanbai and Kualip are full.

This site was approved by the community to be used as the community land.

Fig 11: This installation site is on ground zero and vulnerable for sea flooding. Hence, there should be some sort of wall to prevent large waves from destroying the system.

This site is good, but there is need to trim 2 trees, specifically, 1 banyan tree and Natapoa (nut tree) tree. There is an option to install the solar about 200 meters from the storage house. However, this option is not feasible due to cable costs and village burial ground is sacred.

Table 3: Natanu Site Specification and Evaluation of the selected site

Specifications/Criteria	**Situation**
Clear line of sight with the north direction;	yes
Spots where the sun rays hit first;	yes
Minimum shading;	No, need trimming
Available solid structured house to keep the freezers;	No, need to build
Solid soil structure;	yes

Trying to keep the panels close to the freezer houses to minimise costs;	yes
Keeping the cool storage in convenient areas;	yes
Keeping the system away from social areas;	yes
The site has to be agreed by the village chief and the community as a whole	yes
Safe from natural disasters such as flooding, landslides, cyclone and earthquakes	50% safe, need to build a sea wall to protect it from cyclone swells; need to secure with volcanic ash proof, salt spray and remove during cyclone

Nawanbai

This site will be considered as storage and ice maker backup. It will house 2 freezers and 1 ice maker.

Fig 12: After the two water tanks is the flat area which is suitable of installing the solar system. However, most of the trees will be trimmed and some of them will be cut down and used as timber.

It is one of the best spots in Waisisi. It is also the highest point in the village and holds the water tanks which supply water throughout the villages. There is also needs to trim or cut down trees to also for zero shading.

Table 4: Nawanbai Site Specification and evaluation of the selected site.

Specifications/Criteria	**Situation**
Clear line of sight with the north direction;	yes
Spots where the sun rays hit first;	yes
Minimum shading;	No, need to trimming
Available solid structured house to keep the freezers;	No, need to build a house
Solid soil structure;	yes
Trying to keep the panels close to the freezer houses to minimise costs;	yes

Keeping the cool storage in convenient areas;	yes
Keeping the system away from social areas;	yes
The site has to be agreed by the village chief and the community as a whole	yes
Safe from natural disasters such as flooding, landslides, cyclone and earthquakes	Yes, but need to secure with volcanic ash proof and remove during cyclone

Table:

Kualip

This site is considered as the marketing site of the WFA. It will hold 1 freezer which will be used basically to sell fish to the by-passers. This will reduce the transport costs to Lenakel especially for reef fishes and tuna.

Fig 13: Suitable for installation of the system with few trees and hence, less trimming.

Table 5: Kualip site Specification and Evaluation of the selected site

Specifications/Criteria	**Situation**
Clear line of sight with the north direction;	Yes
Spots where the sun rays hit first;	yes
Minimum shading;	yes
Available solid structured house to keep the freezers;	Yes, but not feasible to install solar panel
Solid soil structure;	yes
Trying to keep the panels close to the freezer houses to minimise costs;	yes
Keeping the cool storage in convenient areas;	yes
Keeping the system away from social areas;	yes
The site has to be agreed by the village chief and the community as a whole	yes
Safe from natural disasters such as flooding, landslides, cyclone and earthquakes	Yes, but need to secure with volcanic ash proof and remove during cyclone

5. Way forward

After the assessment, the team have identified some of the areas which the WFA and the community must address in order for the project to be successful. These areas have been identified and communicated to them through a meeting which catered representatives from the whole community (refer to Appendix 1). Some of them are:

i) Community must build a house urgently to install the system inside. This particular house should have its roof facing north and must also have a strong structure (refer to Appendix 2 for house specification). The houses will be funded by the community itself as their aid in-kind.
ii) Minister Jotham Napat to provide mounting poles for excessive panels (if necessary).
iii) The community must trim identified trees which are in the way of the sun's rays;
iv) Agree that the project belongs to the community, but looked after by the WFA. In other words, the WFA owns the project;
v) The team must do another visit to verify that the buildings are completed and ready

Table 6: Contact person and allocated responsibilities. Each person agreed to take up the responsibilities during the community meeting.

Contact Persons	**Status**	**Agreed Responsibility**
Sam Iaumai (544729)	WFA Chairman	Organize and coordinating the construction of houses at 3 sites
Andrew Yalu (7312137)	Waisisi Chief	Organizing village meeting and support the housing construction
Marsel Bota (7756636)	Nawanbai village chief	Assist in organizing and coordinating the construction of the 3 houses.
Joe Kalili (7756356)	Fisherman	Negotiate with Minister Jotham Napat for supplying mounting poles.

Appendix 1

vote
Agenda

Defaul of
Parson 2.

(1) - opening prayer
(1.) opening remarks

Intro - Main purpose of visit
- funding status
(2) Clear management model -
(3) Potential site < situation / possible sites

(4) Building - Housing
(5) potential size of the System
(6) closing remarks.
(7) closing prayer

4.

(1) - Thanks to community for coming today - J. [illegible]
- yesterday activity
- prayer name
Name ACSE

funding status — Funds available now by Osborne.

(2) - J. [illegible] to Design a Structure & System. - Fishing around the Community & Minister [illegible].

(4) No any housing available by going throw the village.

③ Problem – hill cover the [illegible] rising sun.

* 2 Potential sites – no clear potential site
  - limit sun shade.
  - Soil problem.
  - Call to follow up on the previous sites.
- our preferred Centralize system (complex) when damage can cause project to fail instead 2 different sites)
  - NO disruption in the village.
  - ~~Plan~~

~~④ Building – way forward for building :-~~

(– Most agree to 2 sites)
Freezer – Half ice & fish at each site?

site
* Community agree to build ~~2~~ houses at each site and will take
* – Agree ~~[illegible]~~ complete before materials arrive.
  – Contact Sam.

④ Building – way forward for build.

– Building ~~D~~imension ~~[illegible]~~ must be given to Sam after
See finding out details of Solar freezers.

(5) Poles

if cost of pole [illegible] system
then reduce ~~of~~ size of system.
(- freezer etc)

☆ - Maintain size community really
want ~~[illegible]~~ & freezer system.

- Find way of pole. talk to Minister
J. [illegible]

- Iron - talk to Minister
Name.

Contact
Housing - chief. Sam — Marsel Bota 7756686
544729 - Sam [illegible]

- Iron (from J. Japan) - Joe Kalili 7756356.

- Fishing association

- Village Council } all active. — Eakoli
- ~~Fish~~ FA — Sam
- Cave
- Tourism — John Navuga

working Structure

- work as a community
- There is funds in the association &
  there is ways to collect funds

Question

1. ways to cover Solar from afar
2. Building Dimension to Save & Strengthening Solar Size

Appendix 2

Location	**Number of Freezers**	**Number of ice maker**	**Number of PV panels tot (est.)**	**Number of Batteries (est.)**	**System Voltage (V)**	**Roof area (m^2)**
	1	3	15	2 sets of 12	2 x 24V	23
	2	1	9	1 set of 24 1 set of 12	1 x 48V 1 x 24V	15
	1	0	6	1 set of 24	1 x 24V	Maybe a pole should do

Assumption:

1 500L Freezer = 6 Panel & 24 Batteries (Inverter size 48V)

1 200L Freezer = 3 Panles & 12 Batteries (Inverter size 24V)

Appendix 3

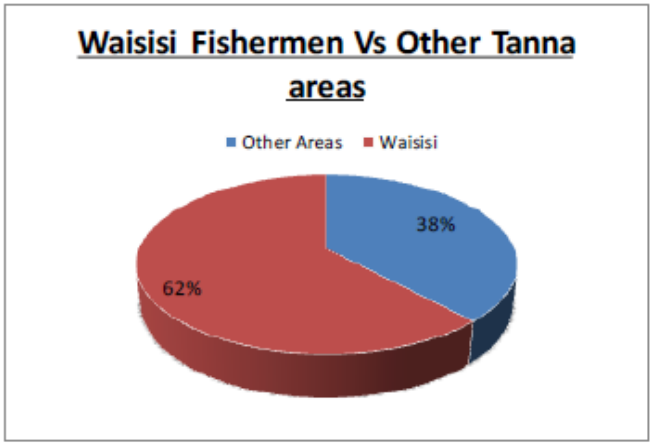
Waisisi Fisherman's Catch Record

Data Source: Tafea Fish Market Forms

Species	Qty	Weight (KG)
Amberjack	20	45.2
Big eye brim	7	11.1
Braun tel jobfish	13	15.2
Braun spoted jobfish	26	2.6
Dogtooth	2	30.3
Eight band loche	15	40.5
Kusaka Brim	30	46
Mahimahi	2	115.5
Mix bottom fish	7	44.9
Other Mixed Reef	2	13.6
Red Longtail Poulet	186	446.7
Silverjaw	46	66.8
Skipjack	5	25
Spotted Loche	4	23
Wahoo	5	56.9
Yellowfin	8	49.9
TOTAL	**378**	**1,033.2**

Fish Data composes of a mixture of Reef fish, Deep bottom fish and pelagic fish species caught by the Waisisi Fishermen in the East of Tanna.

The dominant species caught and sold by the fishers is the Red Long Tail Poulet species which also has the highest fish Value from the sales. Fish data estimates is expected to be a lot higher if all data for fish vendors were to be submitted continuously to the fish market however, this figure can be treated as provisional catch.



The pie chart represents the total Weight of fish caught and sold by Waisisi fisherman compared to that caught and sold by other areas of Tanna combined. The chart proves that Waisisi area contains the highest number of fishing activities compared to other parts of Tanna with 62% of the total Tanna catch.