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EAST RENNELL

Restoration of biorock structure

CONTENT

1SOCIAL ECOLOGY

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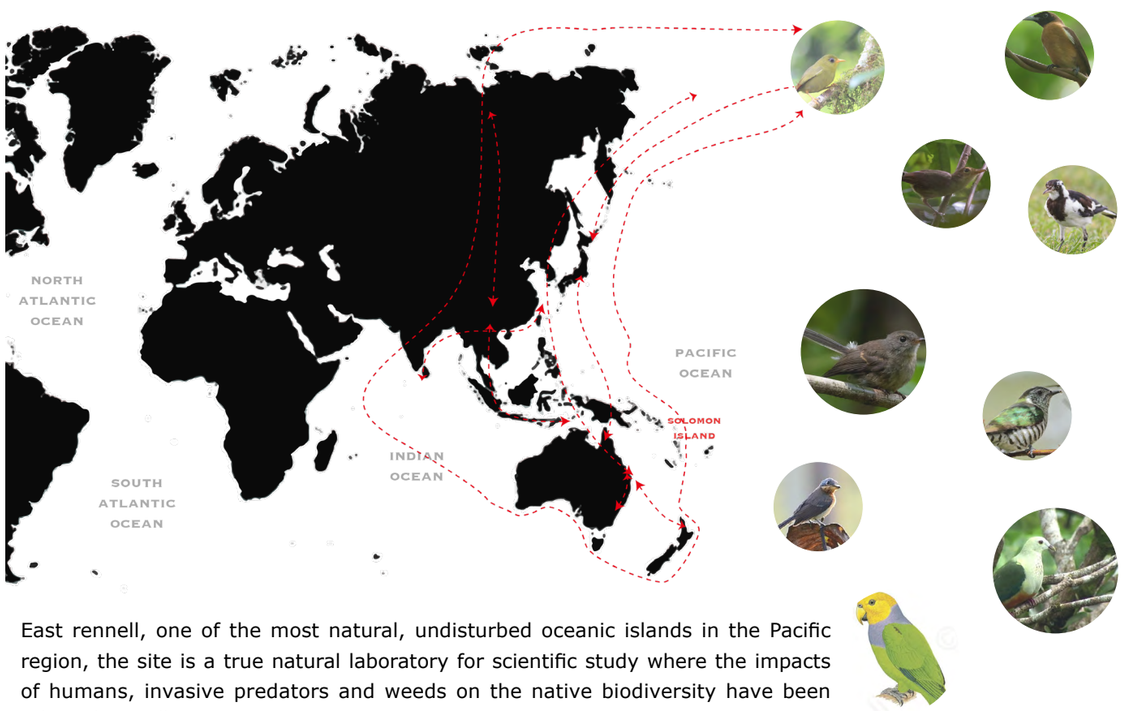
TRIGGER OF THE PRESERVATION

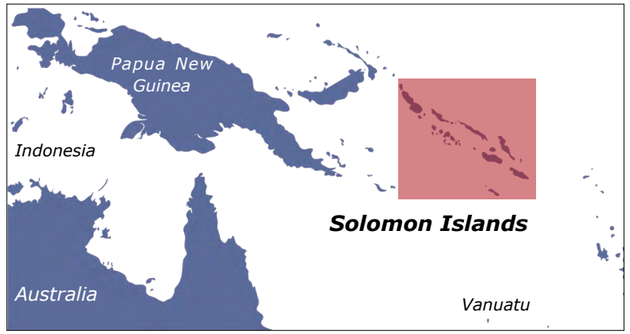
Exceptional stepping-stone for on-going speciation processes (particularly avifauna) in the western Pacific

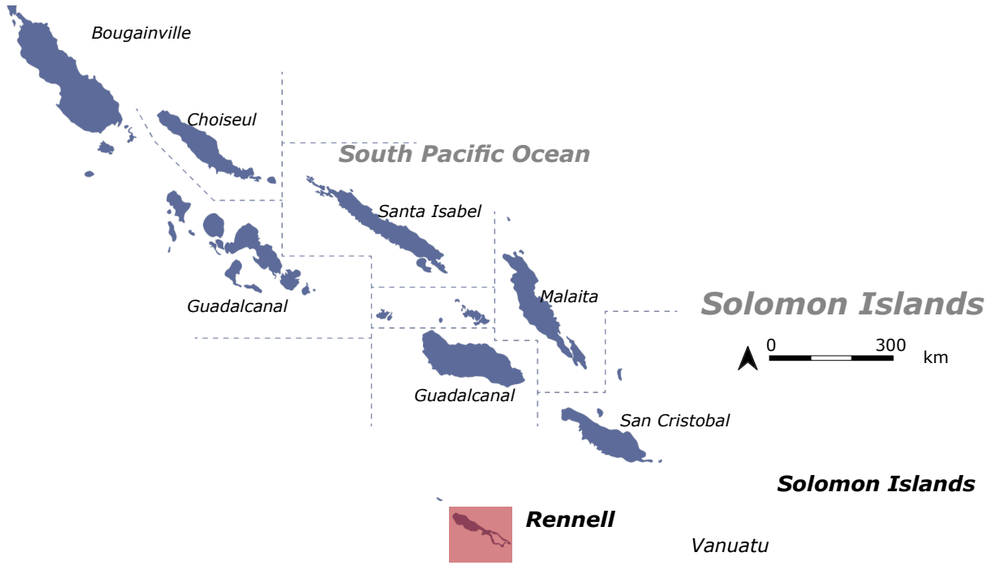


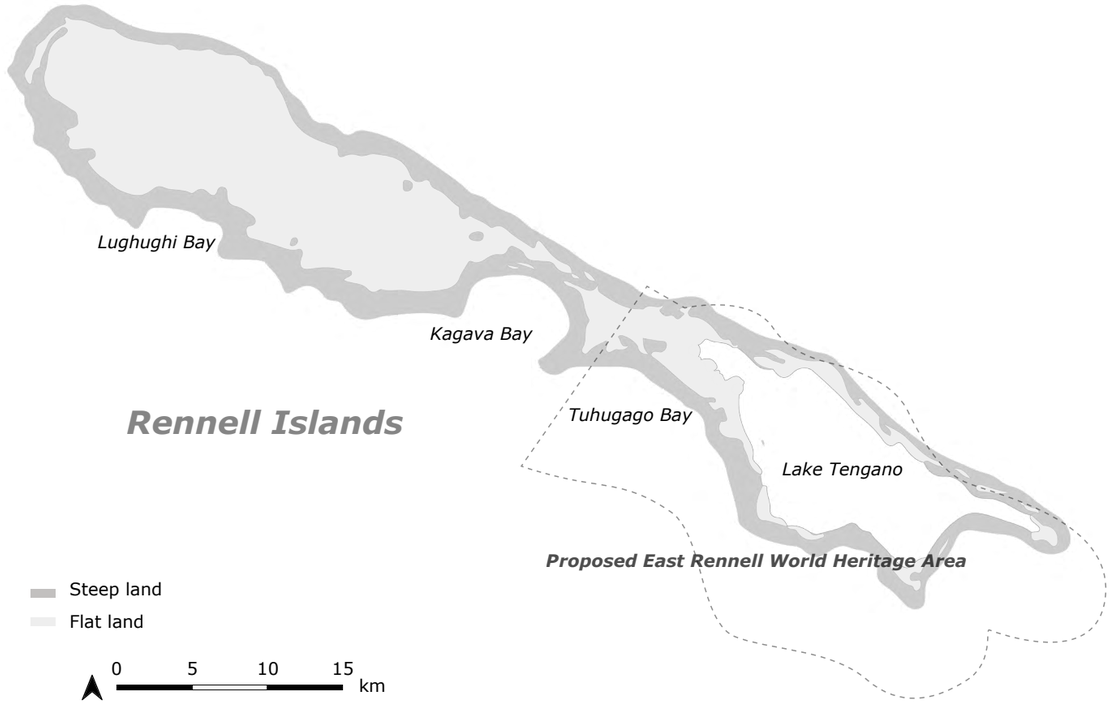
East rennell, one of the most natural, undisturbed oceanic islands in the Pacific region, the site is a true natural laboratory for scientific study where the impacts of humans, invasive predators and weeds on the native biodiversity have been relatively small.

ENVIRONMENTAL HISTORY

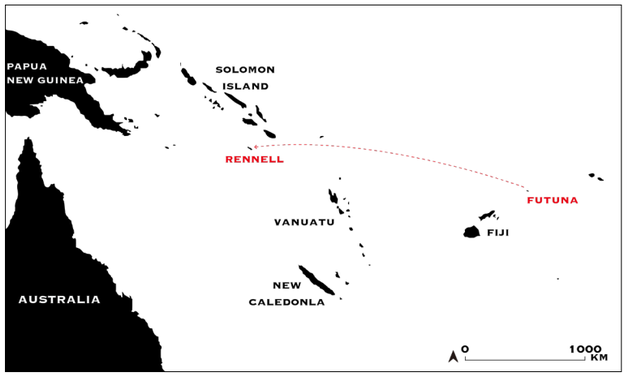
East Rennell makes up the southern third of Rennell Island, the southernmost island in the Solomon Island group in the western Pacific. Rennell, 86 km long x 15 km wide, is the largest raised coral atoll in the world.







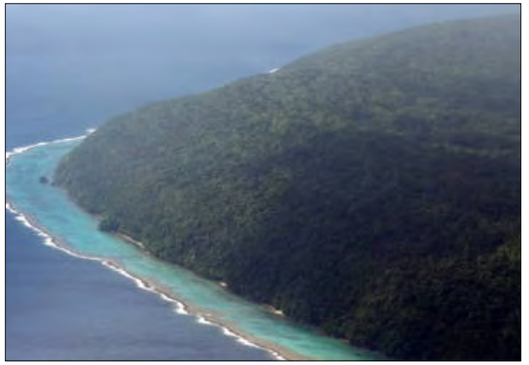
HISTORY



The present-day inhabitants say their ancestors, Kaitu'u, arrived around 1400AD from Ubea, now Wallis & Futuna Islands

1400s	1998	2000	2005	2013
Settlement of Renbel occurred prior to ***1400 AD*** by Polynesians from Uvea, now Wallis Island.	East Rennell was inscribed on the World Heritage List in 1998, and also was the first natural property inscribed on the World Heritage List under ***customary ownership and management.***	The donor programme was ***suspended*** in 2000, primarily on account of civil unrest and government instability in the Solomon Islands, leaving the projects uncompleted.	The WHC ***re-established*** contact with Solomon Islands and the World Heritage property in 2005.	In 2013, the property was inscribed on the List of World Heritage in Danger primarily because of the threat of commercial logging and the lack of a legal mechanism to stop these activities.

WHY THIS PLACE ?



WORLD HERITAGE VALUES

- *Exceptional stepping-stone for on-going speciation processes (particularly avifauna) in the western Pacific*
- *Important site for the study of island biogeography*

OTHER IMPORTANT BIODIVERSITY VALUES

- *End plants*
- *Bats*
- *Invertebrates*
- *Fauna and flora of Lake Tegano*
- *Marine fauna*

AIMS

Improve communication and transport

Improved communication and transport facilities, health and medical services, education resources and income-generating small business enterprises based on sustainable uses of the natural resources.

Sustainble use

Required sustained management plan to adress vulnerabilities and threats inclusing mining, logging, over exploitation of coconut crabs and marine resources and invasive species.

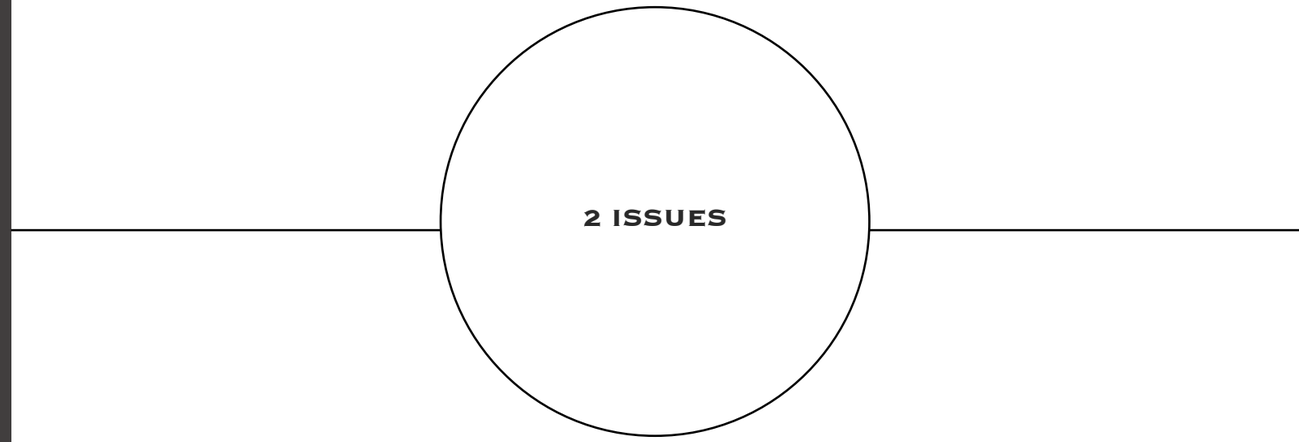
Education

Educate/ enhance awareness and understanding of World Heritage obligations on the part of the community

Better co-ordination and co-operation in community management activities; improved survey and monitoring of natural resources

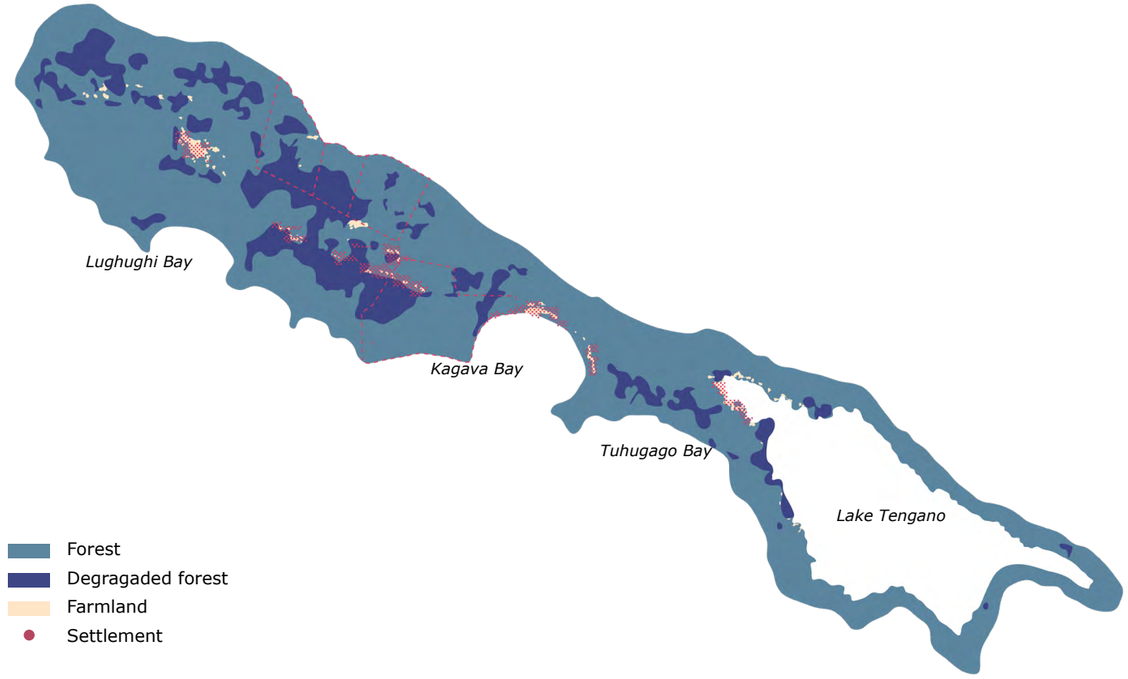
Tourism and visitation management

Invest in tourism which is vital to the long-term management and integrity of the site



2 ISSUES

2.1 LAND COVER TYPE

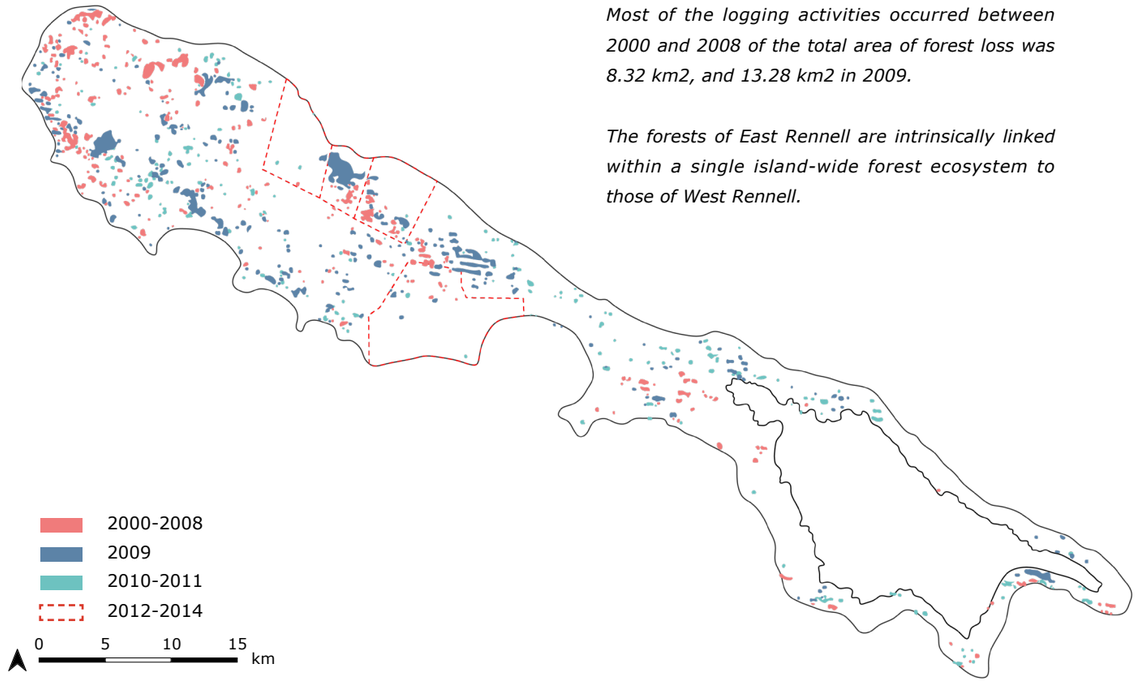


2.2 FOREST COVER LOST

This figure represents annual forest loss.

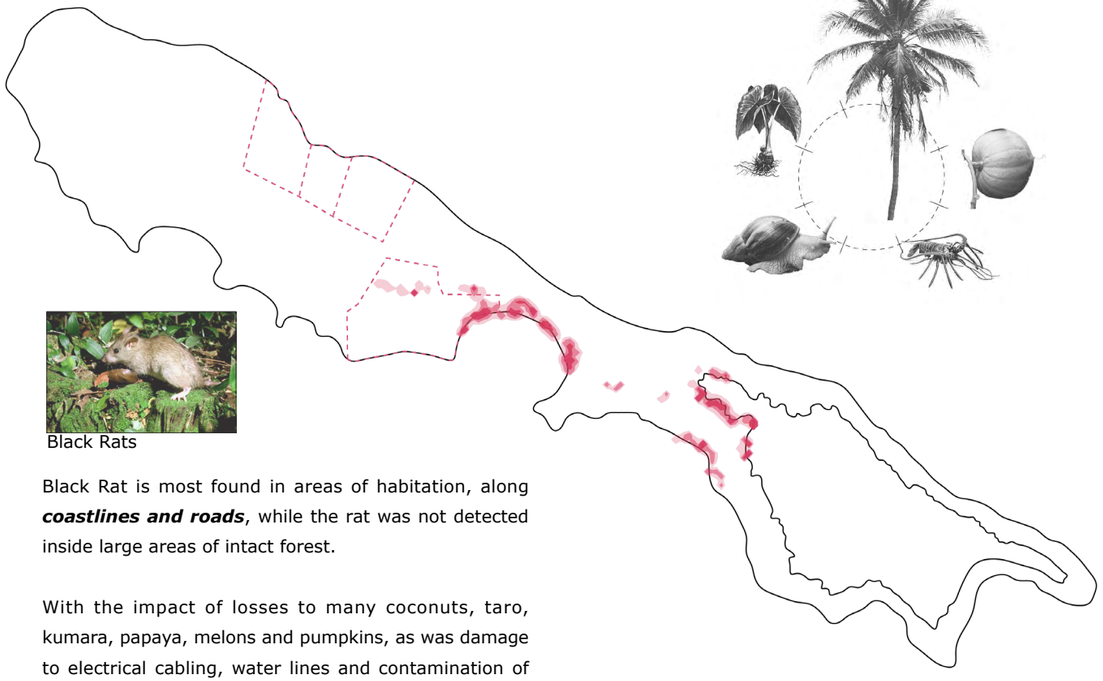
Most of the logging activities occurred between 2000 and 2008 of the total area of forest loss was 8.32 km2, and 13.28 km2 in 2009.

The forests of East Rennell are intrinsically linked within a single island-wide forest ecosystem to those of West Rennell.



2.3 INVASIVE SPECIES

RATS



Black Rats

Black Rat is most found in areas of habitation, along ***coastlines and roads***, while the rat was not detected inside large areas of intact forest.

With the impact of losses to many coconuts, taro, kumara, papaya, melons and pumpkins, as was damage to electrical cabling, water lines and contamination of water supplies.

2.4 OVER-EXPLOITATION OF MARINE RESOURCES

MAEINE RESOURCES

The people of East Rennell harvest several marine species for consumption and for sale - crayfish, giant clam, trochus (sea snail) and reef fish - and there is some opportunistic hunting of turtles, sharks and dolphins.
There's concern that overharvesting of crayfish, trochus, beche-de-mer and clamshells is a serious threat to the marine resources

COCONUT CRAB

Crabs are harvested at night by torchlight, using traps baited with dried coconut flesh. Currently, they are harvested ***year-round***, including during November and December when the females are carrying eggs.

Within the World Heritage property the harvesting success rate is dropping, and many smaller crabs (less than 1 kg) are taken while larger ones (2-3 kg) are becoming scarce.

2.5 EFFECT OF CLIMATE CHANGE

FOOD SCURITY

Increasing water level and salinity has effect of the crops. For example, the coconut trees in low-lying area has widespread die.

Also the health and productivity of the taro crop is also affected by an increased incidence of disease and insect damage causing leaf blight – which might also be a consequence of climate change.

Coconut

Taro

FLOODING

Higher lake levels have also detrimentally affected living conditions in East Rennell. Several houses and tourist lodges have been flooded and abandoned.

The Henua Community High School in Niupani Village, which has 34 students and is the only secondary school in East Rennell, has been closed for several months in each of the past two years because of flooding.

3 ECOLOGICAL PSYCHOLOGY

3 ECOLOGICAL PSYCHOLOGY

3.1 INSTITUTIONAL FRAMEWORK

Trib

* 14

The population is ***organized in tribes***, with approximately 1,000 people belonging to 14 tribes.

Each tribe has a chief, a patrilineal hereditary position. There's a Paramount chief presiding over the 14-member, a role that is also hereditary.

LTWHSA

The second key local institution is the Lake Tegano World Heritage Site Association (LTWHSA), a ***community-based organization*** established as the management authority for the property since 2014.

Officers and members of LTWHSA, the management authority, are all volunteers. The chairperson, for example, is a full-time schoolteacher.

Head of families

A third level of authority is emerging in East Rennell, that of ***Heads of Families***.

Individuals are reportedly asserting more private rights to property, distinct from tribes. The number of Heads of Families is estimated at ***80.***

3.2 TRANSPORTATION

© 2019 Brent A. Mitchell

The rough road to East Rennell takes about 3 hours from the airstrip, one-way, and does not serve all villages.

Tourism to Rennell Island is hampered by lack of access. The single airstrip can only accommodate small planes.

The terrible road condition has made the transport from west rennell to east rennell very difficult and expensive, before 2015 there's barely no connection between these two area.

3.3 LIVELIHOOD

Children in Tegano Village eating flowers of "wata", a traditional medicine for diarrhea and other symptoms

© 2019 Akan Nakamura/UNESCO

A basket made from locally available Pandanus plant

Women in EREHP learn weaving skills in there childhoods--a girl holding hand-waved fan

© 2019 Akan Nakamura/UNESCO

Traditional ***agriculture***, ***fishing*** and ***hunting*** continue to underpin the economy and local people rely on forest products for most construction materials.

Women played important role in generating income for their families.

It is a common activity by women in the four villages to weave baskets and mats using dried leaves of local Pandanus.

3.4 CUSTOMARY GOVERNANCE STRUCTURE

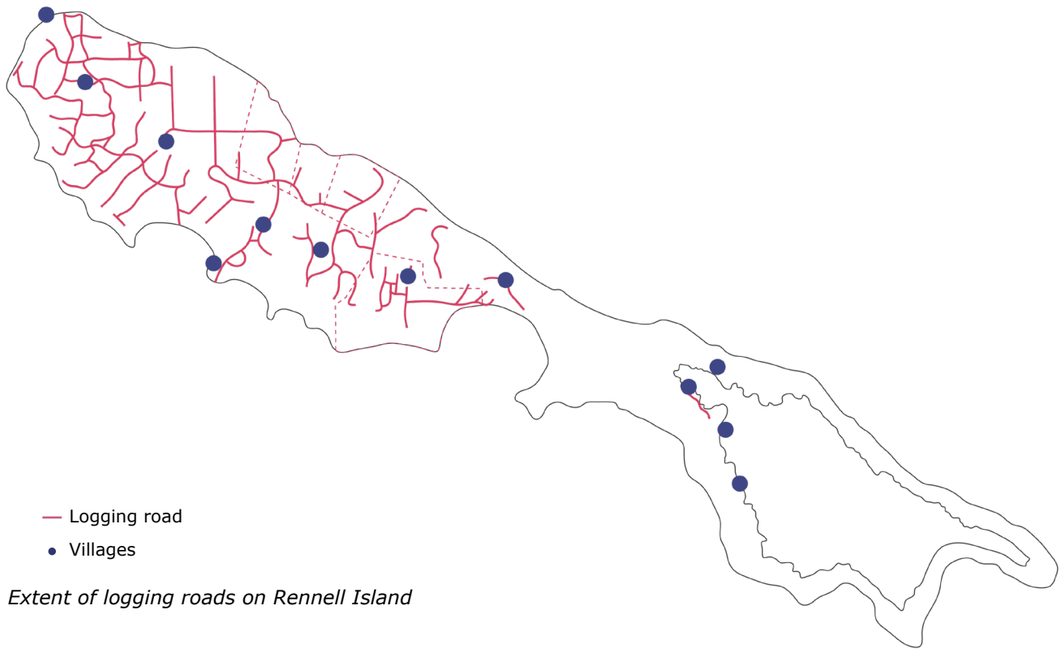
The East Rennell property is not government owned - all areas of land, coastal reef and sea are under customary ownership, while the lake is regarded as common property for the residents of surrounding villages.

The Environment Act 1998 and the Wildlife Management and Protection Act 1998 have provisions relevant to the property, but these are often not effectively enforced at local level.

There is some uncertainty as to the relative powers of national and customary laws in respect of land and resources under customary ownership and traditional management (Price, 2018).

Community meeting in Tevaitahe village, East Rennel Island. 2019 Brent A. Mitchell

3.5 STABLISHMENT OF LOGGING CONCESSION



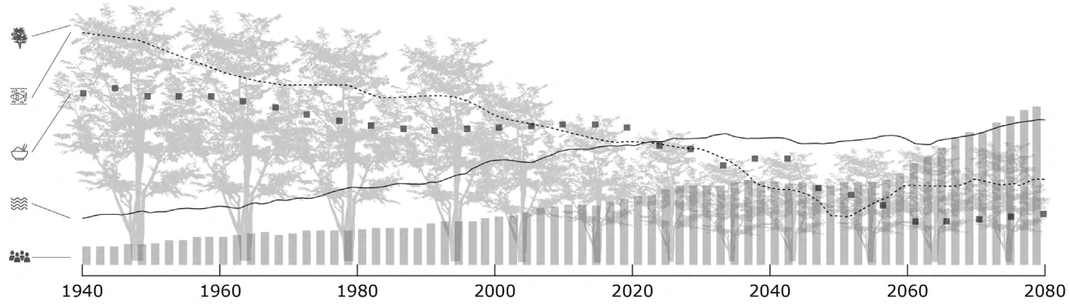
Extent of logging roads on Rennell Island

For foreign-owned logging companies, before an area can be sampled for bauxite, long winding roads must be bulldozed through the forest. Any selected sites must be cleared of trees.

4 LOCAL LIVELIHOOD

4 LOCAL LIVELIHOOD

IMPORTANT ECOLOGICAL VALUE



Tree cover
Current: *moderate*
20 year: *low*
Long term: *low*

Ecological Value
Current: *lmoderate*
20 year: *low*
Long term: *low*

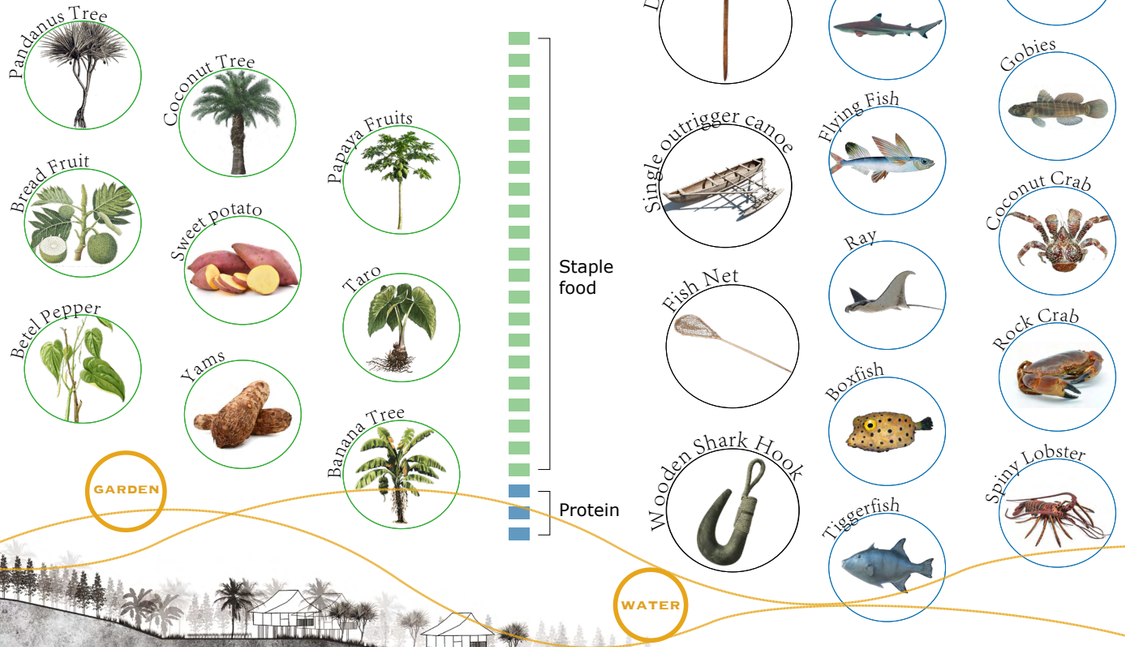
Food Demend
Current: *high*
20 year: *moderate*
Long term: *low*

Water level
Current: *moderate*
20 year: *moderate*
Long term: *high*

Population
Current: *low*
20 year: *moderate*
Long term: *high*

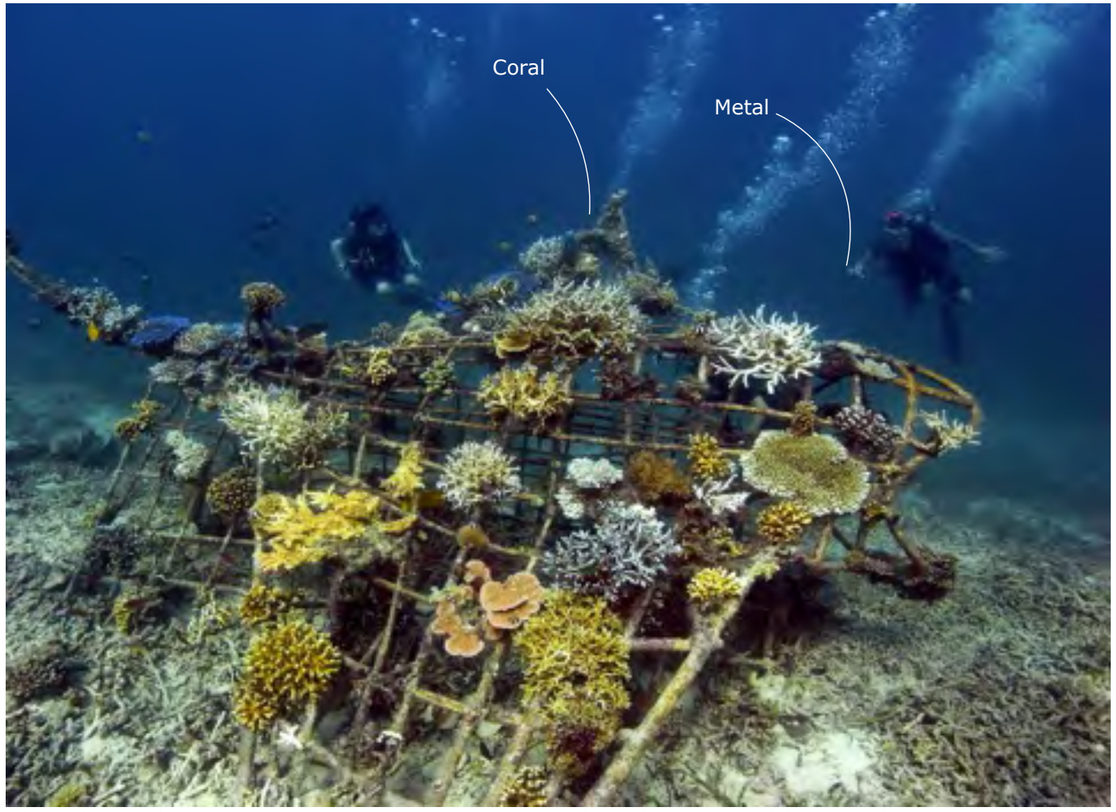
STAPLE FOOD

Staple food takes up most of their eating habits, protein.....



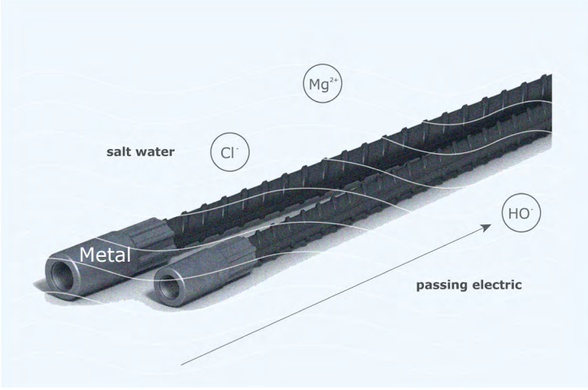
PRECEDENT STUDY

BIOROCKS

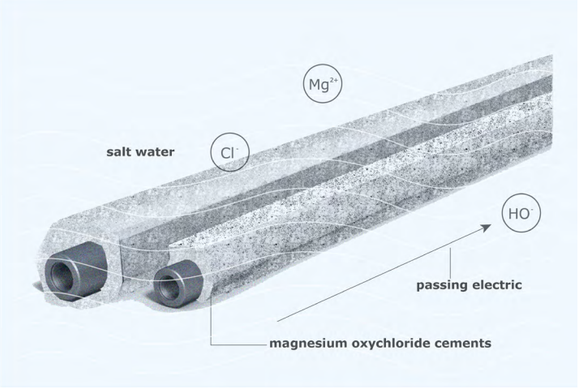


Biorock, also known as Seacrete or Seament, is a trademark name used by Biorock, Inc. to refer to the substance formed by electro-accumulation of minerals dissolved in seawater.
Wolf Hilbertz developed the process and patented it in 1979.

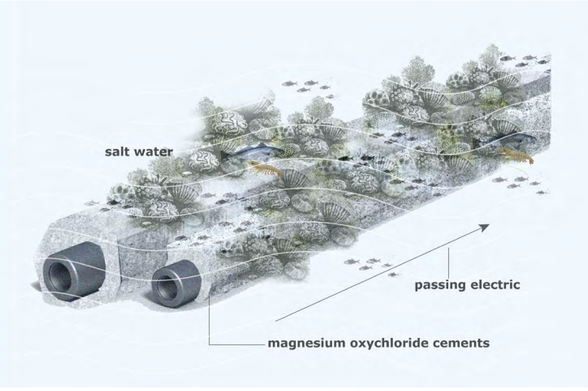
BIOROCKS



The biorock works by passing a small electric current through electrodes in the water, the structure will grow without limit.



Experiments showed that the coatings can thicken at the rate of 5cm per year. As long as current flows, the structure will continues to grow and strengthen.



Coral can thrive on the electrified and oxygenated reef environment, they become more resillent in the stressful environment.

BENEFIT

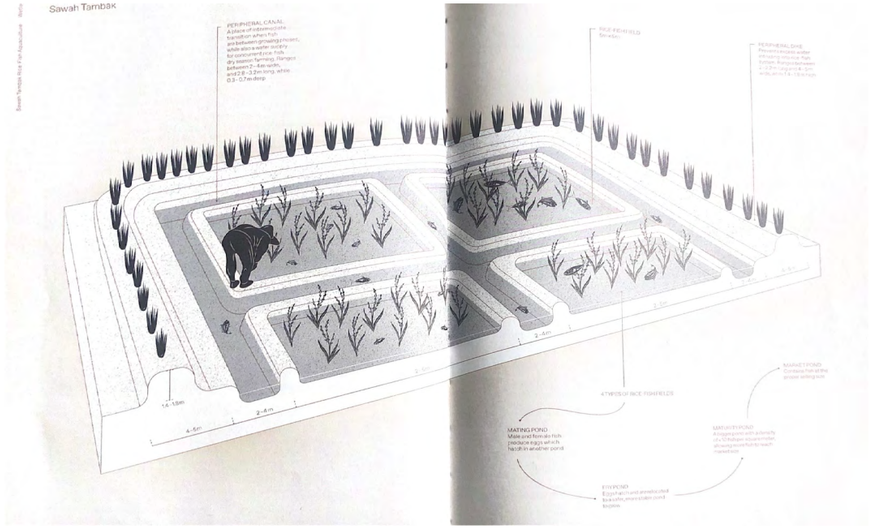
- ***Biorock can enable coral growth and regrowth even in the presence of environmental stress.***

  rising ocean temperatures
  diseases
  other pollution

- **Accelerates growth** ***5×***
- **Restoration of physical damage** ***20×***

Biorock™ technology has been successfully applied to fish and shellfish mariculture as well as to growing limestone breakwaters to protect islands and coastal areas from erosion and rising sea levels.

RICE-FISH AQUACULTURE



Rice fishery-- the surrogate wetlands for fish and birds

By utilizing the dikes of the rice fields to cultivate dryland crops the field can be described as a multi-level system. One such system is the surjan system found in coastal areas with poor drainage in West Java, Indonesia.

Location : Java, Indonesia
People : Javanese
Technology : Sawah Tambak Rice-Fish Ponds

5 STRATGY

DESIGN POSITION

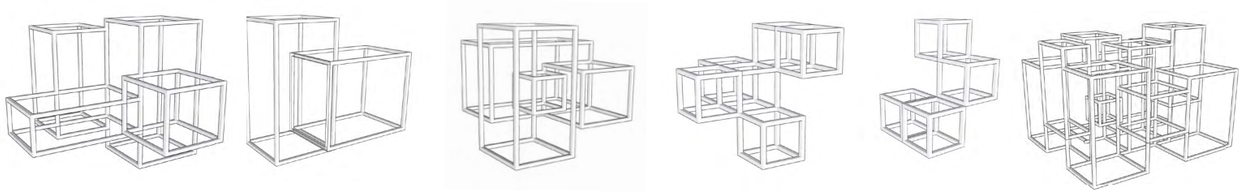
Aiming to restore the marine healthy environment. restore the river/seashore habitat, by using sendimentation and rebuild the corol reef has been disrupted by the logging cocession.

Improve their livelihood, adding nutrition food source and introduce new business to local people.

PROCESS 1: BIOROCK RESTORATION

Distribution of biorock structure

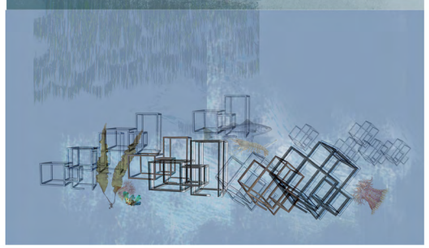
- Shore protection
- Preventing beach erosion
- Marine haabitat restoration



The material I choose is ordinary steel, build and combine them with many shapes and different size in the sea, privide for the marine life to spawl to hide to feed.

First day

Submerged and attached biorock structures to the sea bottom, apply with low voltage which will initiates electrolytic reaction and precipitates mineral crystal on the structure.

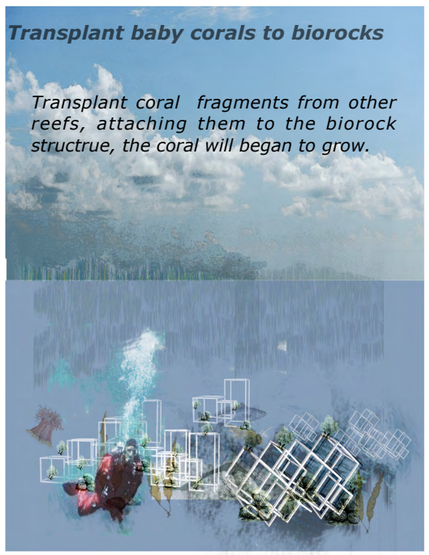


3 days later

Within 3 days, the structure will takes on a whitish appearances as the mineral are keep on adding. attract colonizing marine life.

Transplant baby corals to biorocks

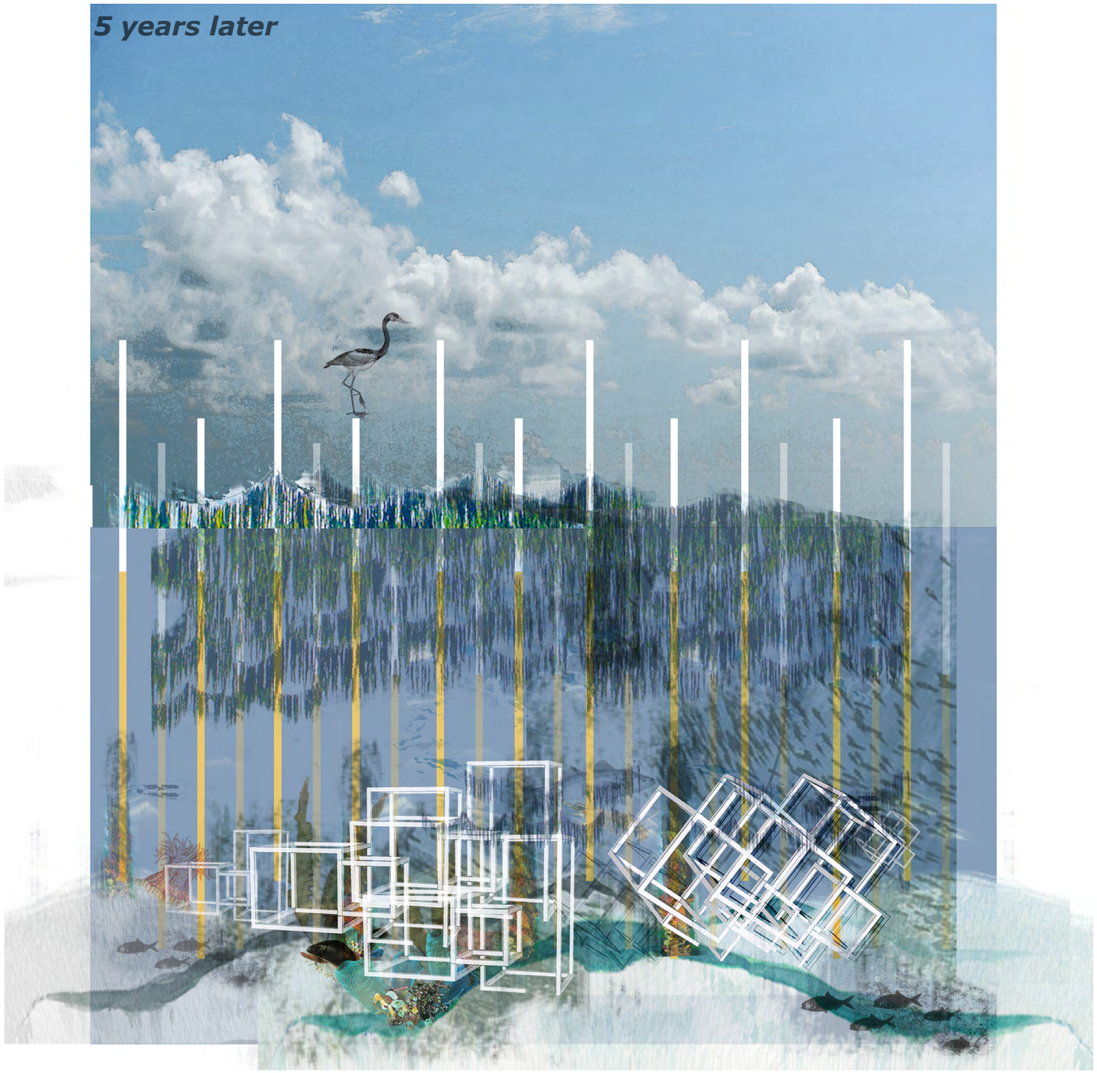
Transplant coral fragments from other reefs, attaching them to the biorock structrue, the coral will began to grow.



7/8 month later

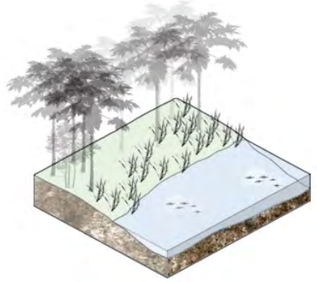
Soon the reef will bacome look just like a natural reef ecosystem rather than a artificial one.

5 years later

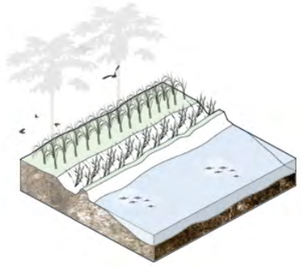


PROCESS 2: WETLAND AGRICULTURE

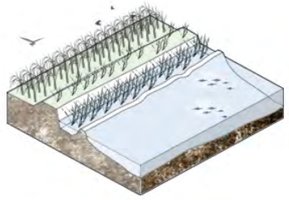
Low yeild



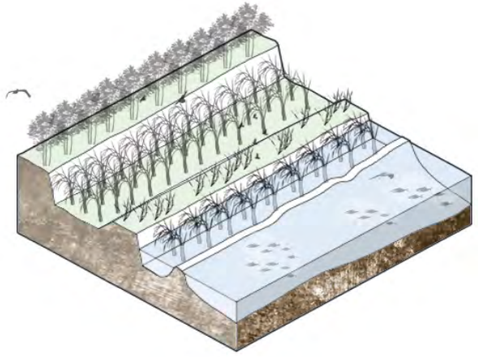
Cut & fill



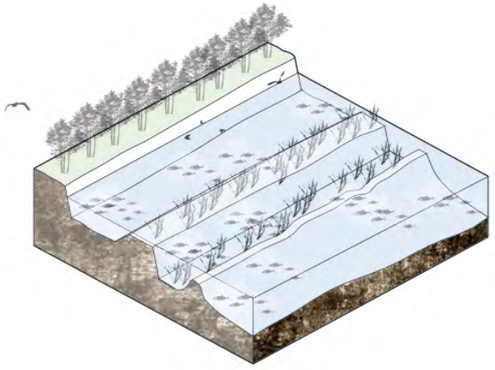
Fish/seed/vegetable farm



Dry season

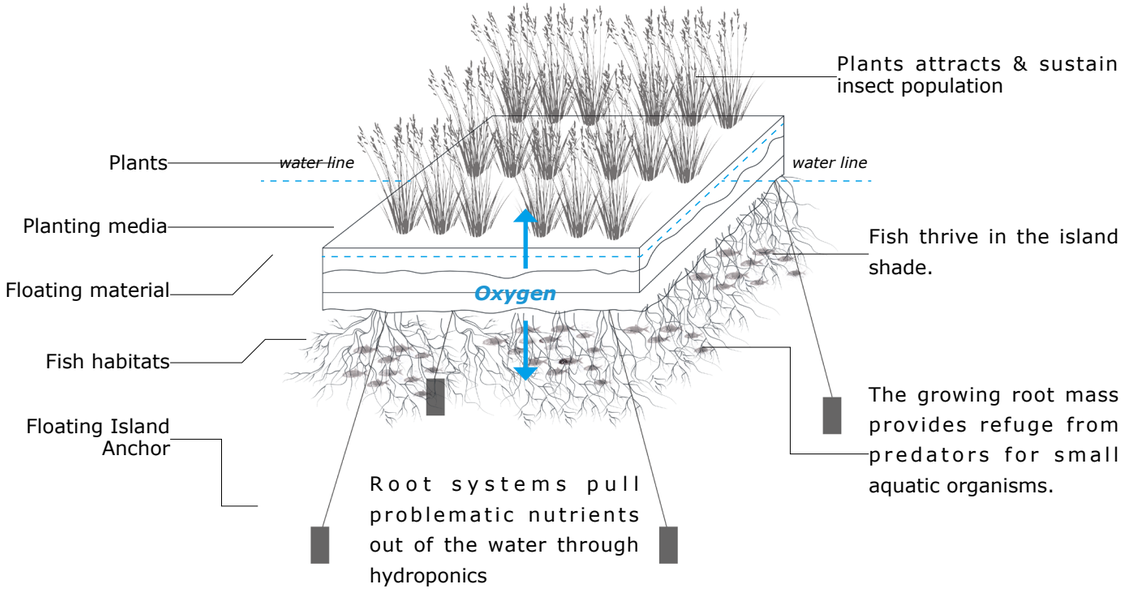


Wet season



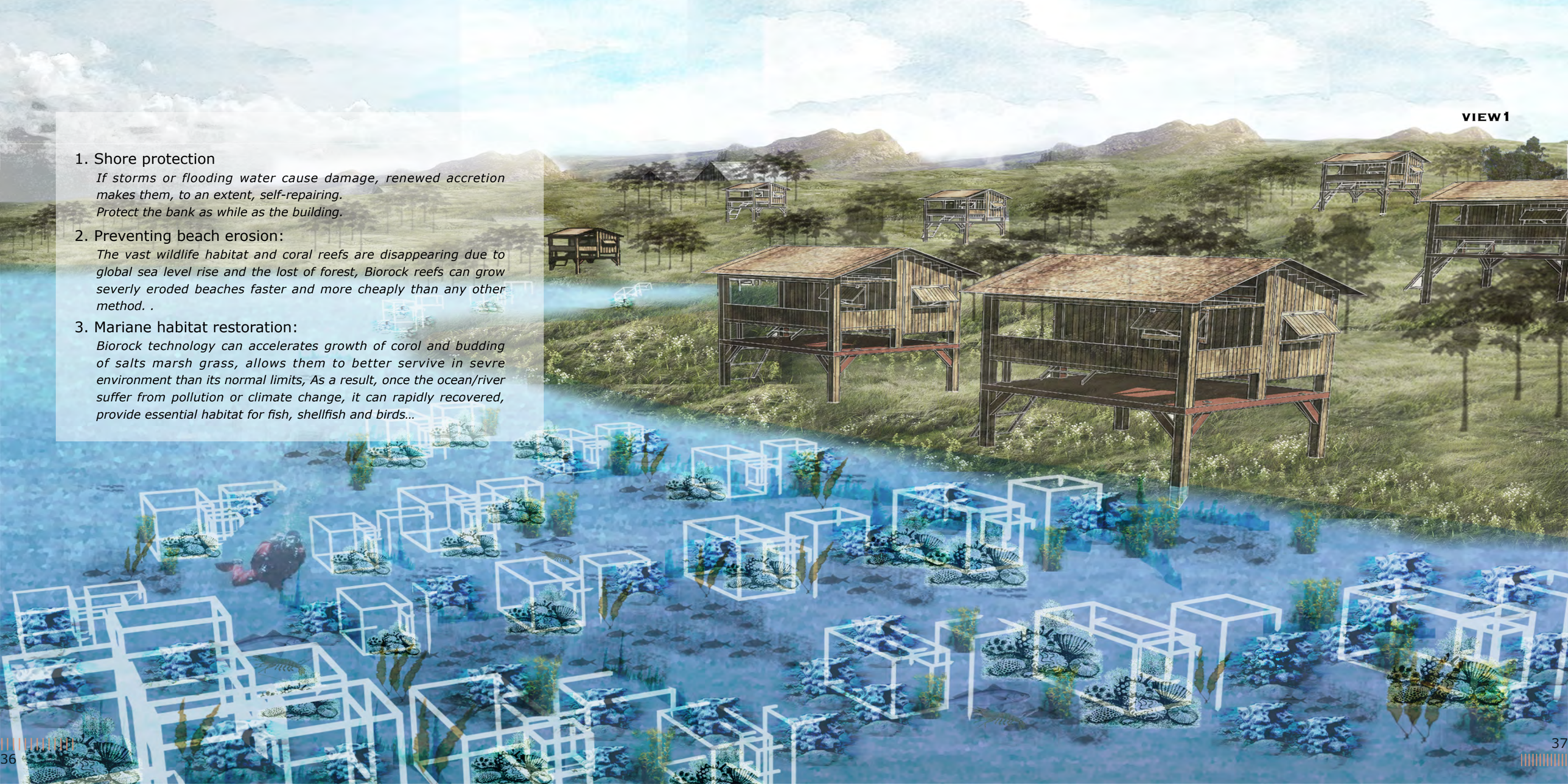
Replenishing aquifers through raised fish pond planting can alleviate the flood impact, better manage the rainwatwater, gain protein & vegie resource, also bring economic benefits to this region.

STRATEGE 3: FLOATING FARM



Climate change threatens to worsen the severity and duration of floods in low-lying East rennell, they have lost number of food resorce.

Floating farms can still flourish in flood conditions — are a way to help East rennell people live with rising waters



1. Shore protection

If storms or flooding water cause damage, renewed accretion makes them, to an extent, self-repairing.
Protect the bank as while as the building.

2. Preventing beach erosion:

The vast wildlife habitat and coral reefs are disappearing due to global sea level rise and the lost of forest, Biorock reefs can grow severly eroded beaches faster and more cheaply than any other method. .

3. Mariane habitat restoration:

Biorock technology can accelerates growth of corol and budding of salts marsh grass, allows them to better servive in sevre environment than its normal limits, As a result, once the ocean/river suffer from pollution or climate change, it can rapidly recovered, provide essential habitat for fish, shellfish and birds…


VIEW2
Floating farm
Biorock Structures
Buildings
Fish pond
Wetland agriculture
Growing vegetable