CLIMATE CHANGE IN ROVIANA LAGOON, SOLOMON ISLANDS:

Villando,

How we can make the environment and people ready



This booklet provides a summary of results from the Pacific Adaptation Strategy Assistance Programme project in the Solomon Islands—Building social and ecological resilience to climate change in Roviana, Solomon Islands.

This booklet would not have been possible without the hard work and dedication of many Roviana people. We are deeply appreciative to the executive of the Roviana Conservation Foundation for their leadership and vision to make the work a success. Leana Hola!

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PACIFIC ADAPTATION STRATEGY Assistance Program

SOLOMON ISLANDS



Australian Government Department of Climate Change and Energy Efficiency







Roviana Lagoon

Roviana and Vonavona Lagoons are a socially and environmentally diverse and dynamic area that has supported human populations for 15,000 years. Historic influences include: tribal warfare, religious diversity, major battleground for World War II, high rainfall, tectonic uplift/subsidence and tsunamis. This history has made the human and ecological communities strong and resilient. This strength will help Roviana and Vonavona to reduce future climate change impacts.



Map showing the locations of Roviana and Vonavona Lagoons, Western Province, Solomon Islands.

An assessment conducted in 2010-2011 found a number of issues that are reducing this strength and making the Roviana area more exposed to climate change.

This booklet provides a summary of these findings and some examples of ways to increase the strength of Roviana. By blending these ideas with the existing traditional knowledge we expect the Roviana communities will be strong under the influences of global climate change in the coming centuries.

Climate change

Introduction

Climate change is being caused by an increase in pollution (mainly carbon dioxide) in the air. This is causing the earth to warm, sea level to rise and the weather to become more variable. In the Solomon Islands we can expect:

- Increase in air temperature 0.5-1.5 degrees by 2030
- Increase in sea surface temperature of 1 degree by 2050
- Ocean acidification will impact coral by 2045
- Sea level in Solomons has increased 8mm per year since 1996.
- Global predictions of 0.5-1.4m rise in sea level by 2100
- Small increase in amount of rain with more intense floods



Flooding from high sea levels in Nusa Hope village.

- Manini sa galegalearane
- Hobe sari totoso tadi ruku, givusu, odu meke masa
- Odu sage sa kolo kaiqa nusa kote lodu



Topographic survey results from Nusa Hope showing high tide mark, 0.5 m and 1 m contours.

Actions

• Map areas of the village likely to experience sea level rise

Findings

Some communities in Roviana

rise with more than half of the village land inundated if the sea

Changes in weather observed

members, and recorded in the

unpredictable seasons, more

wind, and hotter temperatures.

over recent years by community

PASAP project, include more rain,

level rises by 50 cm.

are highly vulnerable to sea level

- Limit construction in coastal areas
- Protect mangroves
- Construct seawalls near essential infrastructure



Marine

Introduction

Roviana is a healthy and diverse marine ecosystem that contains 920 hectares (ha) of coral reefs, 1495 ha of seagrass, more than 5000 ha of sparse seagrass and corals amongst sediment, rubble, rocks and algae.



Marine habitats of Roviana Lagoon.

Findings

- Coral bleaching and disease is already impacting Roviana and will continue to increase with climate change
- Nusa Hope Marine Protected Area (MPA), the most well enforced reserve, is the only MPA that has less bleaching and disease than surrounding reefs
- More coral disease and bleaching on offshore reefs compared to the lagoon
- Lagoon areas experience less disease/bleaching because lagoon corals naturally experience big temperature changes



Coral disease is already impacting Roviana and will continue to increase with climate change.

- Manini sa kolo, ta kina (keoro) meke kamoi minoho sarina binu
- Sari igana gugua na kit'kita, bog'bogo, topa, tarasi hoke va via sagauru (gani ri sari lumulumutu)
- Sari TUKU koa i petupetuana, kulikuliana, sagauru binubinu mene 'sanava' si lopu sokui minoho va mate binu



Subsistence fishing on Dokedoke island.

- Further protect herbivore populations required to maintain coral reef health
- New marine reserves, including connections between coral reef, seagrass and mangrove ecosystems should be encouraged
- Protect lagoon passages, as corals there are resistant to temperature fluctuations, they are important as spawning grounds, and have high connectivity and productivity

Mangroves

Introduction

Mangroves are an important type of plant that grow along the coast. They help to stabilise the coastline and reduce erosion from waves. They also provide an important place for fish and shellfish to live and breed.



Mangroves provide a protected place for fish to live and breed.

Findings

Mangrove ecosystems in Roviana are generally diverse, healthy and have high biomass.

- Mangrove biomass is highest
 inshore, close to major river systems on New Georgia
- Major local threat to mangrove ecosystems is cutting associated with villages and plantations
- Lack of awareness of importance of mangroves for coastal protection
- Sea level rise will impact some areas of mangroves more than others-depending on coastal topography and barriers to migration
- Dieback of mangroves in Rikiriki passage associated with land subsidence and sediment liquefaction following 2007 earthquake

- Petu tuquea sa masamasa pude lopu zuzulu
- Vasina ta maho palae sari petu si:
 - loke ginani na (igana, riki, deo, kapehe)
 - sagea kolo meke zuzulu sa masamasa

- Reduce cutting of mangroves
- Include mangroves in marine protected area network
- Improve people's understanding of the importance of mangroves



Diagram showing the importance of mangroves for stopping erosion, building materials, providing homes for fish and keeping reefs healthy.

Water quality

Introduction

Most coral reef plants and animals need clean seawater to live and reproduce in. When nutrients and sediments from the land wash down rivers after rain they can make the seawater dirty and kill marine life.



Dead fish from bad water quality in Marovo lagoon during a bloom of toxic algae in 2011. Similar events occurred in Roviana in 2012.

- Pana via sa kolo pa poana, kote toa va leana sari binu pa sagauru meke kote soku igana
- Vasina koa logging si boni hola sa kolo
- Pana boni meke manini sa kolo kote ta eva<u>n</u>a sa haqamuqe (algal bloom) – matea igana (gua pa Marovo)

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Findings

- Temperature of lagoon waters is highly variable over time and with depth
- Areas close to passages have greatest variability in water temperature
- Harmful bloom-forming
 phytoplankton species present
 that can kill marine life
- Water quality of Roviana is influenced by high sediment

and nutrient inputs from logging in catchment

- Water quality is poorer in central and eastern Roviana
- Water quality is generally better than global averages
- Light penetration to marine habitats is better offshore but variable with rainfall
- System is vulnerable to increases in nutrient input



A map showing water quality across Roviana with red colours indicating high sediments and low oxygen and blue colours indicating areas with low sediments and high oxygen.

- Reduce logging in catchment areas.
- Ensure buffer zones around rivers are respected by logging companies
- Protect mangrove forests along the coast to reduce erosion



A sediment plume in Viru Harbour after heavy rain.

Connectivity

Introduction

The marine environment is very complex with many different species and habitats. Some species of fish live on coral reefs as adults but need to go into mangroves and rivers to breed. Their baby fish then live in mangroves and then seagrass as they grow up until they move onto coral reef as adults. This movement is called connectivity and is important for healthy and productive fisheries.



Diagram showing the importance of seagrass, mangroves and reefs for fish. Having all these habitats in MPAs helps fish to breed and increases catches outside the MPA.

- Sari igana pa Roviana si votikaedi koari igana pa Marovo meke pa kaiqa popoa pule (lopu tamatasi – genetic). Ke pude papo sari igana pa Roviana, lopu kote boka mae igana pa Marovo babe Australia pude va soku pulei
- TUKU koa ia petupetuana (podopodoana igana), kulikuliana (vasina noma sage) meke sagauru lamana (vasina koa igana nomadi boka podopodo pule) kote boka va soku pulei sari igana pa nada poana

Findings

- There is limited genetic overlap between Marovo Lagoon and Roviana Lagoon, indicating a surprising lack of connectivity between these two systems
- This relative isolation of Roviana increases vulnerability and makes local scale management of marine ecosystems very important
- Local-scale connectivity of fish shows the importance of connectivity between coral reef, seagrass and mangrove habitats
- Fish abundance on reefs near seagrass and mangrove habitats is higher than on isolated reefs
- Influence of connectivity particularly strong for the iconic Bumphead Parrotfish, which is important to keep reefs healthy

- Develop new MPAs within passages
- Protect key species such as Bumphead Parrotfish as this can have wider benefits for a range of other species
- Include mangrove and seagrass in existing MPAs where possible



Gardens

Introduction

Many types of garden crops are grown in the fertile volcanic soils around Roviana Lagoon. The success of these gardens provides the staple food and small-scale economy for most people in Roviana. As the population increases and the climate is changing, these garden areas are under increasing pressure and showing lowered productivity.



Children in Biche village harvesting ngali nuts and learning traditional skills.

- Hobe sa galegalearane meke sari totoso ke soku minoho meke kurukuru <u>n</u>ovali sari linetelete pa inuma. Lopu toa meke namu va leana sari linetelete
- Tinum'tumae tinavete inuma pukerane lopu hodai tie vaqura. Lopu soku kineha ginani si ta lete meke keke ginani mo si ta lete pa keke vasina doduruna sa vuaheni. Gua ke kaleana sa pepeso, lopu masuru
- Lopu hiva hena ginani pa inuma sari tie, ginani pa sitoa (rice, biscuit, noodle, tin food) si ta hena sisigiti

Findings

- Diversity of garden crops is decreasing
- Bushfoods are an important food source during disasters or shortages
- Variability in climate has led to lower productivity through rotting of tubers in very wet periods and crop mortality during dry periods
- Young people no longer value garden knowledge
- Destructive slash and burn methods, which reduce soil fertility, are commonly used
- Reliance and preference for processed foods (e.g. tinned tuna, noodles, biscuits) is increasing
- Pests and diseases are becoming more common, which is having significant impact on garden productivity
- Salt intrusion into coastal gardens is increasing
- Fertile garden land is being used for commercial agro-forestry



Sweet potatoes planted using traditional methods.

- Improve transfer of traditional knowledge between generations
- Access new climate proof crops from Kastom Gaden Association
- Trial composting and mulching to improve soil fertility
- Limit commercial activities on fertile garden lands

Drinking water

Introduction

Access to clean drinking water is an essential requirement for healthy communities. Traditionally in Roviana people have used water from both streams and groundwater. Recently rainwater tanks have also been relied on. Protection of clean drinking water supplies should be the top priority of any community.



Drinking clean water from stream in healthy catchment

Findings

- Climate predictions indicate rainfall will become more variable
- The sea level rise will also cause salt water to come into low-lying groundwater wells making them unsuitable for drinking.
- Community water supply from streams with a forested catchment, and from wells located away from the coastline, will be very important in the future.
- Lopu boka ta gilana totoso kote ruku meke dada
- Kolo korapa odu sage meke kote pasa sari na berukehe
- Sari na leana/tototolo kote harupu gita. Arilaedi hola pude ta kopue, lopu ta maho sari huda pa taqele



Diagram showing a community with a drinking water supply from a healthy catchment (right) will be better off than those in an unhealthy catchment (left) that are forced to use groundwater/tanks due to more variable rainfall and saltwater intrusion.



A clean river on Vangunu surrounded by a healthy catchment

- Keep healthy forests in water catchment areas
- Don't allow logging within 200m of streams or anywhere in water catchment areas
- Maintain a diversity of water sources (rainwater, wells, stream supply)
- » Soku leana vasina boka vagi kolo napo gita si ta novala koarina logging meke mining

Broader vulnerability

In addition to climate change there are many other factors that are weakening the communities and environments of Roviana.

These include:

- Erosion of traditional value systems
- High levels of youth unemployment
- Erosion of customary governance
- Limited inclusion of women in governance
- Fragmentation of villages under sea level rise scenarios
- Limited government support
- Lack of local awareness of climate change impacts





- Soku tinasuna ele vura mae koasa Climate Change (hobe sa gal'galearane/totoso). Pa Roviana, koa dia tinasuna noma hola kote boka novala gita:
 - Hobe meke lopu ninira tinoa, kinoa meke hahanana pukerane (kastom/traditional/religiuos values)
 - INOVIA papaka/kaleadi sari inuma meke vasina hoke vagi ginani
 - TINAGO pa kolo meke higohigo si papaka meke kaleadi
 - Soku tinasuna tie vagura

Taking action

The Roviana Conservation Foundation has developed the 2013-2017 Roviana Climate Change Resilience Plan.

Its vision is:

"The Roviana Lavata environment continues to sustain the livelihoods and culture of all its people and enhances our resilience to climate change as a result of our efforts in empowering each other, in valuing our traditional knowledge, and in owning and carefully managing and protecting our land and sea resources."

5.

Six pillars

- 1. Strengthen governance
- Protect coastal infrastructure 4.
- Maintain ecosystem health 2.
- Build capacity and awareness
- 3. Enhance food security
- 6. **Develop partnerships**



Plant mangroves to protect the coastline from erosion.

Adaptation

Strengthen Governance

- Strengthen RCF office
- Traditional leaders, women, youth, church and government work together

Maintain Ecosystem Health

- Forest, rivers and lagoon
- Resource management (MPA network)
- Waste management

Food & Water Security

- Improve garden practices
- Protect water catchments to protect soil, soil fertility and lagoon water quality

Coastal Protection

- Protect coastal vegetation especially mangroves
- Understand and plan for risk from sea-level rise

Build Capacity and Awareness

- Empower local communities, institutions and groups to manage resources sustainably
- Continue to monitor vulnerability and inform communities



Managing fishing pressure with tabu or MPA can help protect coral reefs from climate change.

Develop Partnerships

- Build local partnerships
- Work with CBO, national and international NGOs and institutions for information and technical skill sharing
- Work with provincial and national government for policy enforcement

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Adaptation:

[tinavete boka tavete gita pude lopu kaleada vugo rerepere]

- Kopu ni nada tinago (kolo/hiqohiqo/leana/poana) pude via, lopu ta <u>n</u>ovala
- Tukui kaiqa nada tinago (sagauru, hiqohiqo) pude boka lovuru pule mae
- Kopuni sari na petupetu meke na huda toa pa masamasa pude lopu zuzulu
- Tavetavete turani sari na organization, ginavuna meke researchers pude boka tumaeni meke dono gilani sari na hinobe/tinasuna korapa ta evana
- Tie varipodo va tum'tumae koari koburu pude lopu muliunu ni sari nada hahanana pukerane



Dry stone wall in Isabel used to protect community from sea level rise.

Summary

Whilst some of these factors are externally driven, many can be addressed at the local level through community-based adaptation. Through a consultative participatory process with Roviana people we have identified several local actions that will re-enforce existing community strengths.

Marine ecosystems can be strengthened by

- Improving management of mangrove ecosystems
- Increasing connectivity between seagrass, mangroves and reef habitats
- Enforcing existing catchment management regulations

Coastal ecosystems can be protected through

- Limiting removal of mangroves adjacent to villages and coconut plantations
- Building seawalls to protect essential infrastructure



Dense mangrove forests provide crucial protection against damaging storm surge.

Gardening practices could be improved through

- Better land use planning to limit agroforestry encroachment onto garden lands;
- Training in soil fertility improvement methods
- Distribution of varieties more resistant to climate extremes
- Documenting traditional knowledge of garden practices and bushfoods for future generations



Maintaining connectivity between mangroves and fringing reefs will help strengthen these ecosystems, which provide food and income for Roviana people.





Sapos íu onam rísosís luk aftarem gut..!