



Rapid Vulnerability and Adaptation Assessment

for the Los Negros Island – Manus Province

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Centre for Climate Change and Sustainable Development

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1.0 INTRODUCTION

The Province of Manus is a maritime province and comprises of more than 215 islands of which four are large volcanic islands with coral limestone on the surface whilst the rest of islands nearly 211 are made from coral polyps or weak limestone deposited with poor loose soils.

Los Negros Island is large volcanic island with coral limestone on the surface and was fattened during the World War II in 1945. Much of the landscape, soils and environment have been changed as a result of World War II relics and disasters.

Los Negros and Manus Islands are located in the warmest pool of oceans in the world (known as Warm Pool) which regarded to influence the global climate and influence the PNG and Pacific weather patterns and its impact on oceans and land resources. Scientific results/programmes on Los Negros Islands and Manus islands other international studies and PNG Weather Office on the island continues since 1980s. These projects include:

- i) PNG Weather Office monitoring and measurements of weather and meteorology since the last 50 years.
- ii) USA Energy Department- Atmospheric Radiation Measurement – 1995
- iii) Japanese Climate and Oceans (JAMSTEC) - 1987
- IV) Australian Government Funded- South Pacific Sea Level and Climate Change Monitoring Project- 1992- 2015.
- vi) PNG Government Funded: Disaster and Risk Management Studies- 2008-2010.

The results from these projects and programmes confirms that climate change, variability, extreme events and sea level rise over the last 50 years and the projections in the next 100 years projects uncertainties and high vulnerabilities on communities, economic and environmental sectors.

Given the location and isolation of the Los Negros Island in the Pacific Ocean and the rest of the country and world, the lack of economic resources on its land makes it a very high risk and vulnerable in achieving sustainable development. However, the oceans and its seas provide alternative resources of revenue and livelihood. The challenge for the Local level Government, Provincial Government and the PNG government to develop adaptation and risk management policy is critical for the long term survival of the people of Los Negros Island.

1.1 Purpose

The purpose of the Vulnerability and Adaptation assessment tour included the following on Los Negros Islands:

- Use the USP-EU Framework methodology for the Vulnerability and Adaptation assessment of climate change, variability, extreme events and sea level changes on Los Negros Islands, its communities and resources;
- Discuss with national and international projects monitoring in Los Negros islands and their results on the study- Collection of updated database on the province

- Visit to all identified coastal and atolls affected by climate change, variability and sea level rise
- Conducted awareness on common hazards in the province
- Analyze issues related to socio- economic and environmental changes and issues related to food security issue, health and disease, water security affecting prone communities
- Produce report with appropriate recommendations to the USP EU Project Management, PNG Provincial Disaster committee, National Disaster Centre and other appropriate Government Agencies.

1.2 Methodology

There are numerous Vulnerability and Assessment Methodologies, however, the use of Rapid Vulnerability and Assessment methodology developed by the USP-EU Project and was used as guide to complete this work and report on the Los Negros Island – Manus Province from the 7th to 14th January 2013. This assessment was carried out by a team from the University of Papua New Guinea and especially from the Centre for Climate Change and Sustainable Development comprising of Professor Chalapan Kaluwin, Dr. John Duguman, Ms Regina Kiele and Mr. David Poselei. Mr. Poselei is the Manus Provincial Government officer responsible for the coordination of Environment, Climate Change and Disaster issues in the Province and accompanied the team to the villages and extremely useful for all protocol matters in villages and contributed to this work.

1.3 Procedures

It is estimated that the population of the Los Negros Islands is more than 4,500 people living the majority of villages visited (see Figures 1 and 2).

In all the villages and during the teams' consultation with leaders and communities; there were always discussions and consultations followed by visits to sites that we were considered vulnerable to the impacts on climate change, variability, sea level changes and extreme events. This was concluded by identifying the priority sectors/issues pertinent with the communities. (See the table of summaries)

The Community consultations were undertaken at Loniu, Naringel, Riuriu, Papitalai, North Point – Lombrum and Mokoreng (Figure 2). All of these communities are situated right on the beach or mangrove front and have noted the encroaching of sea water into the community area.

The Los Negros Island has also been the site for the World War II activities including the stationing of the American troops and General Mac Arthur at Lombrum Naval Base. The presence of this base and now taken over by the Papua New Guinea Defence Force has brought with it ample bombs and shrapnel pieces which have littered the islands and have also contributed to less gardening land available for the communities.

This issue was raised by all communities and is one of the other concerns as stated in Table 1.

The report is structured to firstly state the issues and concerns that the community at the villages raised as a result of the community consultation. This will then be followed with a summary of the main issues and the commonalities amongst the communities. Finally, the Rapid Vulnerability Assessment is completed for each of the villages and is in Annex 1.

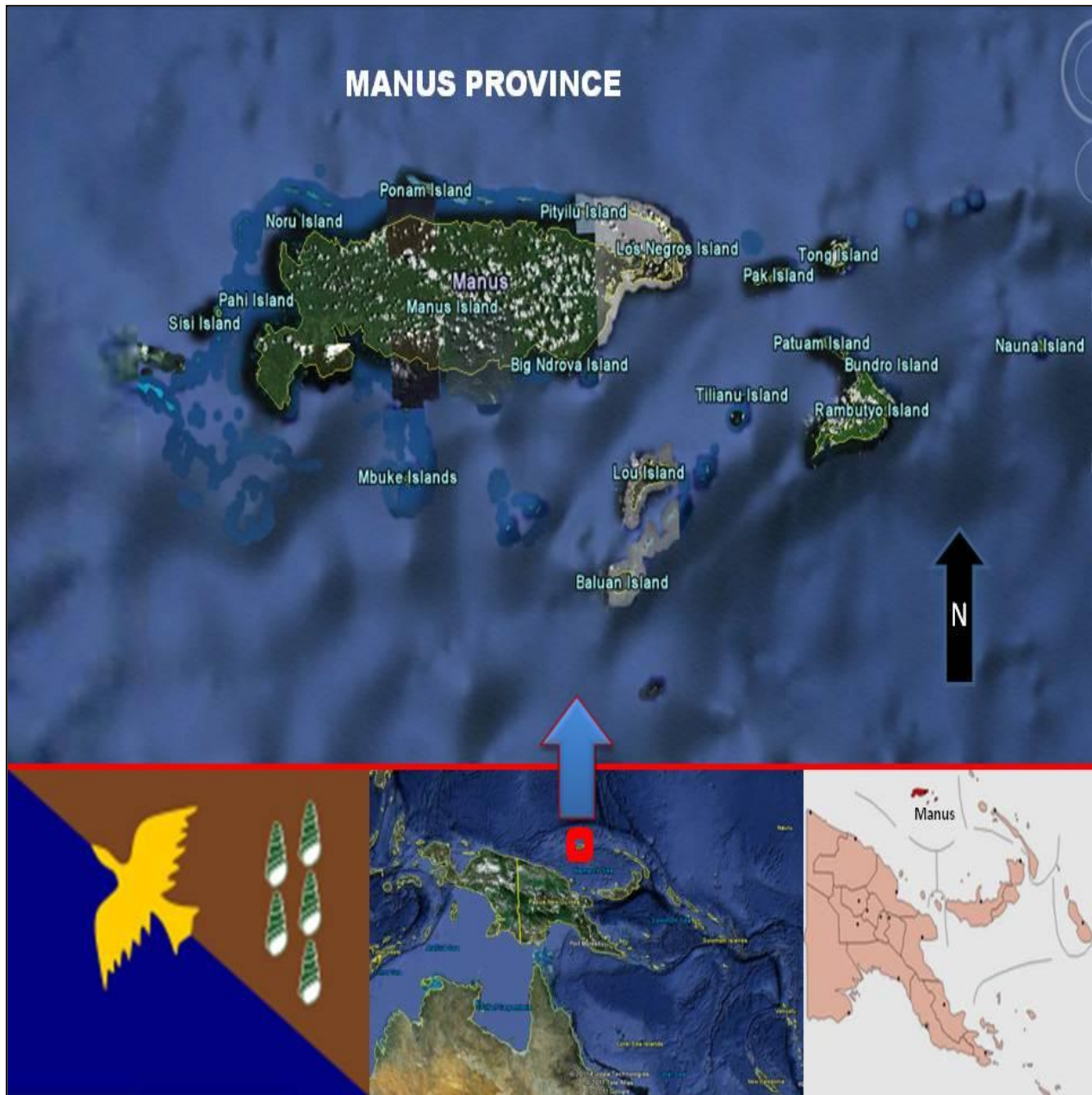


Figure 1: Geographical location of Manus Province

Manus has 270 small islands and atolls in total.

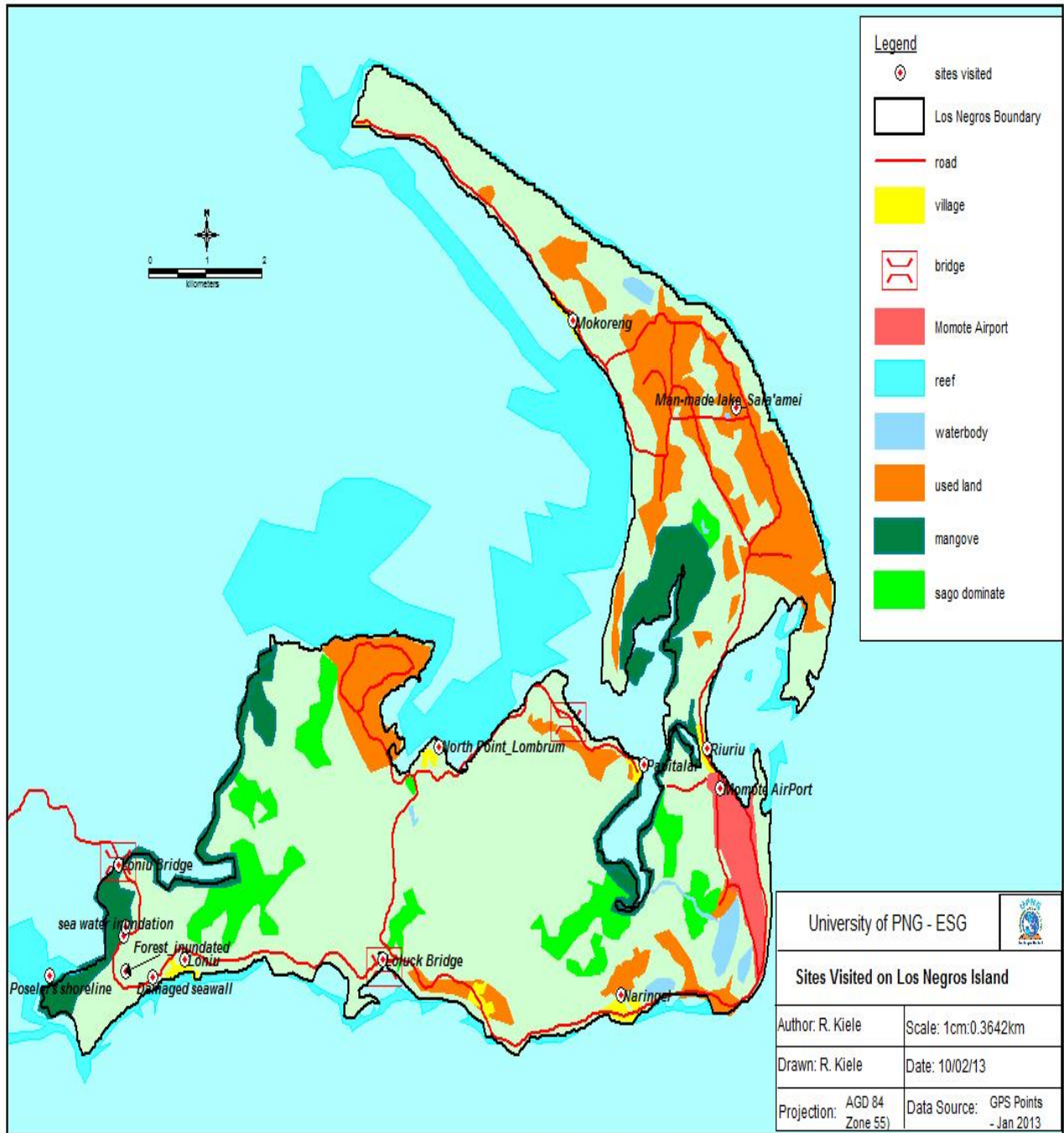


Figure 2: Location map of Los Negros Island - Manus Province and Community Sessions

2.0 SUMMARY OF VULNERABILITY ASSESSMENT IN LOS NEGROS ISLAND

Below are summaries of the consultations and visits to these sites/villages in the Los Negros Island and include:

2.1 Loniu village

Tuesday 8th January 2013

- ❖ Opening by LLG Ward Councillor -Stanley Timothy
- ❖ Introduction by councilor followed by D. Poselei - Manus Provincial Government as part of team on the purpose of the meeting, followed by Prof C Kaluwin on the V & A Assessment and why this is being undertaken. JD & RK gave additional points to stimulate discussions and feedback.
- ❖ The population of the Village is approximately 800 people. It has a high school for students around Manus Island enroll each year.
- ❖ Agriculture/Food security is vulnerable sector. Majority of people use sago as food for less than 40 years. Water resources are regarded as a priority issue.

Questions and Answer Session - Issues

1. Coastal Protection Systems - Priority
2. Impact of extreme events i.e. tsunami (Japan).
3. Infrastructure – road impacted by seawater encroaching
4. Food security – Sago is staple diet (not for sale but domestic consumption including barter amongst villagers; weekly earning from sago is ≤ K50.00 weekly
5. Women involvement/Impact is a concern for resilient approaches
6. Adaptation option – Disaster/resettlement policy - ‘ 3 options’
7. Seawall and Shoreline Priority
8. Self-reliance project/committee (priority)
9. 60-70 year shoreline retreat in Loniu village
10. Water and rainwater catchment-/ vital supply.(short- long term) [water management supply]
11. Sago from Bougainville (solution)
12. Health infrastructure (priority)
13. Water intrusion and pollution of water resource

Loniu village is situated on the beach and sea water has encroached into 70% of their sago resources. In areas, the community has placed stones to be able to get to the sago patches but sea water has also infiltrated together with habitats where mammals would have migrated inland away from the sea water.

2.2 Naringel

Naringel Village 9/01/13 10:30am

- ❖ Introduction by councilor followed by D. Poselei - Manus Provincial Government as part of team on the purpose of the meeting, followed by Prof C Kaluwin on the V & A Assessment and why this is being undertaken. Both Dr Duguman and Ms Kiele gave additional observations and experiences to stimulate discussions and feedback.
- ❖ After discussions the Team and the village communities visited sites and areas that have been impacted by climate change variability and sea level changes. Some adaptation options were being implemented in the village.
- ❖ The village has a primary school and a population of more than 400 people.

The following are some of the important issues raised by the communities as priorities:

Issues

- (a) Mangrove Protection System
- (b) Water resources –Shortage (Hills - require Southern Cross tank)
- (c) Coastal Protection - Seashore erosion – Traditional method using mangroves to protect sea – water intrusion -----> 1 mile along sea front
- (d) Sea Level Rise/Climate Chang Priority ---> Soil/fertility



Figure 3: Sea water intruding into sago and beach coastal forest at Loniu

- (e) Hospital/aid/health focus/ Health centres developed
- (f) Governance Issue /LLG/wards /community/ women/NGO / Church [6 church groups in Neringal
- (g) Infrastructure – Road needed urgently
- (h) Socio – economic – K50/weekly with average of K20 – K50 from sale of sago, fish, garden food (domestic focus on agriculture/marine products)
- (i) Opportunities/Job in the Village is poor
- (j) Cultural/Spiritual/Heritage sites for protection must be encouraged-
- [I joint cultural and economic issues]
- (k) Resource centre – need for this will equip villagers and communities well, to gain information to help themselves

2.3 Riurui Poloka and Momote Villages

Riurui/Poloka / Momote Village 9/01/13 1:30 PM

Councillor-Kanawi Poloka - 2 Agendas for this afternoon; EU and NFA (Fisheries)

Introduction by the councillor followed by D. Poselei on the purpose of the meeting, followed by Prof C Kaluwin on the V & A Assessment and why this is being undertaken. Dr Duguman and Ms Kiele gave additional points to stimulate discussions and feedback.

Mr. Poloka identified the most important challenges are:

- Constraint - Historical WW II damages on the villages and coastal areas, agriculture and land
- Priority issues; Climate Change /Sea Level Rise/Disaster and its impact on the airport, land and food security.

The following are important summaries of vulnerable areas and issues discussed by the communities and government of Manus (Fisheries Dept):

1. Coastal Protection System - Traditional for up to 20 years
[Infrastructure] - Modern (loped/ gabion basket etc)
2. Resettlement/Migration -----> Cultural/Heritage sites

3. Marine resources – FAD - livelihoods focus/tourism.
4. Land use /Food security --Sago / Trading; 90% destruction
5. Water Resources /management.
6. Socio - economic; individuals from community earn K100.00 per week and figures varies from K60 - K100)
7. Water tanks; population of 300 but only 5 tuffa 2000 L tanks- urgent need for water for communities.
8. Health- Malaria /water borne/flood related is a common experiences
9. Spiritual/cultural link with land tenure issue
10. Shelter – housing and need for forestry and timber for houses.

2.4 Papitalai

Meeting stated at 11.00 am in the presence of Peter Malali – councilor # 71638635

Team

David Poselei

Prof C Kaluwin

Dr. J. Duguman

Ms R. Kiele

Two agendas – EU V & A Assessment and NFA (FAD) Community about 30 persons

Opening of meeting by councilor then with prayer from Elderly lady - Pauline

Introduction by councilor followed by D. Poselei on the purpose of the meeting, followed by Prof C Kaluwin on the V & A Assessment and why this is being undertaken. JD & RK gave additional points to stimulate discussions and feedback.

Issues

1. Coastal Protection System - Traditional; modern using gabion baskets etc
2. Food security - marine/land use - sago survey project; Land use - sago (1bag) plant: kina shells/fisheries

Historical areas of WWII with impact of land use (craters, unexploded bombs) and marine resources

3. Water Management /Project – Water Supply



Figure 4: Meeting setting at Papitalai village

4. Women Involvement in Fisheries /Garden/ Impact of tsunami on marine shells/etc
5. Infrastructure - Housing/Roads/Health
6. Socio – Economic - Bananas only, can earn K100.00/weekly; Marine resources around K100.00 per week
No Market to sell fresh food and need to identify proper common areas.
7. Relocation/Resettlement of the village
8. Education and Human resources (Isolation)
9. Disaster Care Centre
10. Bush/REDD in Mangrove/AusAID
11. Energy/Solar technology

2.5 North Point - Lombrum

Lombrum - North Point 10/01/2013 2.00pm

Gathering under - (Martin Douwi) committee's house

Single agendas – EU V & A Assessment; attendance by about 20 persons mainly women, men and children although population is about 500

Opening of meeting by committee followed by D. Poselei on the purpose of the meeting, followed by Prof C Kaluwin on the V & A Assessment and why this is being undertaken. JD & RK gave additional points to stimulate discussions and feedback.

Issues:

1. Water Resources Management Project (tank needed to store water from dam and require piping, maintenance to remove silt, also must be treated to bring it to community; Dam had often dried up to 2 month; Water Assessment required
2. Coastal Protection System were identified as problematic
3. Marine Conservation Protection
4. Food Security- Marine /fisheries ; Agriculture /rice/yam/betel nut; mangroves
5. Capacity Building and Human Resources (Training in Resource Centre) – possible funding through UNDP Small Grant
6. Woman /Governance. To be addressed as an important management issue.
7. Socio – Economic , community member can earn K50 – K70 per week based on agriculture and marine

Products)

8. Renewable Energy [Solar Technology]
9. Health; Malaria /Dengue/water borne/ Hospital Centre, often hard to get to and money is spent on transportation of sick to Lorena
10. Cultural /Management Sites (both on land and ocean)
11. Migration/Resettlement (Sea Level Rise/Disasters such as flooding lead to a Care Centre need to be set up to cater for the community
12. Compensation/insurance

2.6 Mokoreng

The Mokoreng area covers the Salami Settlement ~ 300 people plus people from all Manus and also the Mokoreng people , total of about ~800 – 1000 ; 50 plus households, 8 clans; average weekly household income about K70-80; 2 PMVs; livelihood based on sea/marine and subsistence agriculture.

Monday 14/1/13 10 - 1pm at Mokoreng Community meeting site. About K100 people including children attended. Opening of meeting by committee followed by Regina Kiele on the purpose of the meeting and then stimulated discussions on issues affecting the Mokoreng community.

1. School/ education upgrading

- Library
- Computer
- Solar/electricity
- School on inundated land (need improvement)
-

School built in the early 1950s on inundated land (heavy rainfall, school get inundated and school children are send home), library built but need shelves and books, need electricity provide night study, computer to get students into IT skills (currently lacking), need to lift school grounds to avoid flooding and inundation or some type drainage systems.

Last Years Tsunami damaged the school and entire villages which are all located on the beaches (10 meters from the sea).

2. Food security – needs

- alternatives to food crops, protein,
- Food preservation techniques
- Soil maintenance techniques

3. Water Security – needs:

- i. More water tanks currently about 5 community tanks (5000 litres) but it would be good if each household is given one.
- ii. Or one Southern - cross to harvest water from the Pecheuk Lake.
- iii. Water well gets salty during high tides

4. Sanitation Needs

- i. Need awareness on building pit toilets so that people do not continue to dispose human wastes into the sea and this pollutes the shore line.
5. Mokoreng Advancement Society (economic security)– to improve food security, improve socio-economic conditions through cash economy, biodiversity conservation, soil maintenance, etc (over 138 registered members 60/40% M:F), 7 committee members)
 - i. – poultry projects- layers (to start with first 40 registered members)
 - ii. – vegetable bring from Lea to provide Manus markets
6. Road improvement and relocation
 - Some back road (sea side) is closed due to the King tide in 2008 and debris had
 - block off the entire road
 - Other road is dirt road, much in water logged areas.
7. Reef protection – Reef dying due to over fishing/harvesting and type of type of star fish killing the reef.
 - Need to capture the dangerous starfish to protect the reefs.
8. Health – aid post need completion (unfurnished), need VCT facilities and training
9. Solar energy for lighting (or some sort of biogas generating electricity)
10. Market for community (informal) and a community hall
11. Human capacity building
 - i. Short term training into technical skills and self reliance (tourism, tailoring, carpentry, etc) and vocational schools
12. Forest /Sea protection – tree protection and growing, and sea protection, conservation of cuscus and coconut crabs (declining at faster rate)
13. Economic sustainability – coconut oil milling, soap making, FAD for fisheries,

Others:

- ❖ Community agrees that there should be a resource centre for all Los Negros and a care centre for disaster emergency.
- ❖ Land to Salamei settlement, they now need to resettle into their traditional land under the settlement scheme.

- ❖ War destroyed much of the land, agricultural produce low, and much land taken to airbase not useful.

3.0 SUMMARY - Some Priority Issues

Table 1: Summary of the Priority Issues from the Los Negros Island

No	Issue	Area Noted	Remarks
1	Water Resource Management Project – couple of sites; water catchment	L,N,R,P,M,Nth	Water requirements vary from tanks to reticulation by daming or piping to communities
2	Coastal Protection System – traditional - Modern (coped etc) -Erosion/Sea Level Rise (SLR)/Extreme events	L,N,P,R,Nth,M,	Systems here vary at each location and can have both modern and traditional methods
3	Environmental/Cultural Management – -- Migration Cemeteries	L,N,P,Nth,M	Inundation of cemeteries and infrastructure at Loniu and Mokoreng. The latter during high rainfall
4	Marine/Fisheries Conservation Management (FED); Mullet Fish Project	L,N, R ,Nth, P,M	Overfishing at other sites besides Loniu and star fish at Mokoreng an issue
5	Land Use/Food Security – sago gardens sago/yam/betel nut infection; 90% do not have gardens	L,N,R,Nth, P,M	Loniu has 80% sago affected, dry seasons also impacts on garden foods
6	Governance in LLG/Ward (normal) church Women Association (Pi Los + Manus) Ndrolokou Conservation & Management	L,N,Nth,M	Some have organizations but these need to strengthen
7	Human Capacity Building – women and youth - Improve livelihood ; Economic sustainability	N,P,Nth, M	Willingness of community is there, needs support and strengthening
8	More Education awareness on; - Environmental Management; - Conservation Protection	N,R, P,Nth, M	This is needed in the other five communities as it can stimulate communities to view their areas in a more holistic manner
9	Health Care (vulnerability); health	L,N,R,P,Nth,M	All communities response to health emergencies is varying proportions and a well established health centre will ease having to travel long

			distances to Lorengau
10	Renewable Energy (solar)	L,N,P, R,Nth,M	Solar will provide better opportunities for children to study better and also ease the need to pay for power for communities
11	Tourism Opportunities	N,L,M,Nth	All areas do have scenic features such as limestone cliffs and good beaches ,together with WWII relic and Gen Macarthur's house and need awareness and support to tap their potential

L – Loni, N – Naringal, R – Riurui, P - Papitalai . Nth – North Point ,M - Mokoreng

In relation to 11 above, process is to have a letter of consent from LLG/Ward.

Annex 1: Rapid V & A Checklist Scoring

All assessments at the six communities are preliminary and the evaluation focus is to assess the vulnerability of sea level and its impacts on the shoreline and food resources. Each visit to the sites took up to half a day or up to three hours. Communities were well aware of the consequences of the extreme events and changes over ten to thirty years and provided valuable information. All communities are Open Coast Communities and scoring is set out in Table 2 below.

OPEN COAST CHECKLIST**Level of Physical Vulnerability of Community from Possible Climate Change Induced Stresses related to Coastal Erosion, Inundation & Flooding:**

Site: ____ Loniu _____ Village

Date: ____ 8/1/13 _____

Evaluation Focus: Rapid Assessment of Coastal erosion, impacts of food resources and infrastructure _____**Purpose of Assessment:** Screening of sites for data collection.**Level of Assessment:** Preliminary Assessment**Method used:** Rapid Appraisal**Duration:** ____ 6 ____ hours**Screening Technique:** Point system based on:**KEY: (NUMERICAL)**

- 1 – Minimal Vulnerability
- 2 – Moderate Vulnerability
- 3 – High Vulnerability

Factors	Point System	Points
(1) Foreshore Elevation (Estimation)	5-<7m: 1 3-<5m: 2 1-<3m: 3	3
(2) Village elevation (Estimation)	>50%(5-<7m): 1 >50%(3-<5m): 2 >50%(1-<3m): 3	3
(3) Reef System	Presence of fringing & barrier reefs: 1 Barrier or fringing reefs: 2 No barrier & no fringing reefs: 3	1

(4) Aspect (feature or characteristics)	SW – NE: 1 NE – E or S – SW: 2 East – South: 3	1
(5) Shore morphology, beach composition & distribution (Proxy for wave intensity)	Minimal: 1 Average: 2 High: 3	2
(6) Mangrove Protection	Dense: 1 Scattered: 2 None or isolated stands: 3	2 - 3 (2.5)
(7) Flooding from inland rivers	Close to small stream: 1 Close to medium size stream: 2 Close to river: 3	3
(8) Ease of relocation to higher ground without socio-economic & cultural considerations	Easily: 1 Some geographical constraints: 2 Major constraints: 3	1
(9) No. of exposed sides of village to incoming waves	One: 1 Two: 2 > Two: 3	1
(10) Distance of shoreline to nearest dwelling or building	5 - < 7m: 1 3 - < 5m: 2 1 - < 3m: 3	3
	Total	20.5

OPEN COAST CHECKLIST

Level of Physical Vulnerability of Community from Possible Climate Change Induced Stresses related to Coastal Erosion, Inundation & Flooding:

Site: _____ Naringel _____ Village

Date: _____ 9/1/13 _____

Evaluation Focus: Rapid Assessment of Coastal erosion, impacts of food resources and infrastructure_____

Purpose of Assessment: Screening of sites for data collection.

Level of Assessment: Preliminary Assessment

Method used: Rapid Appraisal

Duration: ___3___ hours

Screening Technique: Point system based on:

KEY: (NUMERICAL)

- 1 – Minimal Vulnerability
- 2 – Moderate Vulnerability
- 3 – High Vulnerability

Factors	Point System	Points
(1) Foreshore Elevation (Estimation)	5-<7m: 1 3-<5m: 2 1-<3m: 3	2
(2) Village elevation (Estimation)	>50%(5-<7m): 1 >50%(3-<5m): 2 >50%(1-<3m): 3	2
(3) Reef System	Presence of fringing & barrier reefs: 1 Barrier or fringing reefs: 2 No barrier & no fringing reefs 3	1
(4) Aspect (feature or characteristics)	SW – NE: 1 NE – E or S – SW: 2 East – South: 3	2 NW – SE
(5) Shore morphology, beach composition & distribution (Proxy for wave intensity)	Minimal: 1 Average: 2 High: 3	1

(6) Mangrove Protection	Dense: 1 Scattered: 2 None or isolated stands: 3	2
(7) Flooding from inland rivers	Close to small stream: 1 Close to medium size stream: 2 Close to river: 3	1
(8) Ease of relocation to higher ground without socio-economic & cultural considerations	Easily: 1 Some geographical constraints: 2 Major constraints: 3	1
(9) No. of exposed sides of village to incoming waves	One: 1 Two: 2 > Two: 3	1
(10) Distance of shoreline to nearest dwelling or building	5 - < 7m: 1 3 - < 5m: 2 1 - < 3m: 3	2
	Total	15.0

OPEN COAST CHECKLIST

Level of Physical Vulnerability of Community from Possible Climate Change Induced Stresses related to Coastal Erosion, Inundation & Flooding:

Site: ____ Ruirui _____ Village

Date: ____ 9/1/13 _____

Evaluation Focus: Rapid Assessment of Coastal erosion, impacts of food resources and infrastructure _____

Purpose of Assessment: Screening of sites for data collection.

Level of Assessment: Preliminary Assessment

Method used: Rapid Appraisal

Duration: ___3___ hours

Screening Technique: Point system based on:

KEY: (NUMERICAL)

- 1 – Minimal Vulnerability
- 2 – Moderate Vulnerability
- 3 – High Vulnerability

Factors	Point System	Points
(1) Foreshore Elevation (Estimation)	5-<7m: 1 3-<5m: 2 1-<3m: 3	3
(2) Village elevation (Estimation)	>50%(5-<7m): 1 >50%(3-<5m): 2 >50%(1-<3m): 3	3
(3) Reef System	Presence of fringing & barrier reefs: 1 Barrier or fringing reefs: 2 No barrier & no fringing reefs: 3	3
(4) Aspect (feature or characteristics)	SW – NE: 1 NE – E or S – SW: 2 East – South: 3	1 N – S
(5) Shore morphology, beach composition & distribution (Proxy for wave intensity)	Minimal: 1 Average: 2 High: 3	1
(6) Mangrove Protection	Dense: 1 Scattered: 2 None or isolated stands: 3	1-2 (1.5)
(7) Flooding from inland rivers	Close to small stream: 1 Close to medium size stream: 2 Close to river: 3	

(8) Ease of relocation to higher ground without socio-economic & cultural considerations	Easily: 1 Some geographical constraints: 2 Major constraints: 3	2- 3 (2.5)
(9) No. of exposed sides of village to incoming waves	One: 1 Two: 2 > Two: 3	2
(10) Distance of shoreline to nearest dwelling or building	5 - < 7m: 1 3 - < 5m: 2 1 - < 3m: 3	3
	Total	20.0

OPEN COAST CHECKLIST

Level of Physical Vulnerability of Community from Possible Climate Change Induced Stresses related to Coastal Erosion, Inundation & Flooding:

Site: ____ Papitalai _____ Village

Date: ____ 10/1/13 _____

Evaluation Focus: Rapid Assessment of Coastal erosion, impacts of food resources and infrastructure _____

Purpose of Assessment: Screening of sites for data collection.

Level of Assessment: Preliminary Assessment

Method used: Rapid Appraisal

Duration: ____ 5 ____ hours

Screening Technique: Point system based on:

KEY: (NUMERICAL)

1 – Minimal Vulnerability

2 – Moderate Vulnerability

3 – High Vulnerability

Factors	Point System	Points
(1) Foreshore Elevation (Estimation)	5-<7m: 1 3-<5m: 2 1-<3m: 3	3
(2) Village elevation (Estimation)	>50%(5-<7m): 1 >50%(3-<5m): 2 >50%(1-<3m): 3	3
(3) Reef System	Presence of fringing & barrier reefs: 1 Barrier or fringing reefs: 2 No barrier & no fringing reefs: 3	3
(4) Aspect (feature or characteristics)	SW – NE: 1 NE – E or S – SW: 2 East – South: 3	1 N – S
(5) Shore morphology, beach composition & distribution (Proxy for wave intensity)	Minimal: 1 Average: 2 High: 3	1
(6) Mangrove Protection	Dense: 1 Scattered: 2 None or isolated stands: 3	2 -3 (2.5)
(7) Flooding from inland rivers	Close to small stream: 1 Close to medium size stream: 2 Close to river: 3	N/A
(8) Ease of relocation to higher ground without socio-economic & cultural considerations	Easily: 1 Some geographical constraints: 2 Major constraints: 3	1 - 2
(9) No. of exposed sides of village to incoming waves	One: 1 Two: 2 > Two: 3	1

(10) Distance of shoreline to nearest dwelling or building	5 - < 7m: 1 3 - < 5m: 2 1 - < 3m: 3	3
	Total	19.0

OPEN COAST CHECKLIST

Level of Physical Vulnerability of Community from Possible Climate Change Induced Stresses related to Coastal Erosion, Inundation & Flooding:

Site: ____ North Point village and Lombrum villages

Date: ____ 10/1/13 _____

Evaluation Focus: Rapid Assessment of Coastal erosion, impacts of food resources and infrastructure _____

Purpose of Assessment: Screening of sites for data collection.

Level of Assessment: Preliminary Assessment

Method used: Rapid Appraisal

Duration: ____ 6 ____ hours

Screening Technique: Point system based on:

KEY: (NUMERICAL)

- 1 – Minimal Vulnerability
- 2 – Moderate Vulnerability
- 3 – High Vulnerability

Factors	Point System	Points
(1) Foreshore Elevation (Estimation)	5-<7m: 1 3-<5m: 2 1-<3m: 3	3
(2) Village elevation (Estimation)	>50%(5-<7m): 1 >50%(3-<5m): 2 >50%(1-<3m): 3	2
(3) Reef System	Presence of fringing & barrier reefs: 1 Barrier or fringing reefs: 2 No barrier & no fringing reefs: 3	3?
(4) Aspect (feature or characteristics)	SW – NE: 1 NE – E or S – SW: 2 East – South: 3	2 NE – SW
(5) Shore morphology, beach composition & distribution (Proxy for wave intensity)	Minimal: 1 Average: 2 High: 3	1
(6) Mangrove Protection	Dense: 1 Scattered: 2 None or isolated stands: 3	2
(7) Flooding from inland rivers	Close to small stream: 1 Close to medium size stream: 2 Close to river: 3	2
(8) Ease of relocation to higher ground without socio-economic & cultural considerations	Easily: 1 Some geographical constraints: 2 Major constraints: 3	1 – 2 (1.5)
(9) No. of exposed sides of village to incoming waves	One: 1 Two: 2 > Two: 3	2
(10) Distance of shoreline to nearest dwelling or building	5 - < 7m: 1 3 - < 5m: 2 1 - < 3m: 3	1 – 2 (1.5)
	Total	20.0

OPEN COAST CHECKLIST

Level of Physical Vulnerability of Community from Possible Climate Change Induced Stresses related to Coastal Erosion, Inundation & Flooding:

Site: ____Mokoreng____Village

Date: ____14/1/13____

Evaluation Focus: Rapid Assessment of Coastal erosion, impacts of food resources and infrastructure_____

Purpose of Assessment: Screening of sites for data collection.

Level of Assessment: Preliminary Assessment

Method used: Rapid Appraisal

Duration: __5__ hours

Screening Technique: Point system based on:

KEY: (NUMERICAL)

- 1 – Minimal Vulnerability
- 2 – Moderate Vulnerability
- 3 – High Vulnerability

Factors	Point System	Points
(1) Foreshore Elevation (Estimation)	5-<7m: 1 3-<5m: 2 1-<3m: 3	3
(2) Village elevation (Estimation)	>50%(5-<7m): 1 >50%(3-<5m): 2 >50%(1-<3m): 3	3
(3) Reef System	Presence of fringing & barrier reefs: 1 Barrier or fringing reefs: 2 No barrier & no fringing reefs: 3	1 – 2 (1.5)
(4) Aspect (feature or characteristics)	SW – NE: 1 NE – E or S – SW: 2 East – South: 3	3
(5) Shore morphology, beach composition & distribution (Proxy for wave intensity)	Minimal: 1 Average: 2 High: 3	3
(6) Mangrove Protection	Dense: 1 Scattered: 2 None or isolated stands: 3	2 -3 (2.5)
(7) Flooding from inland rivers	Close to small stream: 1 Close to medium size stream: 2 Close to river: 3	2
(8) Ease of relocation to higher ground without socio-economic & cultural considerations	Easily: 1 Some geographical constraints: 2 Major constraints: 3	1 – 2 (1.5)
(9) No. of exposed sides of village to incoming waves	One: 1 Two: 2 > Two: 3	2
(10) Distance of shoreline to nearest dwelling or building	5 - < 7m: 1 3 - < 5m: 2 1 - < 3m: 3	1 – 2 (1.5)
	Total	23.0

4. Team's Summary of the Field Visit on Los Negros Islands.

Below is a brief summary of the discussions and field visits with the communities and those international and national projects on the ground on the Island. The use of the above Annex 1 and Table 1 were used to provide this assessment.

Issues and background

The Los Negros Island is one of the 4 large Islands which consist of volcanic and coral limestone on the surface. The coral islands are made from coral polyps or weak limestone deposited with poor loose soils. A population of fewer than 4,500 people, with young youths dominating the economic and social activities in the Los Negros Islands with the view of sustaining their livelihoods.

Given the location and isolation of the Island in the Pacific Ocean and the rest of the country and world the lack of economic resources on its land makes it a very high risk and vulnerable in achieving sustainable development. However, the oceans and its seas provide alternative resources of revenue and livelihood. .

Los Negros Islands and Manus Island are located in the warmest pool of oceans in the world (known as Warm Pool) which regarded to influence the global climate and influence the PNG and Pacific weather patterns and its impact on oceans and land resources. Scientific results/programmes from Los Negros Islands and Manus island and other international studies in the island, reveal that climate change, variability, extreme events and sea level rise over the last 40 years and the projections in the next 100 years spells poses grave danger for Manus Island and its people and other islands along the equator to look at adaptation options- as No Regret Options.

Sea level rise measurement range between 8-20mm each year on Los Negros Islands with the largest influence from the El Nino and La Nina as a result of the energy from the oceans in the Pacific and PNG. The present global average sea level rise is 2-3mm per year but data compiled by the Australian and USA Governments from 1994-2007 shows an accelerated sea level rise of up to 25mm/yr, more than 10 times the global trend this century.

This finding was validated by satellite data showing 2-3cm per year rises particularly in the region from Papua New Guinea southeast to Fiji. The cause and duration of this variation is unknown, but is related to El Nino and La Nina signals

The challenge for the Los Negros Islanders and Province (PNG) government to develop adaptation and risk management policy is critical for the long term survival of the people.

B: Current Vulnerability

The Los Negros Island and its communities are adversely affected by its physical location and size, political representation, lack of economic resources, and coupled by climate change and sea level rise including extreme climatic events, such as water sprouts, sea surges, floods and droughts. These events, and in particular high frequency of EL Nino, produced abnormally high waves and storm surges and have considerable impact, to which the different sectors are vulnerable, especially coastal infrastructure are submerge under the oceans since 20 years ago.

Soil erosion and landslides are important secondary factors related to periods of high rainfall, particularly associated with strong westerly winds, and El Nino and La Nina. Soil erosion, and consequently high levels of sediment in rivers and inshore marine areas, can have adverse effects on coastal resources.

In addition the impact World War II disasters on both land and ocean resources and communities is an added challenge in managing these impacts on the Los Negros Islands.

Vulnerability of Environmental Sectors

Agriculture

The occurrence of climate change and extreme events has a significant negative impact on agricultural productivity. Heavy rainfall, high winds and huge waves associated with Sea level rise and La Nina have caused damage and destruction to both trees, and ground crops. In addition, they wash out crops and result in the water logging of soil and consequent rotting of crops. Droughts have been experienced with serious impacts on agriculture due to insufficient soil moisture leading to cessation of crop growth and thus reduced productivity.

Impact of World War II has permanently damaged their crops and soil fertility and challenges on introduction of new crops especially is a challenge.

Forests

Forests provide a range of resources including, fuel wood and timber which are harvested at both a subsistence and commercial level and as a carbon dioxide sink. Forests are vulnerable to climate change, high winds and temperatures cause damage and loss of foliage and branches and in some circumstances result in uprooting. In addition, periods of low rainfall increase the vulnerability of forests to fire damage.

Mangroves look promising for tradition coastal protection system and for marine habitats. - See Photo 2.

Water

The most serious effects of climate change and variability on water resources occur following prolonged dry spells which have resulted in a shortage of water supplies in majority of the communities and atoll islands. In addition, contamination of water resources due to sea level rises and abnormally huge waves from South West winds and the *El Nino* effect. Such effects tend to be confined to the drier parts of the islands/coastal areas and smaller, outer islands which are still inhabited. Migration of communities to other suitable places/islands is a common option but not the viable measures.

The need for better water resources and supply to all communities in the Los Negros Islands is supported. See Photo 1.

Fisheries

Fish and other marine resources are important protein resources for the majority of the islanders. Fisheries may be adversely affected by increased UV radiation, high temperatures, and high volume of sedimentation due to soil erosion. Also increased frequencies of strong winds (west and east trade winds) in the region have resulted in fish kills and damage to coral reefs as fish habitat.

Mangroves

Mangroves act as a buffer zone between land and sea and play a significant role in protecting both the coastal areas and coral reefs. Mangroves are also important habitat for fish, marine species and provide range of resources used by the islanders. Impacts of climate change, sea level changes, large storm surges, associated with cyclones and flooding resulting in high levels of sediments which have greatly affected the mangroves. Used for fire wood and building homes.

Coral Reefs

Coral reefs provide physical protection of the shoreline and are important habitat for fish and other marine organisms. Corals have been observed to be stressed or even killed due to high UV radiation, sudden increased temperature changes, increased concentrations of sediments and flooding (from freshwater). In addition, increased frequencies of El Niño on the island and waters have killed or injured corals.

Vulnerability of Socio-economic sectors

Population

Within 1 km from the sea to the hinterland, approximately 98% of the people sustain their living in the coastal areas. The majority of the population is more at risk from the impacts of climate change and sea level rise coupled by natural climate variability. In addition, infrastructure, agriculture and other

activities are located on the coastal areas. High frequencies of water spouts observed in the islands associated with huge sea surges, high winds and rainfall means the coastal areas are vulnerable. Similarly on some of the islands, people or activities along the rivers are most at risk from flooding, for example in Loni and Papitalai Villages

Infrastructure and Roads

The number of important infrastructure in Los Negros such as:

- i) Airport and its infrastructure
- ii) Roads (sealed and unsealed)
- iii) 3 main Bridges

These infrastructures and roads are located within less than 0.5km from the sea. The adverse impacts of climate change, variability, sea level changes and extreme events on these roads and infrastructures are great concerns to all the communities and in terms of transport for both air and land.

See Photo 3 as common challenges in developing either traditional or modern adaptation options.

Health

The impacts of climate change, including abrupt changes in temperatures and rainfall are many. Heavy rainfall and flooding have resulted in outbreaks of diarrhoea and other water-borne diseases and at times vector-borne diseases such as dengue. Shortage and contamination of water due to long spells of dry weather and sea level rise have led to outbreaks of diarrhoea, eye and skin infections and a decline in general health. Many of the problems were identified in rural areas, and urban squatter settlements and remote islands.

Well-being

In most of our the observations, the poorest people were noted as being the most vulnerable members of society, and more often affected by climate change and extreme climatic events. Part of this vulnerability stems from the generally poor structure and low quality of the houses, which are often unable to with stand the impacts of climate change, El Niño, flooding, high winds and storm surges. Furthermore, the poor (K50.00 or less per week) are financially less-able to cope with the losses and costs of repair associated with these events.

Migration of people and communities amongst island and coastal areas in the face of accelerated sea level rise and climate change compounded by poor planning has resulted in development of risk reduction negotiations and strategy.

The majority of the people of the islands retain strong links to the land and environment as a result of being engaged in subsistence or small-scale commercial farming and fishing activities. Small-scale commercial activities for income-generation are particularly vulnerable to the adverse reflects of climate change and climatic extremes because they place heavy reliance on a single crop and have very few options for either income or food supply. In contrast, the majority of subsistence farmers grow a wide range of crops and are, generally, more resilient to the impacts of climate change and natural variability.

Economy

The majority of people of island export trade and overall economy is heavily dependent on the production of a small number principally unprocessed products, particularly seafood, vegetable gardens, wood and wood products. This means that the negative effects of climate change and climatic extremes on primary resources are important at both local and national levels. Tourism is small and makes some contribution to the Los Negros economy. Although impacts of trade winds and El Niño on industries are short-lived, the economic recovery is generally long term and expensive. Climate change and the associated sea level rise and abnormal high tides and storms have altered the vulnerability of the majority of the islands environment, society and economy.



Figure 5: Water resources and challenges in the Los Negros Islands



Figure 6: Coastal erosion due to climate change and extreme events in the Los Negros Islands



Figure 7: Gabion baskets used as modern coastal protection systems in the Los Negros Islands