A PRELIMINARY ASSESSMENT OF THE SOCIO-ECONOMIC AND NATURAL RESOURCE USE STATUS ON KIRIWINA AND OUTER ISLANDS OF THE TROBRIAND ISLANDS



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A report prepared for the GIZ/SPC CCCPIR Regional Program Managers, Concerned Stakeholders of the National, Provincial and Local Level Governments of Papua New Guinea.



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EXECUTIVE SUMMARY

- Climate is an aggregate of weather conditions, usually characteristic of a particular region over a certain period of time-measured over a long term period of more than 30 years. It constitutes basic elements that measure regularly the weather such as; air temperature, humidity, type and amount of cloudiness, type and amount of precipitation, air pressure and wind speed and direction of wind. Decadal changes in these elements over 200 plus years during the industrial revolution have perturbed the atmospheric composition so much so with the release of four principal GHGs that the atmospheric and ocean circulatory systems are now altered giving rise to changes in the various elements mentioned here. Collectively these unusual decadal changes are referred to as climate change a termed coined by the IPCC. Climate Change according to the IPCC refers to a change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties, and that persists for an extended period (decades). The changes in climate over time are either due to natural variability or as a result of human activity.
- Coping with the impacts of climate change through adaptive processes is one of two ways in which humans are able to endure and be resilient to the impacts of climate change. The impacts not only affect humans but the ecosystems upon which many of our village communities heavily depend on for their livelihoods and the island of Kiriwina and outer atoll islands are no exception to this.
- The CCCPIR is a GIZ/SPC German-Pacific Regional Programme that is implemented by 12 Pacific Island Countries (PICS). The project aims to strengthen the capacities of regional organisations in the Pacific Island region and its member states to adapt to climate change and mitigate its causes. The programme has been in operation for the last four and half years since commencing in 2009 and will soon terminate in 2015. A total of USD 24 million has been allocated for this programme by the Government of the Federal Republic of Germany through the Ministry for Economic Cooperation and Development. The key sectors that will be focused on are (1) Agriculture (2) Education (3) Energy (4) Forest Ecosystems (5) Land Use Management (6) Tourism
- The operations of the CCCPIR programme in PNG focus on (1) Mainstreaming and Developing Adaptation Strategies and (2) Implementation of Adaptation Measures at the National Level. In addition to introducing new adaptation measures, the CCCPIR programme also complements other existing CCA initiatives at the national levels. The CCCPIR at the moment has two pilot project sites in Central Province and Milne Bay respectively. Through this recently completed scoping study, it is hoped that Kiriwina becomes a third site for CCA initiatives under the CCCPIR Programme.
- The objectives of this recently completed study were therefore to (1) assess the current onthe ground situation as baseline data (2) determine if the village communities are affected by impacts of climate change (3) to determine if the sampled villages located in selected geographical locations are most exposed communities to climate change impacts (4) to develop a plan on what needs to be done in light of the information contained herein.
- There were some assumptions developed from a planning workshop conducted in October 2013 in Alotau, which provided some basis for the scoping study. These assumptions are as follows;

1.

The first basic assumption the CCCPIR team had about Kiriwina was that if climate change has already become a fact on Kiriwina Island, it will only exacerbate the food insecurity issues there as the major threat to food security there is the ever-increasing population which has led to intensified gardening, consequently lowering fallow periods that in turn deplete soil fertility and hence the resultant decreasing yield levels - a major threat to subsistence gardening-based societies.

2. The second equally important assumption is that a clear perception of climate change impacts, adaptation, and adaptive capacity and resilience of a village community of interest on Kiriwina is possible only where and when it follows a fuller understanding of its socio-economic nature of the community or society. This understanding is developed on the basis of a good pool of data and information on the actual situations on the ground that clearly attest to this.

- There has been a significant increase in population and households, and this is likely to continue unless something is done to curb this growth. The implications of this is that there will be continued added pressure on social services and natural resource use including the land. There is a lot of demand placed on the natural resources, when these resources themselves are not abundant. High population growth is the underlying driving force of natural resource degradation and depletion.
- Except for the usual small to medium retail enterprises, tourist lodges and guest houses; there are no major economic or money generating activities occurring on the island. The local economy is supported by fishing and subsistence gardening on which the retail and hospitality sectors partially depend on. However, tourism in our opinion has not taken off in a big way so its impact on the local economic is very minimal. Therefore income generation at the villager's level in ensuring the maintenance of one's livelihood is an important aspect of life. For most villagers, the annual income or earnings are between K100 to K500.00.
- Water security in the villages visited can never be said to be secured as all villages rely mostly on rainfall and underground sources such as shallow wells. The limestone caves are quite some distance from the villages and the quality of water in some limestone caves are fit for human consumption while others are slightly saline. From observations the shallow water wells are not fit for human consumption and the quantity of water cannot be guaranteed during long drought periods. While the polyethylene tanks provide some sense of water security, these are not affordable by most villagers.
- There are evidences that impacts of CC are affecting the people and yet most are not aware
 of CC and its impacts until through this survey that many have become aware but do not fully
 yet understand. Concerns though have been raised about sea-level rise and changes in
 seasonal weather and climate patterns. The degree to which they are impacted by these
 changes will have to be determined in a more rigorous assessment in future (if at all possible).
 The majority of people are not likely to cope well during extreme climate events and other
 natural disasters simply because they reckon they do not have enough food resources and
 water sources, and do not know what to do during extreme events.
- The food security situation on Kiriwina is not assured on a long term sustainable basis. According to the FAO definition of food security – food security in Kiriwina is only for a shortterm. Production levels have been on the decline over the last decade. So during the harvesting of food crops, people immediately may have food but then during the months of December, January and February people claim that they usually run out of food supplies. Access to alternate food sources such as visiting shops in Losuia to purchase store goods are sometimes hindered by weather conditions. The 'taim hangere' period therefore is an indicator that people are not so food secure.

- The hazards that have been of concern and raised in the interviews are sea-level rise, drought, increased pests and diseases infestation on crops, malarial infestation and diarrhoea in humans, and issues such as uncertainty due to changes in seasonal climatic patterns. The people from all the four communities are vulnerable to some extent and the degree of vulnerability needs to be assessed in the next assessment phase as mentioned already.
- The majority (63%) of the villagers' perceive themselves as not be able to cope under extreme climate events or disasters while 37 percent as being able to cope to some degree. As cohesive communities, the majority of individuals in all four villagers and Kiriwina for that matter do agree strongly that they always cooperate well and assist each other during and after any natural disasters and extreme climate events.
- In light of the results and findings, the following recommendations are what we think would be in the best interests of everyone concerned.
 - 1. We cannot deny that the communities are to some degree being affected by CC and with the kind of socio-economic situation most villagers' are in, CC and CV impacts could exacerbate and worsen individual and household abilities to cope under extreme adverse conditions. It is logical therefore that a full vulnerability study be conducted to identify the vulnerable sectors and groups of individuals within each community, explore and identify more key coping and adaptive strategies and devise a system to measure the effectiveness and sustainability of these strategies. Some of the key factors that need to be investigated further can be referred to in Table 8 under sub-section 4.8.
 - 2. A broad-based land use plan of the mainland and a community-based land use plan for the chosen pilot site must be developed together with key provincial and district staff together with the village community and chiefs where possible. Simultaneously or prior to the development of the land use plan, a broad-based hydrogeological study needs to be undertaken to locate where possible ground water resources are on the main island. Given capacity issues with mainstream government organisations like NDAL and NARI, it is further recommended that an NGO group or a professional Land Use Planner and a Hydrogeologist be engaged. The Hydro-geologist to commence and quickly complete the study and the Land Use Planning Specialist to be engaged full-time to take the lead role in planning this task with the support from NDAL, NARI and the Provincial Planning Office of Milne Bay Provincial Administration and the Kiriwina District Administration.
 - 3. A Project Document [inclusive of an Annual Work Plan for 2015) be put together immediately. This project document should outline the objectives of the project, the beneficiaries, the activities (e.g. CC Awareness & Knowledge Management Products) outcomes and outputs of the interventions that CCCPIR would want based on information already presented here in this report as well as the full vulnerability study that would be conducted following the release and acceptance of this report.
 - 4. That a meeting be convened immediately following the acceptance of this report so preparations can commence immediately towards conducting a full vulnerability study. At the same time this meeting should allow for a proper delegation of roles under existing MOUs with key stakeholders so that there is a clear demarcation of roles and extent of responsibilities for each stakeholder to take note of in the implementation of future activities.

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Butia Lodge Management and staff may not be in the position to read this report, but it is only proper that a mention be made of them for making our stay safe and enjoyable. The authors on a final note really did appreciate the good and jovial company of everyone involved and the concerted team effort in the successful completion of the survey. Thank you all!

LIST OF ABREVIATIONS

BS	Base Saturation
CCA	Climate Change Adaptation
CCCPIR	Coping with Climate Change in the Pacific Island Region
CECs	Community Evacuation Centres
CEC	Cation Exchange Capacity
CV	Climate Variability
FAO	Food and Agriculture Organisation of the United Nations
GHGs	Greenhouse Gases
GIZ	German International Aid Agency
IPCC	Intergovernmental Panel on Climate Change
KCC	Kiriwina Council of Chiefs
KRLLG	Kiriwina Rural Local Level Government
MOU	Memorandum of Understanding
NARI	National Agriculture Research Institute
NDAL	National Department of Agriculture & Livestock
NGO	Non-Governmental Organisation
OCCD	Office of Climate Change and Development
PICs	Pacific Island Countries
PMVs	Public Motor Vehicles
PRA	Participatory Rural Appraisal
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RRA	Rapid Rural Appraisal
SPC	Secretariat of the Pacific Community
SPCSP	South Pacific Climate Science Program
TVET	Technical Vocational Education Training

KEY DEFINITIONS AND CONCEPTS ABOUT CLIMATE CHANGE

TERM	DEFINITION AND DESCRIPTION IN VARIOUS CONTEXTS
Climate Change	The Inter-governmental Panel on Climate Change (IPCC) defines Climate Change as a change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties, and that persists for an extended period (decades). The changes in climate over time are either due to natural variability or as a result of human activity.
Climate Vulnerability to Climate Change	The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity. The system referred to here are communities (recognizing that communities are not homogeneous, so particular households or individuals within communities may have differing degrees of vulnerability).
Exposure to Climate Variation	Exposure to climate variation is primarily a function of geography. For example, coastal communities will have higher exposure to sea level rise and cyclones, while communities in semi-arid areas may be most exposed to drought.
Sensitivity to Climate Variation	Sensitivity is the degree to which the community is affected by climatic stresses. A community dependent on rain-fed agriculture is much more sensitive than one where the main livelihood strategy is labour in a mining facility, for instance.
Adaptive Capacity	The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences. One of the most important factors shaping the adaptive capacity of individuals, households and communities is their access to and control over natural, human, social, physical, and financial resources. Examples of resources that may be important to adaptive capacity would be: Human: Knowledge of climate risks, conservation agriculture skills, good health to enable labour Social: Women's savings and loans groups, farmer-based organizations Physical: Irrigation infrastructure, seed and grain storage facilities Natural: Reliable water source, productive land Financial: Micro-insurance, diversified income sources
Resilience	The ability of a community to resist, absorb, and recover from the effects of hazards in a timely and efficient manner, preserving or restoring its essential basic structures, functions and identity.
Hazard	In the context of disaster risk reduction, a hazard is defined as: A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. When discussing hazards in this context we are referring both to shocks such as floods, droughts (rapid onset) and stresses such as changing rainfall patterns (slow onset). It is important to distinguish between the hazard - for example a flood, and the effects of the hazard - for example death of livestock. Some effects, such as food shortages, may be the result of a combination of hazards, including climate shocks and stresses, declining soil fertility, and insecure access to markets.
Adaptation to Climate Change	Adaptation is defined as: Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

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1. INTRODUCTION

1.1. Biophysical Background of Kiriwina Island

Kiriwina Island is the largest island amongst a group of islands belonging to a group of islands called the Trobriand Islands. Administratively it comes under the Kiriwina Rural Local Level Government in the Kiriwina-Goodenough electorate of Milne Bay Province. The islands can be easily located on 1:100 000 topographic map sheet of Kiriwina between 8 degrees 20 minutes - 8 degrees 50 minutes South (latitude) and at a longitudinal position of 151 00 – 151 degrees 10 minutes East. Although brief descriptions are given of the islands; much of the broad-based discussions are centred on the main island of Kiriwina and Kuyawa Island Kiriwina itself is 273 square kilometres in size, while Kuyawa is approximately 1.4 square kilometres in size.

Apart from the main island of Kiriwina there are other outer islands (atolls) west and east of it. On the furthest western end are the islands of Tuma and Kadai located northwest of the main island itself. The others are the small atolls of Kuyawa and Munuwata that lie in a southwesterly direction from Losuia. Directly across from Lousia is the larger island of Kaileuna. The offshore smaller islands within paddling distance are the Muwo and Baimapu Islands. All these islands are found on the western and southwestern end of the main island of Kiriwina. There are also small islands (atolls) which are not probably inhabited such as Nanauli Island. On the eastern front of Kiriwina lies Kitava Island (See Figure 1.1.1).



Figure 1.1.1. Locality Map of the Kiriwina Islands (Trobriand Islands)

1.1.1. General Climatic Conditions

According to McAlpine et al, 1983; these groups of islands have a lowland humid type of climate¹. The mean maximum temperatures are slightly cooler than other places in the lowlands such as those experiencing distinct seasonality. Usually the wet season can be expected around January to March with a slight seasonality. The mean annual rainfall on the islands ranges around 3000 mm to 3500 mm and the mean monthly rainfalls are usually more than 200 mm. Water deficit is rare and if does happen losses are minimal. There is usually a moderate water surplus throughout the year as shown by comparing estimated evaporation figures against those of rainfall. The mean maximum and mean minimum temperatures for these islands range between 30 - 32 °C for the maximums and 19 - 23°C for the minimums.

The 'Water Balance model developed by McAlpine et al for a standard 15 year period has been used to determine and estimate changes in the levels of soil moisture in the soil and to estimate seasonal and annual

A PRELIMINARY SOCIO-ECONOMIC AND NATURAL RESOURCE USE ASSESSMENT ON KIRIWINA ISLAND

¹ This broad climate type classification is based on (a) altitude (b) mean annual rainfall.

run-offs and surpluses. The rainfall and evaporation data for these have been extracted from records of Lousia Station². Estimates of 'soil moisture' are determined by the weekly differences between rainfall as input and evaporation as output or withdrawal from the soil. While 'water surplus' have been calculated based on weekly surplus (if any) is in excess of recharging soil moisture to its maximum³. These estimated should be representative of the islands. However, there will be subtle local differences between Kiriwina and the other islands due to the way they are aligned and the height of any highest barrier (ridgeline). It should also be noted here that projections made for PNG generally indicate an increase in humidity levels, increase in temperatures by at least 0.11°C per decade (since 1950). There is uncertainty in rainfall projections but generalized predictions are that; there is likely to be an increase in rainfall across PNG and less though short droughty periods.



Figure 1.1.2. Climate Characteristics: Water balance components and temperature and RH for Losuia Station

Kiriwina lies in a vertical position (north/south alignment) and hence has little significant disturbances in largescale winds that sweep the ocean surface. Because of the orographic and topography characteristics of Kiriwina Island; it does not have rainfall shadows, as would those areas that have high mountain and ridgelines. These islands are not so prone to water deficit problems as both the southeast and northwest seasons bring in ample rainfall. Though this cannot be stated with conviction given the unpredictability associated with climate variability (CV) and climate change (CC), as severe drought induced by El Nino can cause water deficit problems. With the change in CV and CC, predicted surface temperature changes for the regions as reported in the SPCS report can cause significant disturbances in the climate systems (El Nino &

³ The assumption used in this model is that a soil's maximum storage or field capacity is about 1500mm. The estimated weekly surplus (if any) is calculated to be the amount by which weekly (monthly in this case) rain fall is in excess of the requirement to recharge soil moisture to its maximum capacity after having met the evapotranspiration demands.

² Data was extracted from Climate Tables of Papua New Guinea compiled by McAlpine et al 1975.

La Nina) so much so that the frequencies and intensity of cyclones, and high intensity rains can cause considerable damage and loss to property and lives.

Since these areas are humid, very high humidity levels between 90-95% can be expected in these areas. The graph at the lower right shows the likely humidity levels one can expect on a daily, weekly and monthly basis. The humidity indexes are calculated based on the daily 0900hrs and 1500hrs relative humidity figures to get the monthly indices. The first five months are usually months were humidity levels are very high. The lower left graph shows the temperature characteristics of the area. The mean temperatures vary between a magnitude of 0.5 to 1°C.

1.1.2. Landforms, Lithology and Soils

This section of the report describes the landforms, lithology and soils in the order as set out here. Lithology and soils are described as separate paragraphs under the major landforms that form the main island of Kiriwina. Maps of these major landforms and soils can be referred to in Appendix 6.1 and 6.2.

Kiriwina Island including that of other islands lies approximately between 1-15 metres above sea level. Relief is negligible - approximately less than 10 metres on most islands. Relief is just a measure of difference in height within the landform type. For example a location on a ridge crest or summit and the nearest lowest point (e.g. a valley). The area is generally flat with slopes less than 2°. The islands are mostly raised coral reefs with associated back reef plains. These coral reefs were at one time submerged and eventually raised through geo-tectonic processes such as warping and tilting some million years ago. Fluvial and littoral processes have mostly formed the associated back-plains found on these islands.

1.1.2.1. Raised Coral Reefs

The raised coral reefs and their associated back reef plains are landforms that form the most part of the island and cover an area of approximately 229 square kilometres. They are mostly coral reef platforms comprising little dissected and undulating terrain, which occasionally may have gently sloping broad ridges having relief less than 10 metres. Slope within this landform is less than 2°.

The dominant rock types (lithology) are limestone and alluvial deposits. The limestone being the base rock type acting as the foundation of these islands while the alluviums are deposits on the limestone as a result of fluvial and littoral processes.

The dominant soils that can be found in this landform type are called Rendolls⁴ (see Plate 1.2). They are usually shallow, well-drained and dark coloured soils with weakly acid to neutral soil reactions formed on calcareous parent materials, which in this case is coral limestone. They are generally moderate to highly fertile soils with high (> 25 meq %) cation exchange capacity (CEC) and high (>60%) base saturation (BS) levels. But in this case tests have to be done to ascertain the BS levels as continuous gardening could have reduced the fertility of these soils. These soils occupy about 91.6km².

Plate 1.1. Typical features of a raised coral reef and associated narrow backreef plain (imperfect to swampy area) at Kaibola



Plate 1.2. Rendolls: Typical features of this soil are its very shallow depth as evidenced by the dug and piled heaps of coral limestone rock fragments.



⁴ Soil names used are those of the United States Department of Agriculture Soil Taxonomic Classification System (USDA)

The other subdominant soils are the Fluvaquents and the Tropudalfs. The former being poorly drained with high or variable organic carbon to depths of >125 cm; and are normally be found in the associated back reef plains. The latter are moderately deep (50-80cm depth) and well to imperfectly drained soils with finer textured (clayey) subsoils. Tropudalfs would normally be found occurring in association with the Rendolls. Both soils are weakly acid and are moderate to highly fertile given that they have high CEC (> 25 meq %) and BS levels (>60%). Both soils occupy approximately 68. 7km² each and form the remainder of soils found on raised coral reefs.

1.1.2.2. Beach Ridge Complexes and Beach Plains.

This landform type is formed from depositional processes. Usually one will encounter long parallel sand ridges and swales (depressions) along the coastline. The sand ridges may at times reach up to 2 m in height but progressively inland they tend to level out and either form gently undulating sandy plains. The depressions are generally swampy, and maybe tidal with sinuous tidal creeks or non-tidal with standing water.

Present beaches, sand spits and bars, and tidal flats or non-tidal swamps are included in this landform type. As shown in Appendix 6.1, this landform type is found along the top northeastern front of Kiriwina and occupies a land area of approximately 8 square kilometres. Slopes within this landform are less than 2°.

Since the rock type is marine sand, the dominant soil type found in this landform is called Tropopsamments. They are deep, well drained to imperfectly-drained undifferentiated sandy soils with weakly acid to neutral soil reactions. They are generally low to moderately fertile with low CEC (< 10 meq %) and high (>60%) BS levels. These soils occupy about 3.2km² of the total (8 km²) of beach ridge complexes and beach plains. The most likely places to find these soils would be on the sandy beach ridges.

The other subdominant soils are the Psammaquents and the Hapludolls. The former being poorly drained sandy soils with high or variable organic carbon to depths of >125 cm. The latter are well to imperfectly drained soils with finer textured (clayey) subsoils. Both soils are weakly acid and are moderate to highly fertile given that they have high CEC (> 25 meq %) and BS levels (>60%). The Hapludolls are weak to alkaline soils with thick (>25cm) dark topsoils and high BS levels. Both soils respectively occupy approximately 2.4km² of the beach ridge complexes and beach plains.

1.1.2.3. Undifferentiated Coastal Plain

The undifferentiated coastal plain is the next landform type that forms part of Kiriwina. This landform type occurs directly east of Lousia and occupies an approximate land area of 13 square kilometres. This landform starts along the south coast from the Waguama Bay area covering places such as Obulaku all the way north to Teyava.

This undifferentiated, coastal plain landform comprises of a complex array of tidal flats, coral reefs, sandy beaches, low emerged coral platforms and small alluvial plains. Generally this complex set of sub-landform types form an irregular coast with narrow discontinuous beaches protected by either fringing or barrier coral reefs, or outer mangrove flats, with tidal flats and brackish swamps in bays and inlets. Small low angle alluvial plains may be present on the land ward margin (probably where the road transects) and could be backed by higher coral platforms or higher alluvial plains.

Given the complexity of the environmental setting



that this landform type constitutes, there is again an associated set of soils. The dominant soils often found in this landform type are the Fluvaquents, and the subdominant types that occur on approximate equal proportions of land are the Hydraquents and Tropohemists. The three soil types are in fact poorly drained to permanently saturated and half decomposed organic soils. Fluvaquents are poorly to very poorly drained alluvial soils with high or variable organic carbon to depths of >125 cm. They are weakly acid to neutral soils (6.5-7.0) and are considered moderate to highly fertile as indicated by the high CEC values (>25 meq%) and BS values (>60%). These soils are typical of the flood plains. The Fluvaquents are estimated to cover an area of 5.2 km² of the total 13 km² that this landform occupies.

The Hydraquents on the other hand are permanently saturated soils that when stood on are soft underfoot. They are mostly fine textured (clayey) soils typically found in back plains or tidal flats. Tropohemists are swampy half-decomposed, organic soils often with interbedded mineral layers. You will find these soils in swampy areas. Sometimes the Tropohemists are referred to as bog soils or peat soils. Both equally cover an area of 7.9 km² (i.e. 3.9 km² each).

The Hydraquents are fertile in their natural state, but improvements such as draining could result in acidification of these soils. Tropohemists would have very little mineral soil to support larger plants should large-scale drainage be implemented. However, over time as mineralization progresses Tropohemists may be able to support larger plants. Shallow rooted crops like taro could be planted if desired. Otherwise it is best to leave these (soils) areas alone.

1.1.2.4. Undifferentiated Swamps

The undifferentiated swamps are all seasonal or permanent swamps that cannot be classified as either back swamps or block valley swamps. Many of these swamps occur in basins without drainage or with poor internal drainage, and water table is either seasonally or permanently at or above the ground surface level. The swampy areas occur close to the villages of Bwaitavia, Kaulikwau, Kabulula, and Wakaisa to Okaibobwa. These undifferentiated swampy areas cover an area of approximately 23km².

Within these undifferentiated swampy areas; the dominant soils are the Tropofibrists and the



subdominant soils are the Hydraquents. Tropofibrists are similar to the Tropohemists, however in Tropofibrists the organic matter is just slightly decomposed, in that you can be able to tell the botanical origins of the material that are undergoing the decomposition process. They are peat soils as well but are differentiated on the decomposition stages of the organic matter that is present.

1.1.3. Present Vegetation and Land Uses

The original vegetation in most parts of the island has been deforested and what is presently seen on the island is mostly secondary regrowth, scrubs and isolated stands of pandanus associated with grasslands. Much of the area within the vicinity of Losuia station and further north is used for gardening with patches of scattered scrubs associated with open grassland.

The mid-southern part of the island extending toward Obulaku is also covered by secondary regrowth mostly comprising tall softwoods. Again



most parts of the island are intensely gardened except for the narrow swales along the shorelines where mangrove vegetation exist. Along most of the coast line mangroves can be seen and where these mangroves are absent coconuts can be seen with undergrowth of scrubs or pandanus stands and herbaceous crawling vegetation.

On many of the atoll islands that are not settled the original vegetation still remain. Those that are settled usually have coconut stands and chestnuts or gardens in most cases. Plates 1.5 and 1.6 show an aerial view of the scrub-like vegetation and how intensely the land is gardened (exposed land

Plate 1.6. Aerial snap shot of the intensity of gardening being done amongst the scrubland in the central and northern parts of Kiriwina Island.



patches) amongst the scrubland in the northern part of Kiriwina mainland. Unlike the past where fallow periods were usually longer than 5 years, the periods are now shorter and vary between 1¹/₂ -5 years.

1.2. Background to the Scoping Study

Climate is an aggregate of weather conditions, usually characteristic of a particular region over a certain period of time-measured over a long term period of more than 30 years. It constitutes basic elements that measure regularly the weather such as; air temperature, humidity, type and amount of cloudiness, type and amount of precipitation, air pressure and wind speed and direction of wind. Decadal changes in these elements over 200 plus years during the industrial revolution have perturbed the atmospheric composition so much so with the release of four principal GHGs that the atmospheric and ocean circulatory systems are now altered giving rise to changes in the various elements mentioned here. Collectively these unusual decadal changes are referred to as climate change – a termed coined by the IPCC. Climate Change according to the IPCC refers to a change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties, and that persists for an extended period (decades). The changes in climate over time are either due to natural variability or as a result of human activity.

Coping with the impacts of climate change through adaptive processes is one of two ways in which humans are able to endure and be resilient to the impacts of climate change. The impacts not only affect humans but the ecosystems upon which many of our village communities greatly depend on for their livelihoods and the island of Kiriwina and outer atoll islands are no exception to this.

This report is an outcome of a recent scoping assessment or survey conducted with the view to determining possible linkages of climate change impacts with the issues faced by the villagers and the preparation of a detailed work plan on areas which the CCCPIR Program should be focusing on and the adaptation and mitigation options that can be pursued simultaneously to enable the people to cope to the impacts of climate change. The study was conducted from the 1st May to 5th May 2014 and the results of the findings are contained in this report. The study was funded under the CCCPIR Program with funding from the German International Aid Agency (GIZ) - the principle funder of the CCCPIR Programme.

1.3. Objectives of the Scoping Study

The objectives of this scoping study were;

- (1) to assess the current on-the ground situation as baseline data
- (2) to determine if the village communities are affected by the impacts of climate change
- (3) to determine if the sampled villages located in selected geographical locations are most exposed communities to the CC impacts.
- (4) to develop a plan on what needs to be done in light of the information provided contained herein.

1.4. T Programme

The CCCPIR is a GIZ/SPC German-Pacific Regional Programme that is implemented by 12 Pacific Island Countries (PICs). The project aims to strengthen the capacities of regional organisations in the Pacific Island region and its member states to adapt to climate change and mitigate its causes.

The programme has 6 thematic areas/components which include the following;

- (1) Capacity Development at Regional Level
- (2) Mainstreaming and Developing Adaptation Strategies
- (3) Implementing Adaptation Measures at the National Level
- (4) Sustainable Tourism and Climate Change
- (5) Sustainable Energy Management and
- (6) Climate Change Education

The programme has been in operation for the last four and half years since commencing in 2009 and will soon terminate in 2015. A total of USD 24 million has been allocated for this programme by the Government of the Federal Republic of Germany through the Ministry for Economic Cooperation and Development. The key sectors that will be focused on are (1) Agriculture (2) Education (3) Energy (4) Forest Ecosystems (5) Land Use Management (6) Tourism.

Acknowledging the fact that a larger proportion of PNG's population derive their sources of sustenance from the natural environment (from terrestrial and marine environments); natural resource management has been identified as an area of high priority. Natural resource management needs to be improved in the face of climate change impacts.

The operations of the CCCPIR programme in PNG fall under the second and third thematic areas, which are (1) Mainstreaming and Developing Adaptation Strategies and (2) Implementation of Adaptation Measures at the National Level. In addition to introducing new adaptation measures, the CCCPIR programme also complements other existing CCA initiatives at the national level. The CCCPIR at the moment has two pilot project sites in Central Province and Milne Bay respectively. Interventions currently on-going are introduction of drought and flood-tolerant crops and the processing of these crops and existing local crops to prolong the shelf-life of the processed foods which can be sold or consumed during trying times. Through the recently completed scoping study, it is hoped that Kiriwina becomes a third site for CCA initiatives under the CCCPIR Programme.

2. SURVEY METHODOLOGY

2.1. Survey Approaches

A draft survey methodology was initially developed and finalised to guide the team in conducting the scoping assessment to provide answers to the research questions and meet the objectives. The method combined elements of a RRA & PRA and three ways of data gathering were employed which are listed below;

- (1) Group Interview (Focus Groups)
- (2) Individual Villager (Survey Questionnaire)
- (3) Visual Observations (including sample collection if necessary and possible).

Questionnaires developed for the approaches are attached as appendices. The approach incorporating elements of a RRA and PRA was to ensure that adequate and relevant data could be collected in the given time. With the exception of visual observations, both the Group Interview and the Individual Survey questionnaires contain unscaled and scaled questions (includes, Likert Scale and Ranking Scales) and opened and closed questions. Every effort was made in ensuring that every member of the team was made aware of village protocols and followed these protocols and procedures in making sure that the purpose of the visit was explained to the villagers prior to conducting the interviews (see Appendix 3).

2.1.1. Focus Group Interviews

In every village, all villager attendees to the meetings were congregated in the main village square. After the preliminary introduction of the program and investigating project team usually by a member of the CCCPIR Implementing Team, the KRLLG consultant, and the representative of the KCC, two team members (the KRLLG consultant and Mr. Milala from OCCD) were left with this main village group whilst ten (10) interviewed 2 to 3 persons randomly selected from within the crowd. They were assisted by the KCC representative. The interview of the main village group was called a 'Focus Group'; focus being the village or village group (see Plate 2.1 & 2.2).

The focus group questionnaire used to interview these large groups was more general in content and intended to gather information about the village community. A blank copy of this questionnaire can be referred to in Appendix 1.1).



2.1.2. Individual Interviews

These were conducted using a more detailed questionnaire intended to collect more data \ information specifically on family households (see Plate 2.3). Each member of the CCCPIR Implementation Team randomly took away a villager (usually two people but interviewed separately) from the rest of the group and

interviewed him or her. This was intended to get information and gain some understanding on the way Kiriwina Islanders were living daily, their issues of food security, and the threats they faced with and\or without the intrusion of extreme climate events commonly associated with CC. Most questions related to livelihood issues: the natural resources, utilization of these resources, constraints to use, adequacy or inadequacy of available resources to support life in the long term, gardening and the constraints faced. Livelihood outlook in the many different sectors concerned was gauged using the questionnaire. A blank copy of the questionnaire is inserted here as Appendix 1.2.



2.1.3. Visual Observations

Since most of the livelihood, including food security activity, centres around gardening, visual observations generally involved visiting food gardens and recording observations on farming systems practices, crops planted, management practices, and crop performance characteristics in general so as to gauge possible yield

outlook (see Plate 2.4). But this was not only the aspects of community living that this component of observation entailed; all aspects of the environment – within physical, economic, social, and cultural realms. As stated elsewhere in this report, all these aspects bear down on the ability of a community to adapt to times of adversity; brought about by the negative impacts of extreme climate events which are generally regarded as climate change. A blank copy of the observation questionnaire provided to team members to record these observations is inserted as Appendix 1.3.

Plate 2.4. Visual Observations being conducted in gardens on Kuyawa Is.



2.2. Criteria Used in Selecting Sample Villages and Sample Size

Of the eighty-one villages and a total population of 37 500 people and 7 559 households, only four villages were selected as sample villages for the interviews. The criteria used in selecting these four villages were primarily based on geography and population figures. It was decided that one large in-land village (Tubowada village) be selected to represent the in-land villages, one large coastal village (Tukwaukwa) to represent villages located on the coast lines in the northern part of the island, another (Obulaku) on the mid-southern part of the island and one village (Kuyawa) representing the small atoll islands. In each village 20 people (at least with some level of formal education) were randomly selected for individual interviews (see Plate 2.3), while the remainder (~30-40 people per focus group) of the villagers who were present were interviewed in a forum-like atmosphere (refer to Plates 2.1 & 2.2).

Total sample size per village therefore varied between 110-120 people per village. Visual observations of the village settings including the state of the houses, physical infrastructures such as water wells, tanks, service amenities and gardens were noted by the team members (see Plate 2.4). Table 1 shows the population of each village, while Figures 2.1-2.5 visually shows the graphic distribution of the sexes and households between the villages.

Village	2000 Population Census				2011 Population Census			
	Males	Females	Total	No. Housebolds	Males	Females	Total	No. Housebolds
	10.4	101			0.00			nouscholus
lubowada	194	184	378	/0	262	237	499	99
Obulaku	162	139	301	68	224	194	418	91
Kuyawa	288	249	537	110	256	215	471	85
Tukwaukwa	435	410	845	145	537	516	1 053	183
TOTAL	1 079	982	2 061	393	1 279	1 162	2 441	458

Table 1. Selected Villages and Population Sizes based on 2000 and 2011 Census Data.

2.3. Assumptions Considered Prior to the Survey

The CCCPIR project team entered Kiriwina with some assumptions upon which any profound issues identified at Kiriwina could be assessed and verified, thus making the findings and the issues of the assessments clearer to delineate and verify. These assumptions were developed from a planning workshop conducted in October 2013 in Alotau, and formed the basis of the scoping study.

1. The first basic assumption the CCCPIR team had about Kiriwina was that if climate change has already become a fact on Kiriwina Island, it will only exacerbate the food insecurity issues there as the major threat to food security there is the ever-increasing population which has led to intensified gardening, consequently lowering fallow periods that in turn deplete soil fertility and hence the resultant decreasing yield levels - a major threat to subsistence gardening-based societies.

2. The second equally important assumption is that a clear perception of climate change impacts, adaptation, and adaptive capacity and resilience of a village community of interest on Kiriwina, is possible only where and when it follows a fuller understanding of its socio-economic nature of the community or society - which is developed on the basis of a good pool of data and information on the actual situations on the ground that clearly attest to this.

2.4. How Data Was Analysed

Most of the data gathered through the questionnaires were entered into an MS Excel file format and calculations done in determining the central tendency and distribution (using range, mean and modes) of the responses. Descriptive analysis are presented as graphs which were derived from the MS Excel file formats. The statistical tests, relevant to the research questions were attempted but due to the absence of a statistical package and the unfamiliarity (not user-friendly) of the open source statistical software programme-the "R" Statistical Software Package, no analysis could be done on the three research questions. Instead a matrix system was used to make arbitrary evaluations pertaining to only two questions. This can be referred to subsections 4.7 and 4.8

So what is presented is a descriptive analysis of the survey data. The results and findings section give all the descriptive results of the findings while the inferential information (derived using a matrix approach) in answering the research questions are included in the Discussions Section – subsections 4.7 and 4.8). It should also be noted that most of the descriptive and inferential data has been drawn from all three methods of data collection.

2.5. Issues Concerning the Assessment and Information Generated

Before the report divulges into the findings of the scoping study there are a few issues worthy of consideration when reporting these findings. During the debriefing and despite varying observations and opinions between the members of the survey team, important issues were noted of the assessment which readers should note.

1.	Reactions to the Questionnaires: Gauging people's understanding of the questions and the questionnaires	In each of the sampled villages, people's understanding of the questions and questionnaires were observed through their reactions (facial & body language) and obviously some things could have been vague to the villagers; e.g. traditional farming systems as opposed to current systems. This could have been accounted for by distinguishing between the two by asking if the current farming system is a changed one or traditional or a hybrid of the two. It probably, would have made more sense to the villagers had we asked them a separate question first that asked whether the farming practice(s) they are using today are traditional or modern, of a mixture of both. There were many instances when and where people were not clear with the intents of the questions that they were posed. One is on the traditional farming practices and current modern day practices they may have adopted. This is because the people were asked only of the traditional farming practices but not current day modern practices, if any. Climate change, as a subject, is also another example of this case. So what this observation implies is that the questionnaires need to be revised in light of these issues as these questionnaires have already being trialled here.
2. 	Responses of Interviewees: This is to gauge whether the interviews achieved the objectives of the whole assessment.	The response(s) to any question hinges on three factors:[1] the respondent is not clear with the question and hence the kind of answers available that he\she can respond with- and this is especially related to the language used and the level at which the question is tailored, [2] the question(s) being vague or [3] the respondent(s) lack of know of the subject matter at hand and [4] is a combination of some or all three factors influencing the responses. Below are some of the responses to several questions and issues considered to relate to the core objectives of this study and are outlined here to indicate whether the people understood the questions clearly and were giving the correct answers or what answers were required.

3. RESULTS AND FINDINGS

Considering the issues raised in subsection 2.5, this section of the report provides an overview of the findings of the survey. The manner in which the results and findings are presented in this report follow the same structured-manner of the questionnaires. Throughout the section a comparative analysis of certain measureable variables are made between the villages and as much as possible inferences on what the analysed data is informing us. In some instances in the discussions, extrapolations are made from the sample data to convey an insight of what is the likely situation in each of the villages and geographical locations within which they are situated.

3.1. Community Governance Structure and Social Systems

The type of community governance structure or power structure and social systems through which social norms are devised to control individuals and maintain social order is the Chiefdom System. Generally chiefdoms are more integrated and made up of many local communities that differ from one another in rank and status and this is evidently embedded within such a system as in the Trobriand Islands. In controlling the masses, the authority and power lies with just one person such as the paramount chief who usually issues orders alone or in close consultation with an advisory council such as the KCC. The position of the paramount chief is usually of hereditary and wealth, and the immediate and close kinsmen and women form the upper echelons of the Kiriwina society.

Aside from the traditional governance system, there is the state system involving the three-tier levels of governance structures which includes the national, provincial and local level government (LLG) system. The provision of social and economical services use these levels of governance through which financial resources are channel at the national level through to the lower tier of governance. Each jurisdiction is supposed to provide the human resources to implement service delivery to the masses. The four sampled villages come under the administration of Kiriwina Rural Local Level Government (KRLLG).

The state systems while making in-roads into the traditional governing structure (through the election of local members and local presidents and vice –presidents), at the grassroots level where village matters are concerned - power is still being held by the paramount chief and his KCC. As observed, and from the responses noted here, if any adaptation initiatives are to be implemented, these must be brought to the attention of the paramount chief and his KCC as a matter of protocol. Such protocol was followed by the team when a meeting was arranged and held between the paramount chief and his KCC in Kiriwina (including the District staff), resulting in verbal undertakings been made by the paramount chief and his KCC to support any intervention that can reduce the stress on their fast-depleting natural resources.

3.2. Demographic and Household Information

This subsection provides a background information about the sampled population's composition, age group distribution, marital status and level of formal education. It also informs the average household sizes per village. Information from this sampled population is used to extrapolate onto the large population.

3.2.1. Background of the Sampled Population

While it was intended that an equal number of both females and males were to be interviewed it never turned out to be so. Of the total population sampled (80 people surveyed & ~227 people in focus groups)



53 percent were males and 47 percent females (see Fig.2.1.). In two focus group interviews at Obulaku and Tukwaukwa, primary school children also part took in the interviews.

3.2.1.1. Age Composition of Respondents

Of the males interviewed 32 percent of these were aged between 30-39 years, 26 percent aged between 40-49 years and 24 percent in the 20-29 years old age-group. The other 18 percent of the males are equally (9%) each) classed in the 50-59 years and 60 plus age-category. With the female respondents, 33 percent were in the 30-39 years age category, 30 percent in the 20-29 years age category and 17 percent aged between 40-49 years old. The remaining 20 percent of females equally fall in between the ages of 50-59 years and 60 plus age category (see Fig 2.2-2.3).



3.2.1.2. Marital Status of Respondents

Eighty five percent of the respondents interviewed were married, while 9 percent have never been married. Those 9 percent of villagers not married are aged between 20-49 years. Three percent of the villagers between 30-39 years old are divorced, while another 3 percent are widowed. Those widowed persons are in their late 60s (see Fig.2.4).

3.2.1.3 Household Number and Family Size

There has been a significant increase in household numbers and total population from the 2011 census as indicated in Table 1. Figure 2.5 shows the household and population distribution of the four sampled villages with Tukwaukwa village having the largest population and number of households compared to the other villages.

Household sizes in the villages vary from the smallest (VSH) which here refers to 2-3 people in a household to the largest (VLH) comprising 10-11 or more people per household. Figure 2.6 shows small (SHS 4-5), medium (MHS 6-7) and large (LHS 8-9) households to be the most common sizes. Thirty two percent of males and 27 percent of females interviewed have small households (SHS), while 21 percent and 33 percent of males and females respectively have medium sized households (MSH). Large households are also common in many of the villages as indicated by 23 percent of males and 20 percent of females having these household size. There is no reason to believe that the very small sized households will grow over time given that most of the respondents are within the child-bearing age of between 20-39 years.









Figure 2.7. Level of Formal Education of Sampled Population.







3.2.1.4 Educational Background of Villagers.

Seventy-four percent of the respondents have attended some form of education compared to 26 percent who have never had any formal education. Forty-two percent of the villagers interviewed were educated only to primary school level (standard 6 level and grade 8 level in recent years). Only 20 percent have attended high school or secondary school within Kiriwina or in Alotau. Two percent have attained college or vocational trade certificates and 10 percent have received college Diplomas in Teaching and Engineering and other fields. Many of those who have attained Diploma and Certificates are males. However, comparisons between the villages show a stark difference in education levels between the villages and the sexes. Figures 2.8 – 2.11 show these disparities.

For the island community of Kuyawa (see Fig.2.8) 56 percent have never had any formal education. For the 44 percent who have had some formal education, majority 31 percent only reached primary school level, with the minority 6 percent having high or secondary school level. Another 6 percent minority have had college level. One will notice that in many instances there are more females not attending school than males, even if they have attended school, female numbers are usually low compared to males attending the various levels of formal education.

For those in Obulaku village (see Fig.2.9), 31 percentage have never attended school compared to 63 percent having some form of formal education. Of the 63 percent, 38 percent were educated to primary school level, 19 percent educated to high or secondary school level. Thirteen percent of the sampled population have college Diplomas-mostly in the teaching profession, and many of these are males. Again more males appear to have attended school compared to females. While it may seem odd, there were more females (33 %) who claimed to have attended high school then males (10%).

In Tubowada village (see Fig.2.10), 81 percent have been educated up to primary school level, while those that have attained high school level education make up 19 percent of the respondents interviewed (see Fig.2.10.) Eighty one percent of those that had attended primary school are males, while females account for 75 percent. There were more females (25 %) than males (13%) who have attended high school. None have attended college certificate or diploma level education.

In the case of Tukwaukwa village (see Fig.211), 81 percent have also attended school at various levels, from primary to college level education, while 19 percent have never attended school at all. Many of the

respondents (31%) have attended high school, with 25 percent of the respondents having attained college certificates and diplomas. Those who only reached primary schooling account for 25 percent of the respondents interviewed (see Fig.2.11). Finally, none of the respondents have ever reached university level education and this does make sense as one would not find people with such qualifications residing in villages as most would either be employed or would have migrated to towns in search of work.



3.2. Social Services and State of Infrastructure

In this subsection, a descriptive information is provided to describe social services such as accessibility, number of staff, types of services provided at the health centres and the state of educational, health and communicational facilities and infrastructure such as roads and bridges or jetties within the villages and closest surrounding villages. As much as possible, some persistent issues that are faced by the villagers are highlighted.

3.2.1. Local Housing, Educational, Health, Transport and Communication Services.

3.2.1.1 Status of Local Houses.

Unlike the last two decades where very strong cultural barriers hindered the ordinary villagers to improve their housing and living conditions, there has been a gradual change with the resultant that many villagers' are now able to build permanent and semi-permanent houses. However, the sizes of the houses still remain below that of the paramount chief's house and houses of other powerful chiefs. The following plates (Plates 3.1-3.4) show the types of houses that can be seen on the main Kiriwina Island and the surrounding small raised coral atolls (islands). As can be seen from the photographs, the houses are of various states and type and it can be noticed that the traditional types-wholly constructed from bush material still remain as such in some villages while others have iron-roofing. There are few permanent houses built with iron roofing and fibro-cladded or flat iron-sheeted walls. Based on visual observations, there are far more semi-permanent and permanent houses in Tukwaukwa, Obulaku and Tubowada than Kuyawa Island village.





3.2.1.2 Educational Infrastructure and Services.

The selected villages have their own primary and elementary schools (see Plates 4.1-4.4) which are located within walking distance. Others use canoes to attend school-particularly for the other islands close to Kuyawa village. And estimated 530 children attend school, meaning on average about 132 at any-one attend school

in each village. At the time of the survey, it became apparent that there are issues associated with the schools. Many of the responses pertaining to these issues made reference to the types and standard of materials used to build the classrooms and teachers' houses, lighting issues, no proper toilets and water supply systems for sanitary purposes, not enough teachers to teach. In some of the primary schools there are only four teachers (e.g. Tubowada Primary School). For instance in Tubowada, one teacher teaches three grades (3-5 classes). The shortage of teachers is due to the fact that there are not adequate and proper teachers' houses to be able to accommodate any new teachers. All these raised issues relate to one common factor-and that is not enough financial assistance is allocated to the schools in order for these issues to be addressed.

The only high school [secondary school] where children passing out from the primary schools and attend is Kiriwina High School and it is quite some distance.

Except for Obulaku primary school which was recently (new school) established and had its first grade seven intake in 2014; the rest of the primary schools have an average of nine children going onto Kiriwina High School (or Cameron High School



Plate 4.2. Primary School at Obulaku Village



in Alotau when there is enough space). Of the nine children there are at least 5 males and 4 females. Kiriwina High School is a boarding school but because of the large number of students, resulting in the school sometimes running out of food rations, students whose homes are nearby take up residence in their villages and have to walk every day to attend classes.

There are no vocational training centres on the island but at the time of the study, arrangements were made to establish a TVET Centre. In the meantime an average of between two and three students upon completing high school attend vocational training in Alotau. The less number of vocational training attendees is due mainly to the high cost of airfares and boat-fares for those who cannot afford to pay.



3.2.1.3 Health Infrastructure and Services.

Most villages have small aid-posts within walking distance but almost many of these aid-posts do not have adequate basic medicinal supplies (see Plate 5.1) and people have to sometimes walk long distances to get to the nearest health centre. Some of the aid-posts are in need of repair and maintenance (see Plate 5.2 as an example).



The people are generally healthy and do not often go to the aid-posts or health centres. The average frequency of trips visiting the aid-posts/health centre is usually 6-7 times a year. Aside from being healthy people, there are other reasons why people tend not to attend or visit these aid-posts – and most of the reasons have to do with transportation. For people living on Kuyawa Island the nearest health centre is at Kaisiga or Losuia Station. In many cases, referrals are made to Losuia Station and the transport used is either sailing cances or motorised dinghy. The kinds of health services provided range from out-patients, prenatal and antenatal services, dental and treatment of STDs and other common diseases and sicknesses as malaria, colds and flu to diarhoerrial sicknesses.

In the case of Obulaku, villagers' have to walk 3.1 kilometers to Katuvi Aid-post to get medication. The main point of referral for serious health related issues or complications is Losuia Station. Table 2. Shows estimated distances from the sampled villages to Losuia to access basic health and postal communication services.

Village Distance (km) to Losuia Health Centre and Other Health Centres/Aid-post						
	Losuia HC	Omarakana HC	Kaituvi Aid-post	Kaisiga Aid-post		
Tubowada	11.4	4.5	-	-		
Obulaku	9.9	-	3.1	-		
Kuyawa	24.1	-	-	11.9		
Tukwaukwa	3.6	-	-	-		

Table 2. Nearest Health Centres and Aid-posts Accessed by the Selected Villages.

3.2.1.4 Transportation Infrastructure and Services.

There are three modes of transportation used by the people in getting around to visiting or accessing services on the island. Apart from walking and running (relaying messages), there are public motor-vehicles (PMVs) and bicycles for those on the mainland, and there are sailing canoes and motorised dinghys in the case of those on the outer islands (see Plate 6.1 & 6.2). There are no PMVs and one or two bicycles in the four villages that were visited. In the case of motorised dinghies, only Tukwaukwa had two and Kuyawa had five, and the rest of the villages apart from Tubowada have canoes as means of transportation.

The road infrastructure at the time of the study were recently graded following the visit of a tourist liner (ship). However such improvement only appeared to be on the route from Kaibola to Losuia. Many of the roads however need improving through compaction to prevent seepage and dispersion of the limestone material which in many instances creates pot-holes. As observed in some sections of the road heading toward Tubowada village (despite the recent grading) some of these pot-holes were filled up with water as a result of organic matter and debris clogging the small pores.

Major concerns that were raised in the case of Kuyawa Island, were the difficulty faced travelling in bad weather conditions in times of health related emergencies. Another issue was the high cost of transport where Kuyawans have to pay K20.00 per trip using motorised dinghy. For villages on the main island, their main problem has been to do with the limited number of public motor vehicles (PMVs), hence the irregularity and difficulty in quickly accessing vital services. For children and women in particular, there have been concerns raised by them on security and safety while walking long distances to fetch water or access aid-posts.

3.2.1.5 Postal and Telecommunication Services.

With the exception of postal services in Losuia station, most villages on the main Kiriwina Island and the large off-shore atoll islands have 3G mobile phone communication coverage. Coverage is limited though on some far flung islands and it takes a while and some walking or roaming before coverage can be discovered. With the revolutionary quick adoption and embracement of mobile phone communication technology throughout PNG, it is not surprising that almost all respondents interviewed claimed to have one or two mobiles in their households (see Fig.3.1).

Plate 6.1. Women and children walking from Obulaku to Kaituvi



Plate 6.2. Sailing canoes from Kuyawa sometimes transport the sick to Losuia





When it comes to communicating during emergencies, mobile phone usage in relaying messages outside of the village is very common compared to the traditional modes of communication (word of mouth). It has surfaced that provincial radio news services (Voice of the Kula) is not often broadcasted regularly or listened to in some villages and so people are not always up to date with local news. Only very few people owning transistor radios are able to keep abreast with news around the province and national news, other than that not many people have the luxury to spend money on buying dry-cells (batteries) to listen to news.

3.2.2. Social and Law and Order Issues in the Villages.

Social issues commonly faced by the villages include arguments over gardening land, arguments over courtship issues and stealing food from gardens. Compared to past decades when some of the respondents (those in their mid-40s) where growing up, stealing food from food gardens was unheard off. It has now become a common cause for concern even though it is not frequently practiced and widespread. According to most of the respondents, these issues are solved under decree from the chief or through the village court system. Matters arising over land usage are also solved through the village courts or the traditional land mediation processes



where the elders and the chief become involved to sort out land use matters. This is especially where tithe arrangements over land use are concerned or encroaching onto another person's land.

An interesting finding amongst the four selected villages is the mention of alcohol (factory made & homebrew) and drug (marijuana) consumption and abuse in Tukwaukwa but not the other three villages. Apparently, the three villages (Tubowada, Obulaku and Kuyawa) are far from Losuia Station and so the youths from these villages are not fully exposed to these social ills unlike the youths from Tukwaukwa who are within walking distance to Losuia and likely to have already or constantly being exposed and influenced by peer pressure. Alcohol abuse and associated fights and eloping issues are common in Tukwaukwa than the other three villages mentioned above. While these issues are common, they do not occur frequently but instead occur occasionally throughout the year.

3.3. Economic Services and Status

Except for the usual small to medium retail enterprises and tourist lodges and guest houses; there are no major economic or money generating activity occurring on the island. The local economy is supported by fishing and subsistence gardening on which the retail and hospitality sectors partially depend on. Income generation at the villager's level in ensuring the maintenance of one's livelihood is an important aspect of life. The next sub-sections describe the economic status of the villagers-particularly how much the people earn, and where these earnings are sourced from and how these earnings are spent.

3.3.1 Annual Income and Earnings

Approximately 46 percent of people in all selected villages earn between K100 and K500 annually, while 26 percent earn less than K100 and 12 percent earn between K501 to K1000. Only 9 percent of the population earn between K000 to K5000 and 7 percent earning between K5000 to K10 000 (see Fig.4.1).

Hence for most of the villagers, the annual income or earnings would therefore be between K100 to K500.00. However, the earnings within the villages vary greatly between the sexes and age group as you will notice in Fig.4.2-4.5.



About 46 percent of villagers between the ages of 20-60 + years on Kuyawa Island earn between K100-K500 annually, while 31 percent earn less than K100. Only 6 percent of the villagers aged 40-49 years earn K1001 to K5000 annually.

In the case of Obulaku village, income levels between K100-K500.00 per annum are claimed to be earned by 50 percent of the people ranging in age from 20-59 years. Those earning less than K100.00 per annum constitute 6 percent of the population and some of these people fall in the 60 plus age group as well as in the 20-39 years age group. Two minority groups representing 6 percent of the population and within the 30-39 years age group respectively claim to earn K501-K1000 and K1001-K5000.00. Another minority group of people within the 40-49 years age group claim to earn between K5001 to K10 000.00 annually.

Similarly in Tubowada village, income levels between K100-K500.00 are earned annually by 44 percent of the villagers aged between 20-49 years old with 19 percent within the 40-49 years age group. Approximately 19 percent of villagers aged 20-39 years old earn less than K100.00 annually, while a similar percent (19%) also within the same age groups earn between K501-K1000.00 annually. Six percent of people in the respective age groups 20-29 and 30-39 years earn between K1001 and K5000.00 annually.

In Tukwaukwa village, about one third (31%) of people within the 20-29 years, 30-39 years, 40-49 years and 60 plus age groups earn annual incomes between K100-K500. Twenty five percent of people on the other hand earn less than K100 annually. These villagers range in age between 20-39 years and 60 plus years. About 19 percent of villagers aged 50-59 years, and 6 percent aged 20-29 years earn between K501 and K1000 annually, while 6 percent aged between 40-49 years earn between K1001 to K5000 annually. Six percent of villagers aged between 20-29 years and 60 plus years earn K5001-K10 000.

3.3.2 Main Sources of Income and **Earnings**

While several income sources were recorded and ranked according to the most income generating source; only three main ones were requested to be identified and indicated as the main sources of income by the respondents. The main sources of income vary between the geographical locations in which the villages are situated, and what is obvious is that a large proportion of the incomes or earnings are derived from the environment-particularly from the sale of surplus⁵ agriculture produce or sale of marine products.









Figure 4.5. Distribution of Income in Tukwaukwa Village

⁵ The question though is how much of the production is surplus when land productivity and crop production levels are low. This will have to be explored further.

Again a series of graphs (Fig.5.1-5.4) have been developed to display the distribution and variation of the sources of income in each village setting. It must be noted that some of the respondents claim two main sources of income and this had been taken into account, which is why some of the sources of income areas have been inflated.

The main source of income for the island community of Kuyawa is from the sale of marine products. More than half the male (58%) and female (51%) claim to earn their source of income from the sale of marine products (fresh and processed products), while artefacts are the secondary source of income (see Fig.5.1). The rest of the villagers earn their income sources from sale of garden produce, from tourism and wages from formal work particularly in the case of teachers.

The low percentage sale of garden produce is due to scarcity of land. Those able to produce more are able to sell the excesses to other villagers on the island. Scarcity of land is due partially to high population density and the limited availability of arable land as most of the island's garden lands have very shallow soils.

The main sources of income in Obulaku village are from the sale of surplus garden produce and marine products⁶ (see Fig.5.2). Thirty eight percent males and 38 percent females earn most of their income from garden produce, while 30 and 40 percent of males and females respectively earn their income from sale of marine produce. Others earn their sources of income informal marketing in the village, sale of artefacts and at Losuia or Alotau, remittances and from wages (mainly teachers and aid-post orderlies).

Sale of surplus garden produce and marine products are the main sources of income for the villagers of Tubowada (see Fig.5.3). Approximately 38 percent and 25 percent of females sell artefacts as their main source of income, with 28 percent and 34 percent of both males and females earn income through the sale of surplus garden produce. The third major income source for most villagers comes from informal marketing with 10 percent of the males and 4 percent of females supporting their livelihood through this means.

The three main sources of income for those in Tukwaukwa are sale of surplus garden food produce and marine products, and wages for those employed as teachers and aid-post orderlies (see Fig.5.4). The





Figure 5.3. Main Sources of Income in Tuboada Village





⁶ Marine products refer here to sale of fresh fish and crustaceans', sea slugs/beech-de-mere, shark fins, turtles etc.

fourth income source is from receiving remittances with approximately 19 percent claiming to receive monies from relatives outside of Kiriwina.

3.3.3 Income Spending Priorities of Males and Females by Village.

Nine categorical spending areas where defined to determine peoples spending habits or priorities, where and how much (%) of their incomes are spent. Figures 5.5 - 5.12 show each respondents spending priorities are and how much is usually spent in each category. It should be noted that the more percentages individuals claim to spend in one category increases the bars.

On Kuyawa Island spending on food is the priority area for both males and females as 90 percent of both sexes spend about a third of their income in this area. The second priority areas of spending income for males is on household goods and sundries, whereas females spend money on buying clothes. The third priority area for both males and females is meeting cultural obligations (see Fig.5.5 & 5.6) and it appears females spend more than males in meeting cultural obligations but this is not conclusive, as stated earlier – one person's large spending inflates the bars.



Spending priorities between both genders in Obulaku differ markedly with males spending more on clothes than females. Females contribute more to church activities in Obulaku than males. Food is second priority for both genders with each respondent spending a reasonable proportion of their income on food. The third priority spending areas also differ with males spending more on household goods and sundries while women spend more on clothes (see Fig.5.7 & 5.8). Despite this being a year of free education, income spent on school fees, are in-fact project fees.



Food is the priority spending area for both genders from Tubowada village. The second priority area of spending is household goods and sundries. The third priority area of spending for males is paying for school fees while females contribute more to meeting cultural obligations (see Fig.5.9-5.10).



Spending priorities in Tukwaukwa for both genders is on food, household goods and sundries, cultural obligations and or clothes in the case of females (see Fig.5.11-5.12.). Again each individual spends according their personal preferences and in few of the areas identified and not all areas as such.



3.4 Water Resources and Water Security

Based on old records of climatic data and the simple Water Balance Model created to understand soil moisture and the projected increased rainfall across PNG, the islands are not likely to be prone to water shortages. But our observations and the responses do not reflect this notion that water availability should not be a problem. From observations, the main sources of water are from the limestone caves and sub-terrainean water channels or ducts (see Plate 7.1 & 7.2), underground wells (see Plate 7.3), polluted shallow water wells (see Plate 7.4) and rainwater harvested from roof tops and stored in used 200 litre plastic containers or 3000 and 9000 litre-polyethylene tanks (see Plate 7.5 & 7.6).





Water security in the visited villages can never be said to be secured as all villages rely mostly on rainfall and underground sources such as shallow wells. The limestone caves are quite far from the villages and the quality of water in some limestone caves are fit for human consumption, while others are slightly saline implying therefore that there are underground ducts connecting the caves with the sea. From observations the shallow water wells are not fit for human consumption and the quantity of water cannot be guaranteed during long drought periods. While the polyethylene tanks provide some sense of water security these are not affordable by most villagers. The few that have been photographed are those that have either been bought by a member of a well-to do family or through funding from Aid Donors or those people with high traditional status.

3.5 Food Resources and Food Security

This subsection provides information on the main farming system, length of fallow periods, crop production trend, a summary of the main sources of food and main types of foods that Kiriwina people eat daily and sell as income source. Issues and constraints to farming are highlighted as well-some of which influence crop production. In the context of this report, food resources is any resource that is easily accessible, culturally acceptable and nutritionally edible by the local population.

Food security in this report adopts the definition of the FAO, which is "when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life". This entails all people regardless of gender, age, ethnicity, religious background have access to and the means [income generating opportunities] to allow them to meet their dietary needs.

Against the background of this definition are four key factors that have been considered and used to give a situational analysis of food security on Kiriwina Island. The following are the key factors underpinning the FAO definition of food security [1] physical availability of food [2] economic and physical access to food [3] food utilization [4] stability of the other three factors over time. These factors will be the basis for further discussions of the food security situation in subsection 4.6.

3.5.1 Main Subsistence-Based Farming Systems.

As explained elsewhere in this report, there is an interconnectedness of people with their natural environments and Kiriwina Islanders are no different to any other people from the developing world who have a strong attachment with the land and seas. The main sources of food in the first instance are from the terrestrial and marine environments.



Plate 8.2. Mixed Cropping System: At site between Obulaku & Wawela.



Plate 8.3. Greater Yam [D. alata] genera on public display – Kuyawa Island.



The Kiriwina Islanders are known for their yam-based traditional farming systems which intimately forms an important part of their culture. The Lesser yam (*Dioscorea esculenta*) is the predominant yam cultivar used in this farming system (see Plate 8.1). Sometimes Greater yam (*Dioscorea alata*) species are intercropped amongst the Lesser yams. One particular variety of the *D. alata* genera (Long yam) is not usually eaten but is displayed for the public to view as a sign of prestige and pride (see Plate 8.3).

Aside from the major yam-based farming system, is the taro-based farming system and a mixed cropping system especially after yams have been harvested. In both the taro-based and mixed gardening system there are bananas and yams grown together with other crops such as papayas, sugarcanes which form the canopy. The undergrowth of this system usually comprises sweet potatoes, taro and green leafy vegetables. Fruit tree crops (except for papaya) are unusually absent in the gardens (see Plate 8.2) but can be found grown around the houses in the villages. The farming systems mentioned here are subsistence-based farming systems where most of the crops are grown either for consumption or meeting cultural obligations or for sale and bartering.

Maintaining strong traditional roles, both males and females have access to these food resources though equal access in terms of income generation (although recognised) is not clearly visible or evident especially for the womenfolk. Surplus garden food is sometimes sold at Losuia, otherwise home consumption is the first priority.

3.5.2 Length of Fallow Periods.

The garden fallow periods differ between the northern and southern parts of the main Kiriwina Island, as well as those on the smaller coral atolls. In the northern part of the island, the fallow periods are

very short with periods anywhere between two to three year cycles. A similar short cycle also applies for those on Kuyawa and the outer islands. The fallow periods on the mid-southern part of the main island stretching from Obulaku to Vakuta, are longer – anywhere between 5-6 years.
3.5.3 Crop Production Levels and Constraints to Farming

Food production levels (levels of yields) of most crops in Kiriwina (and the rest of the Trobriand Islands) over the last 10 years have been declining in quantity and quality. The decline in food production levels directly result in food shortages. Factors contributing and influencing food crop production decline include the following;

1. Low Soil Fertility

As a result of very short fallow periods (as mentioned in subsection 3.5.2), the soils are low in fertility status. Apart from crops taking up the few remaining soil nutrients, soil nutrient are also lost through leaching during the wet season. Immobility of nutrients during the dry season cause less uptake by the remaining crops (e.g. sweet potato and banana). Symptoms of low soil fertility (deficiency of N, P, K and micro-nutrients like Cu, Mn, Zn and Fe) were evident in crops like yams, cassava, sweet potato and taro plants in many of the gardens visited on mainland Kiriwina and Kuyawa Island (see Plate 8.5). It was also noted that organic matter levels were very little in many of the soils.

2. High Incidences of Pests and Diseases

There several pests and diseases which also affected the food crop production on Kiriwina. The main serious insect pests identified during the survey include taro beetle (*Papuana woodlarkiana*) and taro hawk-moth (*Hippothion cerelio*) caterpillars on taros, sweet-potato moth (*Herse convolvuli*) caterpillars, sweet potato weevils (*Cylas formicarius*) on sweet potatoes and Amblypelta (or Tip Wilt) bugs on cassava and banana which are also responsible for transmitting viruses for many mosaic diseases.

There are often regular out-breaks of taro hawkmoth- caterpillar defoliating taro plants and caterpillars of the sweet potato moth defoliating sweet potatoes plants (see Plate 8.6). Amblypelta bugs are also common on the island and these bugs usually suck the fragile young cassava growing tips or shoots of the cassava plant (see Plate 8.7). In banana crops, the bugs suck the young developing banana fingers (fruit bunch). The bugs through sucking cause the crops to dry and eventually die. The bugs in the process of sucking also transmit virus or bacteria that cause the growing tips to wilt.

A more common and serious pest are the microscopic worm-like animals called nematodes which affect mostly yams and taros on the island. These nematodes usually (root-knot nematodes) feed on the tissues and cause deformation in the shapes of the tubers (see Plate 8.8). Nematode

Plate 8.4. Smaller-sized Manihot esculenta



Plate 8.5. Chlorosis of yam leaves: Symptoms of N & P Deficiencies.



Plate 8.6. Defoliated sweet potato leaves by Grey Moth Caterpillar.



Plate 8.7. Dead Manihot esculenta probably caused by Amblypelta Bugs.



infestation has led to a decline in yam and taro production resulting in smaller gardens being made these days because of the less amount of clean nematode-free planting material. Villagers are involuntarily forced to obtain nematode-free yam tubers from Alotau, Normanby and Goodenough Islands. Because of the high infestation of nematodes in harvested yam tubers, the tubers cannot not be stored for longer periods, instead they are usually consumed as soon as they are harvested. Other pests include green parrots which damaged pawpaw fruits and corn cobs; and crabs in the case of gardens located along the coastal shoreline.

Plate 8.8. Dioscorea esculenta - Nematode Infested & Small Sized Tubers.



A serious disease on the islands which is more prevalent during the wet season is the taro leaf blight light (TLB), which generally affects local taro varieties on the islands.

3. Effects of Soil Salinity and Salt Sprays

Effects of soil salinity and salt sprays were evidently noticed in most coastal gardens in the southern part of Kiriwina (Obulaku-Wawela) and on Kuyawa Island. The banana and sweet potatoes leaves turn brown and eventually the crops die as the result of high sodium toxicity levels. The locals have to build barrier walls made of coconut fronds to prevent the salt sprays carried by the strong south-east winds on to their crops.

4. Narrow Genetic Base of Food Crops

The narrow genetic-base of crop diversity (crops and fruit trees) is another important factor observed. There were relatively few varieties of banana (< 10), taro species / varieties (< 8), few sweet potatoes (<12) and a good number of Yam species / varieties (> 15). Besides banana, papaya and citrus (pamelo), it was noted that there were not many other fruit trees such as the seedless breadfruit.

5. Changing Unpredictable Weather Pattern

The changing and unpredictable weather pattern has affected the gardening pattern (time to clear new gardens) of the local people and changes in the weather patterns and climate parameters (e.g. rainfall, high humidity) have also been blamed for the outbreaks of pests and diseases.

Apart from the above are social and economic issues and constraints faced by the people such as people stealing from other people's food gardens. Other constraints which contribute to a decline in food crop yields is not having the right types of tools to clear gardens and prepare the land (soils). A lot of work has to be done to the dominant shallow soils to create conducive rooting zones for the tuberous crops. This labourious work involves the excavation of coral lime-stones and the sifting of these to create boundaries or simply heaping these in scattered piles before the crops can be planted.

3.5.4 Other Food Sources, Food Preservation Methods and Availability

Apart from the food gardens are the marine derived products such as fish and a whole range of crustaceans which are used as food or sold for cash (e.g. snappers, sea slugs, turtles - see Plate 8.9). The marine and fresh water products provide the protein needs of the people while the staple food crops provide the energy needs of the people. Fruit trees – mostly citrus provide the vitamins and other supplementary nutrient needs. Aside from getting their protein sources from the marine and fresh water-environments, a majority of respondents (90%) both males and females claim to rear livestock such as free-range chickens and ducks, and pigs (see Plate 8.10). The animals and birds are raised for



consumption and meeting cultural obligations such as feasts. Another source of food these days is purchasing processed food from the trade stores. Many respondents tend to purchase store goods whenever they have a money from the sale of their surplus garden crops or surplus fish, turtle or crustaceans. Otherwise purchasing of store goods is confined to the working class people in the district and the well-to-do people.

Apart from the traditional food preservation method of smoking fish and game meat, storage of yams in elaborate decorated yam houses is one method of preserving yam tubers for future uses. There are no

Plate 8.10. Pigs are a source of protein and income in Kiriwina these days.



traditional food processing methods. Food availability therefore is usually for a short time only and people have to resort to store goods. Even with the storage of yams, there is no guarantee that stocked yams will be eaten by the household as by the end of the 7-8 month period all the yams would have been depleted through family consumption, or meeting cultural obligations.

Table 3 is a summary of the main types of food that Kiriwina Islanders are accustomed to eating daily as well as how long these foods can be stored for future consumption.

Major Sources	Main Foods	Number of Varieties	Length of Storage	Comments
Terrestrial: Includes naturally wild & domesticated sources from the land, food gardens, secondary regrowth bush/scrubland and grasslands.	 Lesser Yams [D. esculenta] Greater Yam [<i>D. alata</i>] Taro tru [<i>C. esculenta</i>] Giant taro [<i>Alocasia</i>] Banana Sweet potatoes Cassava Giant Swamp taro Chinese taro [<i>Xanthosoma</i>] Game: Feral pigs Domesticated pigs Free Range Chicken 	D. esculenta: 3 vars. D. alata: 3 vars. C. esculenta: 4 vars. Giant taro: 1 var. Musa Species: 4 vars. I. batatas: 7 vars. M. esculenta: 2 vars.	6 months 3-4 months 1-2 months < 1 month < 1 month < 1 month < 1 month < 1 month	Eaten during the time when there is no food. By then most yams would have been used up meeting cultural obligations. Some early maturing and high yielding sweet potato varieties were introduced by NARI in early 2000.
Fresh Water: Includes the swampy waterways in low- lying areas or the Phragmities swamps.	 Eel fish Cat fish Fresh water prawns & shrimps Tortoise Wild ducks 		Most of these fish products do not usually last for more than 2 weeks	Traditional food preservation techniques such as dry-smoking these products is the only practice done.
Marine: Includes sources such as estuarine environments, coral reefs and open seas.	 Scaled fish Non-scaled fish Green turtles Crustaceans 	Snappers, red emperors Sharks, Sting rays Sea turtles Rock lobsters, mud- crabs	Most of these fish products do not usually last for more than 2 weeks	Dry-smoking of these products only takes place when there is surplus, otherwise most are eaten fresh or sold to townsfolk in Losuia.
Manufactured Store Goods: This only includes the basic imported food stuff that most people are used to consuming every day.	 Rice Flour Canned meat Canned fish Sugar Tea and Coffee 	There are several kinds of products or brands for each of these manufactured store goods or food products	Most if not all of these food products have longer shelf- life usually 2-3 years.	Rice and flour have become staple foods for most people and are usually served alongside local foods. In bad-times these food are usually part of relief packages.

Table 3. A Summary of the Major Sources and Main Types of Food Available to People on Kiriwina Island.

3.6 Natural Resource Use and Management and Climate Change

This subsection provides a broad understanding of how much the terrestrial and marine resources are dependent on by the villagers in their every-day lives and the kinds of traditional practices, mechanisms and strategies that the villagers use in managing these resources. A general understanding of the knowledge levels (including traditional knowledge relating to weather and seasonal indicators) of the respondents on climate change, their level of concerns and the kinds of impacts including individual perceptions of their ability to cope or adapt in times of extreme events are described here.

3.6.1 Natural Resource Use and Management.

There is heavy reliance on the terrestrial and marine resources on Kuyawa especially for firewood, gardening and housing materials and marine products for food and sale. Demand for handicraft materials is moderate to very high, while there is a low to very low level use of the bush for hunting and wild food gathering (see Fig.6.1).

Resource use in Obulaku is also high to very high (see Fig.6.2). There is a high to very high demand for firewood, housing and gardening materials (see Plate 9.1), while there is a moderate to very high level of demand handicraft materials. Not much demand is placed on the natural resources for wild food. In



terms of demand placed on the natural environment for handicrafts materials; almost half the respondents claim to have a moderate to a very high use for handicrafts, while the other half have a low to very low level use of the environment for handicraft.



Half the Tubowada respondents claim moderate to very high level use of the natural environment for wild food gathering while the other half claim to have a low to very low use of the environment for wild food. In the case of hunting an almost equal proportion of respondents claim a moderate to very high and low to very low use of the natural environment for hunting. Almost the majority of the Tubowada respondents have a high to very high use of the natural environment for firewood, materials for handicrafts, housing and garden materials (see Fig.6.3 & Plate 9.2).







Plate 9.3. Staked vams on the coastal plain north of Tukwaukwa Village

There is a high to very high resource use and demand by Tukwaukwa villagers' for housing and gardening material, and a moderate to very high use of the natural environment for handicrafts materials (see Fig.6.4 & Plate 7.3). With the exception of a minority, the majority of respondents have a low to very low level use of the natural environment for wild food and hunting purposes.



In Plate 9.3 the villagers of Tukwaukwa have to walk a fair distance to make gardens as the village has expanded in the last few years to become one of the second largest village after Kavataria village.

So far it has been determined that demand for the use of resources for the various uses mentioned has been and continues to be high. This has led to a low supply of resources over the last 10 years up until the present according to the majority of the responses from the respondents in all four villages. Population increase has been a contributing factor.

There is an interesting Kiriwina concept in land management - particularly distribution, called Kwabila (tithe arrangement), in which some portion of land is allocated by a rich landowner to a person with no land. The concept entails that the person given the land produces food and some of the production is given to the rich landowner. It would be interesting to see how this can contribute in any way to land ownership, land mobilization, and land allocation and land use, and land management; especially with regards to overused land, declining soil fertility and the resultant food production and distribution.

3.6.2 Knowledge on Climate Change and Concerns on its Impacts.

Concerning the level of knowledge and concerns associated with impacts of climate change (CC), the responses given in many instances can be said to be captured by the survey. Despite concerns that the responses may be not be fully captured, the responses actually relate well with some of the assumptions the team members had in mind. One of the assumptions is that most people would not be well versed with CC or what its impacts are, and this is captured here. Although, a minority through further explanations were able to relate events and scenarios they personally observed or experienced, most of the responses concerning impacts were vague showing a lack of understanding or simply no knowledge about CC. Generally, CC is a subject matter not many know about and this finding was clearly reflected in the survey by the majority of respondents in all sampled villages (see Fig.6.5-6.12). However, local knowledge relating to weather and seasonal indicators continue to be used. Some of the responses we note are related to these seasonal indicators, and through further elaborations relate changes in the weather and season indicators as something to do with CC. The common weather and seasonal indicators noted are as follows;

1.	Alignment of a group of stars	: Uluva – as indicator of crops beginning to mature : Kibi – as indicator of planting time : Southern Cross – as indicator of harvest time
		: Eclipse - as indicator of likely hunger period
2.	Winds	: South-easterly winds - indicator of yam harvesting period
3.	Bird (<i>Bulakata</i>)	: A particular bird walking into the village – sign of hunger

The level of knowledge on CC on Kuyawa Island is very minimal to nothing at all. Fourteen percent of males and 56 percent of females do have a little knowledge or idea on what climate change is, while 86 percent of males and 44 percent of females know nothing at all about climate change (see Fig.6.5).

As explained in the introductory part of this sub-section, the responses pertaining to the level of concern on impacts of CC show a direct contradiction to responses to the level of knowledge on CC. Nevertheless, the people do show some level of concern on situations they see around them. On Kuyawa Island peoples responses were divided between not being concerned at all to very concerned. A greater proportion of respondents show they were concerned compared to those not concerned at all (see Fig.6.6). Issues that the majority were most concerned about were rising sea levels, and changes and disruptions in their cropping or gardening activities [calendars] due to changes in climatic patterns.



Again despite a minority male and females in Obulaku village having some information or little information on CC; the majority (50% males and 67% females) have no knowledge about CC. Only 20 percent of males have some information about CC, while 30 percent of males and 33 percent of females have a little knowledge about what CC is (see Fig.6.7).



In terms of the level of concern on impacts of CC, 66 percent of females and 10 percent of males have no concern at all. Only 20 percent of the males were a little concerned and those moderately concerned are 10 percent of males and 17 percent of females. Sixty percent of males were very concerned as opposed to 17 percent of females (see Fig.6.8). The issues that were highlighted most were rising sea levels.

A similar situation also applies to Tubowada villagers where the majority of respondents (50% males and 50% females) know nothing at all about CC. Only 38 percent of males have some knowledge about CC and those having a little knowledge on CC comprise of just 13 percent males and 50 percent females (see Fig.6.9).

The levels of concerns about impacts of CC by Tubowada villagers show that the majority of people, both males (78%) and females (42%) are very concerned about impacts of CC (see Fig.6.10). The issues of most concern raised by the villagers were rising sea levels and coastal erosion caused by sea level rise and storm surges which reduces their garden lands located along the shoreline. Others generally stated disruptions to their gardening activities affected by seasonal changes.

There is a reasonable level of knowledge on CC that people from Tukwaukwa have with 23 percent of males and 29 percent of females having some sort of information, and 33 percent males and 29 percent of females having a little knowledge on CC. Those with no knowledge about CC comprise of 44 percent males and 42 percent females (see Fig. 6.11). A majority (78% males and 72% females) of the respondents expressed being very concerned about impacts of CC. Less than 20 percent of the respondents are either not concerned at all, a little concerned or moderately concerned (see Fig.6.12).





Figure 6.10. Level of Concern on Climate Change Impacts by





Again sea level rise is a concern raised by most people in Tukwaukwa. Concerns have been that during high tides the sea gets up to houses near the shoreline. Plates 10.1 and 10.2 show how the beach

has receded over time, and the level of sea during high tides. This is what many respondents have referred to as sea level rise, as they once had beaches (sand spits) and mangroves in the foreshore areas that were much longer than can be seen today.



Concerns have also been raised about the heat of the sun and the intensity which unlike the past causes so much discomfort for the elderly and those working out in the fields where there is sparse vegetation to protect them. Concerns were also raised about disruptions to their gardening activities with changes in seasonal climate patterns.

3.6.3 Ability to Cope with Extreme Events Induced by Climate Change.

To deduct peoples' ability to cope to impacts of extreme events exacerbated by CC, questions were structured to draw forth the reliability and availability of water and food resources, and if people had traditional ways of sustainably managing their resources and monitoring their environments continually. It was also necessary to draw forth from the respondents/villagers their intuition on what to do when faced with any life-threatening and extreme events. Another aspect of determining coping ability is determining whether or not people (that is every able individual) corporate well during any kind of extreme events to communally assist each other.

Again what is presented here are people's perceptions weighed against their own past, recent experiences and existing situations and analysis of their future situations should extreme events dawn upon them. It is more of a deduction of individual confidence - a test of the ability of individuals to be able to cope under any extreme event or situation. A general statement made here is that, despite very strong agreements made about most villagers being cooperative (VILLCOOPSWELL), at the individual level it can be seen that the majority do not agree that they are able to cope in terms of having reliable water and food sources and know what do during extreme events.

3.6.3.1 Ability of Kuyawa Islanders to Cope with CC Impacts.

On Kuyawa Island, 73 percent and 6 percent respectively do not agree and agree a little that they have reliable water resources (HRWATERRES). A similar response can be seen (see Fig.7.1) concerning reliable food

resources (HRFOODRES) with 29 percent not agreeing and 47 percent agreeing a little having reliable food resources.

Fifty six percent state that they sustainably manage their natural resources (SUSTMGTNATRES), while 25 percent agree a little with the statement that they manage their resources sustainably. In terms of monitoring their local environments (CMLENVCONDITIONS), 67 percent do not agree that they continually monitor their local environment and 20 percent agree a little that they continually monitor their environment.



Fifty six percent and 64 percent of the villagers do not agree that they know what to do during droughts or flooding events (KWTDDDROUGHT/FLOOD), or when there are tidal surges caused by cyclones or even not know what to do during cyclone events (KWTDTIDALSURGE/CYCLONE), while 31 percent and 18 percent agree a little on what they are able to do during these extreme events. Thirty percent and 38 percent strongly agree and very strong agree that cooperation amongst the villages is well as in times of emergencies or any event that is staged the villagers work well together (VILLCOOPSWELL).

3.6.3.2 Ability of Obulaku Villagers to Cope with CC Impacts.

Responses of the Obulaku villagers' generally indicate that the majority of respondents do not agree to the statements when weighed against their individual circumstances (see Fig. 7.2).

Fifty six percent and 31 percent respectively do not agree and agree a little that they have reliable water resources (HRWATERRES). With regard to having reliable food resources (HRFOODRES), it appears that more than half (57%) agree to having reliable food resources compared to 43 percent (13% not agreeing & 30% agreeing a little) not agreeing to having reliable food resources.



More than half (56%) do not agree or agree a little on being able to manage their natural resources sustainably, while only 25 percent moderately agree to managing sustainably their natural resources (SUSTMGTNATRES). Fifty six percent do not agree that they continually monitor their local environments (CMLENVCONDITIONS), while only 6 percent strongly agree otherwise.

In terms of knowing what to do during droughts, floods (KWTDDDROUGHT/FLOOD), tidal surges and cyclonic events (KWTDTIDALSURGE/CYCLONE), more than half (52% and 69%) do not agree that they know what to do during these events. Apart from the respondents who do not agree (14%) or agree a little (14%), the majority (36% moderately, 14% strongly & 22% very strongly) agree that the villagers corporate well (VILLCOOPSWELL) during extreme life-threatening situations or in any events that affect the community.

3.6.3.3 Ability of Tubowada Villagers to Cope with CC Impacts.

The coping ability of the Tubowada villagers is slightly different, in that the majority strongly (50%) to very strongly agree (12.5%) that there are reliable water (HRWATERRES) and food resources (HRFOODRES) should they encounter any extreme events (see Fig.7.3). Only 37 percent agree a little on having reliable water and food resources.

Less than 30 percent do not agree that they manage their natural resources sustainably, while 31 percent agree a little that they do sustainably manage their natural resources well (SUSTMGTNATRES). Nineteen percent moderately agree and 25 percent strongly agree that they manage their natural resources in a



sustainable manner. Only 43 percent do not agree on continually monitoring their local environments, while 57 percent at various levels of agreement (18% agree a little, 12% moderately, 12% strongly & 12% very strongly agree) do continually monitor their local environments (CMLENVCONDITIONS).

Only 13 percent of respondents do not agree on knowing what to do during droughts and flooding events (KWTDDDROUGHT/FLOOD), while 53 percent agree a little on knowing what to do during these events. Seven percent and 27 percent moderately and strong agree on knowing what to do when faced with droughts and flooding events. About half (50%) the respondents do not agree that they know what to do during tidal surges and or approaching cyclone events (KWTDTIDALSURGE/CYCLONE); and 50 percent agree to some degree (31% agree a little, 6% moderately agree & 12% strongly agree) on knowing what to do when faced with these events or situations. Responses concerning how well the villagers or community corporate (VILLCOOPSWELL) indicates one group (43%) not agreeing and the other group (57%) agreeing to some d2egree that villagers do corporate well before, during and after disasters.

3.6.3.4 Ability of Tukwaukwa Villagers to Cope with CC Impacts.

A similar response pattern of the coping abilities of Tubowada villagers can also be seen as well from Tukwaukwa villagers. Seventy five precent agree as having reliable water (HRWATERRES) compared to 25 percent who do not agree that they have reliable water.



As can be seen in Figure 7.4, only thirteen percent agree a little while 6 percent moderately agree to having reliable water resources. And 31 and 25 percent strongly to very strongly agree as having reliable water resources. With regard to having reliable food resources (HRFOODRES) the majority 56 percent (44% strongly agree & 12% very strongly agree) that they have food resources that they can rely on during bad times. There is no disagreement, except for a considerable 31 percent who are doubtful (agree a little) that they have reliable food resources.

About 56 percent do not agree that they manage their natural resources sustainably, while 25 percent agree a little that they do sustainably manage their natural resources well (SUSTMGTNATRES). Twelve percent moderately agree and 6 percent very strongly agree that they manage their natural resources in a sustainable manner. Fifty six percent do not agree on continually monitoring their local environments, while almost 38 percent agree a little and 6 percent moderately agree to continually monitoring their local environments (CMLENVCONDITIONS).

Only 31 percent of respondents do not agree on knowing what to do during droughts and flooding events (KWTDDDROUGHT/FLOOD), and 18 percent who (doubters) agree a little on knowing what to do during these events. Forty one percent moderately, strongly and very strongly agree on knowing what to do when faced with droughts and flooding events. More than half (56%) the respondents do not agree that they know what to do during tidal surges and or approaching cyclone events (KWTDTIDALSURGE/CYCLONE); while 44 percent agree to some degree (6% agree a little, 31% moderately & 6% strongly agree) on knowing what to do when faced with these events or situations.

Again responses concerning how well the villagers or community corporate (VILLCOOPSWELL) indicates one group (25%) not agreeing and the other group (75%) agreeing to some degree that villagers do corporate well before, during and after disasters. The majority 31 and 37 percent strongly to very strongly agree that the villagers cooperate well during emergency situations or disasters effectively.

Table 4 is a summary of responses pertaining to disaster risk management and basically draws chronological climate-related hazards that the people themselves can recall as well as describe what the impacts were and how the villagers have been able to cope under such natural hazards (cyclones, droughts and or flooding event) in their own communities.

	Table 4. Summarised Responses Pertaining	to Disaster Risk Management Based	I on Past Climate-Related Disasters.
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Disaster/Event	Impacts	Coping Strategy & Effectiveness	Comments
Strong winds created by the recent cyclone in 2014.	The strong winds damaged most food gardens further resulting in short-time unavailability of food and clean water. Some traditional houses were damaged.	People were able to build temporary make-shift shelters while others had to take shelter in classrooms or the church buildings (these shelters are built of permanent materials) to weather-down the winds until these were over. Although these strategies were effective in the short time period (1-2 weeks) lasting solutions need to be devised.	With the exception of fleeing to school grounds (classrooms) or permanently built church buildings, there is no community evacuation centre or shelter (CEC).
Rainfall all year around even during the yam harvesting period in 2013	Directly affected the food gardens due to waterlogged soil conditions. Indirectly became an expensive exercise feeding families as more people came to rely on processed store goods/foods.	Many villagers had to purchase processed store foods from remittances sent by their working relatives. But these was not effective as it was done sporadically and was additional burden on the formal working class relatives elsewhere.	No relief was supplied by the local government to affected families according to the responses collected from the focus group interviews.
Drought experienced in 1997	This was a nation-wide disaster and affected most productive functions such as water and food sources.	While others resorted to living on remittances provided by working class relatives, others resorted to fish and other marine products for survival	The national government provided food relief supplies to most affected communities and all villages have stated that this was an island-wide relief program.
Cyclone in 1994	Devastated many village homes and food crop gardens and water sources through the contamination of run-off into the water wells and sub-terrainean caves and channels.	Many villagers had to struggle to meet ends meet by subsisting on stored yams and processed food for while recovering from the after-math effects sometime before government relief.	It must be noted that there are no community disaster plans (CDP).

4. **DISCUSSIONS**

This section of the report is an elaboration of the important findings and what can be interpreted or learnt from these findings or information. The unsupervised discussions attempt to cross-reference survey data and visual observations and draw our analysis of this. The information thus presented here under this section is in synthesised or summary-like form of the findings in Section 3.

4.1. Future Climate Predictions

While the Water Balance Model was developed to give a fair idea of what the climate might like be, it should be noted that records used have been outdated. However, there has been not much change from a broad based perspective. What is interesting is that people have stated that; over the last 20 years or so there have been variations in the seasonal patterns or within the seasons. While the global climate models have been used to determine predictions as reported in the SPCS report, a model is as good as the data that is fed into the model. Nevertheless we can only report what may happen in future and perhaps crudely make incremental changes onto existing data we are familiar. Local projections for each of the climate parameters would be well used in future to really ascertain future changes in each of the important parameters mentioned here (e.g. rainfall projections, temperature projections, windspeed measurements, evapotranspiration or evaporation rates etc). What is probably of most importance is rainfall, humidity

What is interesting is that; people have stated that over the last 20 years or so there have been variations in the seasonal patterns or within the seasons.....

Projections made for PNG generally indicate an increase in humidity levels, increase in temperatures by at least 0.11°C per decade (since 1950). There is uncertainty in rainfall projections but generalized predictions are that; there is likely to be an increase in rainfall across PNG and less though short droughty periods.

levels and surface temperatures. Projections made for PNG generally indicate an increase in humidity levels, increase in temperatures by at least 0.11°C per decade (since 1950). There is uncertainty in rainfall projections but generalized predictions are that; there is likely to be an increase in rainfall across PNG and less though short droughty periods.

4.2. Demography and Resource Utilisation

Based on comparisons made between the 2000 and 2011 census figures, there apparently has been a significant increase in population and households, and this is likely to continue unless something is done to

curb this growth. The implications of this is that there will be continued added pressure on social services and natural resource use including the land. As has been noted, there is a lot of demand placed on the natural resources, when these resources are not abundant. High population growth is the driving force of natural resource degradation and depletion. The sample size while small is representative enough to confidently state that the responses given are worthy of consideration as most (74%) are formally educated to some level, the majority (85%) are married, in the active working age group (20-49 years) and most have made educated responses based on their experiences and observations.

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The implications of this is that there will be continued added pressure on social services and natural resource use including the land. High population growth is the 'driving force' of natural resource degradation and depletion.

4.3. Social Services and Physical Infrastructure Status

There has been a gradual improvement in housing and living conditions with many semi-permanent and permanent structures being built now. In the villages that were visited, iron-sheets have been handed out to villagers under the Local MP's District Services Improvement Program. However, the house size for the

There has been a gradual improvement in housing and living conditions with many semi-permanent and permanent structures being built now...

The purchase of iron roofing and other materials from Alotau maybe expensive but is a gain toward reducing the demand for housing materials from the already over-depleted and scarce resources that exist on the island. ordinary villagers still remain below the Paramount Chief and his other powerful Chiefs' houses. The purchase of iron roofing and other materials from Alotau maybe expensive but is a gain toward reducing the demand for housing materials from the already almost-depleted and degraded resources that exist on the island.

A better educated and informed community is crucial in making informed decisions when faced with any kind of situation. There are many issues affecting the education of elementary and primary school children, and one of this is the shortage of permanent houses for teachers and classrooms for the children.

The inadequacy of housing has made it hard for teachers to educate children. While these issues maybe beyond the projects scope to address it is imperative that this be stated in this report for any donor agency to look into in future. The issues that were raised are in-fact not unique to the Kiriwina Islanders but also applies across many remote and inaccessible areas throughout PNG.

While the team was unable to determine the number of health related cases to ascertain the health status of the communities; the physical appearance from our observations and the responses based on the frequency of visits to the aid-posts and health centre at Losuia suggest that people are generally healthy. There are however issues associated with the state of some of these health infrastructure-many in debilitated conditions and if not, basic medicinal supplies are in short supply or absent. Accessibility to health, education and postal services is an issue for those on the outer islands, including villages on the main island who do not have these services and have to walk long distances. Knowing the status of the health infrastructure, we could do well by looking into food nutritional interventions to prevent people from getting serious health problems.

In terms of communication within and outside of Kiriwina, it is heartening to know that more than half the number of households (56-81%) in all villages have one or two mobile phones per household. A large proportion (62-75%) of respondents use mobile phones to communicate whenever there is an emergency.

4.4. Economic Services and Status

Except for the usual small to medium retail enterprises and tourist lodges and guest houses; there are no major economic or money generating activity occurring on the island. The local economy is supported by fishing and subsistence gardening on which the retail and hospitality sectors partially depend on. However, tourism in our opinion has not taken off in a big way so its impact on the local economic is very minimal.

Again most of the sources of income are from sale of subsistence gardening or fishing products. This implies that there is a high dependency on the natural resources.

Therefore income generation at the villager's level in ensuring the maintenance of one's livelihood is an important aspect of life. For most villagers, the annual income or earnings are between K100 to K500.00. However, the earnings within the villages vary greatly between the sexes and age group. Again most of the sources of income are from sale of subsistence garden produce or fishing products. This implies that there is a high dependency on the natural resources. The very minimal annual income is probably due to issues raised such as accessibility and lack of transportation problems to and from Losuia. Villages closer to Lousia are likely to earn more than those furthest from Losuia. Spending of such incomes are centred on meeting basic needs such as foods, household sundries and clothes. Spending associated with meeting cultural obligations is third on list of most villagers.

4.5. Water Resources and Utilisation

While the water balance model suggests ample water being brought in by the rains, projections of more rainfall across the country as reported in the SPCS report and the incremental adjustments on old records imply that these islands are not prone to water deficit problems. However, given the unpredictability

associated with climate variability and climate change, our observations and the responses from the respondents show otherwise. A very severe drought induced by El Nino can cause water deficit problems.

The responses indicate that there is a greater need for capturing sufficient and quality water and ensuring its long term sustainability. Our general understanding is that water seepage or infiltration is probably high given the porous nature of the underlying parent material (coral limestone), and that whatever that is not captured (in water tanks) ends up as runoff or is lost into the subsurface in underground water reservoirs and shallow lenses. There is a need for a broad-based hydrogeological study to locate where possible ground water

Given the unpredictability associated with climate variability and climate change; our observations and responses show the opposite. There is a greater need for capturing sufficient and quality water and the need to ensure long-term sustainability of this resource.

resources are on the main island. What has been observed so far in the villages are shallow contaminated wells, some of which are located at unimaginable sites – especially at Obulaku village.

4.6. Food Resources and Food Security

In summing up the food security situation on Kiriwina from the responses of the respondents and visual observations we conclude that according to the FAO definition of food security – food security in Kiriwina is only for a short-term. The FAO definition states that: "food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (1996 World Food Summit). The four key factors underpinning the FAO definition of food security are outlined below:

level of food production, stock levels and net trade.
An adequate supply of food at the national level or international level does not in itself guarantee household level food security. Concerns about insufficient food access has now resulted in a greater policy focus on incomes, expenditure, markets and prices in achieving food security objectives.
Commonly understood as the way the body makes the most of various nutrients in the food. Sufficient energy and nutrient intake by individuals is the result of good care and feeding practices, food preparation, and diversity of the diet, and intra- household distribution of food. Combined with good biological utilisation of food consumed, this determines the nutritional status of individuals.
Even if one's food intake is adequate today, one is considered to be food insecure if he or she has inadequate access to food on a periodic basis, risking a deterioration of one's nutritional status. Adverse weather conditions, political instability, or economic factors (unemployment, rising costs [price] of food) may have an impact on one's food security status

Table 5. Four Key Factors Underpinning the FAO Definition of Food Security

Source: EC-FAO Food Security Program 2008 - www.foodsec.org/dl

All four factors have to be fulfilled simultaneously if we are to say that food security exists. So when giving a situational analysis of food security on Kiriwina Island, we conclude that in terms of:

1. The Physical Availability of Food

Production levels in terms of quantity and quality have declined over the last 10 years and that food is not available throughout the year as three months (December-February) of every year, people run out of food and have to resort to other means to ensure their households have something to eat. As discovered in

subsection 4.6, the decline in food crop production is influenced by (1) low soil fertility (2) high incidences of pests and diseases (3) soil salinity and salt sprays (4) the narrow genetic-base of crops and (5) changing and unpredictable weather pattern. All these factors influence the availability and unavailability of food.

2. Economic and Physical Access to Food

Not everyone in the visited villages has adequate supply of food and the majority of the villagers sources of income are from the sale of agriculture produce through subsistence gardening and sale of marine products. But then the average annual level of income is low (K 100-K 500.00) and given the current cost of goods including food, adequate supply is questionable. In fact most of the earnings go toward purchasing food and little is spent on improving their living standards. This implies that people are not so food secure and have to resort to purchasing processed store-food.

3. Food Utilisation

We can only, at this point in time make general statements based on the physical appearances of the people that, they are generally healthy and active people. There are however sufficient amounts of energy foods and protein foods available only during 9 months of the (minus taim hangere). People also have green leafy vegetables that provide nutrients for disease prevention.

4. The Three Factors Being Stable Over Time

The situation with the Kiriwina Islanders is that production levels have been on the decline over the last decade. So during the harvesting of food crops, people immediately may have food but then during the months of December, January and February people claim that they usually run out of food supplies and yam is one such food crop. As noted sometimes weather conditions hinder people from accessing services including shops in Lousia to purchase food. The 'taim hangere' period therefore is an indicator that people are not so food secure.

Given the problems of running out of yams (food) during the 'taim hangere' months of December, January and February. What is needed therefore is to devise a package that can ensure food security is sustainable overtime or on a long-term sustainable basis.

4.7 Are the Communities Affected by Climate Change Impacts?

To answer the question as to whether the communities are affected by impacts of climate variability and climate change, we cannot be 100 percent certain that the communities are impacted on by CC, given the absence of rainfall and temperature projections, as well as sea level rise projections dating back at least to the last 20-30 years from which some relationship can be built with the claimed impacts. In the interim and based on the educated responses and evidenced by the shortened beaches and changes in

From the observations and responses made concerning CC impacts, we can state here with some certainty that each of the sampled communities are being be affected directly and indirectly by impacts of climate change. However, the degree to which they are impacted by these changes will have to be determined in a more rigorous assessment in future (if at all possible).

seasonal climatic patterns over the last two decades as claimed by the villagers, we can say that the communities are impacted on by effects of climate change. The hazards that have been of concern and raised in the interviews are sea-level rise, drought, increased pests and diseases infestation on crops, malarial infestation and diarrhoea in humans, and concerns on uncertainty due to changes in seasonal climatic patterns. Although there is no scientific backing up of sea level rise projections, evidences as seen in Plates 10.1 and 10.2 are indications that sea levels will continue to rise.

We note that these four communities are not homogeneous and there are certain groups in the communities who are marginalised, or who could be at more risk and less able to adapt or cope to CC impacts. From the observations and responses made concerning CC impacts, we can state here with some certainty that each of the sampled communities are likely to be affected by impacts of climate change directly and indirectly. However, the degree to which they are impacted by these changes will have to be determined in a more rigorous assessment in future (if possible), but in the interim and based on information here, a matrix system has been used to evaluate arbitrarily the degree of impacts under the present circumstances (see Table 6B).

Generally though, effects of climate change have already impacted on innumerable communities in our region particularly the small atoll islands around PNG (and some smaller PICs), exposing them to increasing hazards and making them more vulnerable; and we can expect this to become more marked, and for some communities catastrophic, in the coming years. Table 6A is a summarised checklist determining whether or not the communities in Trobriand Islands are affected by CC. While Table 6B is an arbitrary preliminary evaluation using a matrix approach to evaluate the likely levels of impact from CC related hazards and risks under the present circumstances. The details and levels of measurements can be referred to in Appendix 5.

Impacts on the Functional Systems	Affected Assets or Activities	Key Climate Influences	Observed and Possible Effects	Section in Report explaining effects.
Terrestrial Environmental Dimensions	Roads and other infrastructure such as buildings. Gardening activities especially with timing of planting and harvesting- Terrestrial ecosystems	Increased rainfall Very strong seasonal winds or storms. Unpredictability in seasonal climate patterns. Changes in any of the climate parameters will disturb the terrestrial ecosystems.	Damage to sections of the roads. Flooding in low-lying areas or overland flow from nearby swampy land into adjacent garden lands. Abundance of pests and diseases or loss of biodiversity due to increased temperatures, high humidity and increased rainfalls. High rainfall also causes leaching of soil nutrients resulting Low soil fertility.	Section 3.2.1. paragraph 5 Section 3.6.2. paragraph 4 Section 4.6
Coastal and Marine Environmental Dimensions	Coastal line and Low-lying swampy areas.	Increased atmospheric temperatures contribute to combined influences of sea level rise, wave direction and energy as well as very strong seasonal winds and severe storms. Changes in any of the climate parameters will disturb the marine ecosystems.	Reduced shoreline and reduction in gardening land and shoreline (beaches) of the villages. Exposure of the low-lying swampy areas to tidal flooding.	Section 3.6.2. paragraph 6-8
Impacts on Human Settlement (Socio- economic Dimensions)	Health Water Supply Food Supplies and Income earning opportunities	Increased rainfalls, increased temperatures, high humidity levels	Increased casualties of vector-borne and water- borne diseases and sicknesses. Inadequate quantity and poor quality of water resources	Section 3.4, 3.5, 4.5 and 46

Table 6A.	Summarised	Checklist o	f Climate	Change Im	pacts Affecting	a the Communities.
						,

Are Kuyawa Islanders more likely to be greatly affected by climate change impacts than the other villages of Obulaku, Tubowada and Tukwaukwa?

Independent Variable	Kuyawa Island Village	Obulaku Village	Tubowada Village	Tukwaukwa Village
1. Levels Incomes: [L, M & H]	L1-Low (77%)	L1- Low (75%)	L1- Low (63%)	L1 - Low (56%)
2. Diversity of Income Sources: [F, S & M]	L1 – Few (1)	L2 – Some (2)	L2 – Some (2)	L2- Some (2)
3. Diversity of Food Sources: [F, S & M]	L2 – Some (3)	L2 – Some (3)	L3 – Many (4)	L2 – Some (3)
4. Crop Production Levels: [L, M & H]	L2-Moderate	L2-Moderate	L2-Moderate	L2-Moderate
5. Diversity of Water Sources: [F, S & M]	L1-Few (1)	L2 – Some (3)	L2=Some (2)	L2 – Some (3)
6. Standard of Housing: [L, M & H]	L1 - Low	L2- Moderate	L2 - Moderate	L2 – Moderate
Dependent Variable	4 x (L1) & 2 x (L2)	1 x (L1) & 5 x (L2)	1 x (L1), 4 x (L2) 1 x (L3)	5 x (L2) & 1 x (L1)
Level of CC Impacts: Low, Moderate & High	Moderate to High Impact	Moderate Impact	Moderate Impact	Moderate Impact

4.8. Coping Ability of Communities to Climate Change Impacts

While scientific climate change analysis is vital for broad context, in many instances at the local level, such analysis is not always complete when scientific data is not available or very limited in scope. Such is the case here, however most of the relevant information and local knowledge often already exists and has been partially generated by the locals during the survey. We would like to think that often the local people have the knowledge and capabilities to adapt to any situation as their ancestors have been before them. Local knowledge also has a credible authority for informing a influencing what can or must be done.

In determining the coping ability of communities to the impacts of climate change and climate variability, a stock take is taken of the various responses and observations captured in this survey. The following is a summarised vulnerability situation on Kiriwina Island and the outer islands and the strategies that people implement to cope with climate change impacts and other natural hazards. While an indepth analysis could be done in future to ascertain some of the strategies this superficial situational analysis is the best that has been done under present circumstances (lack of localised scientific data on sea-level rise projections, cyclones/strong winds about the area and the limited time taken to undertake this scoping study). Generally though



Fig.8 shows that on an individual basis, the majority (63%) perceive themselves as not being able to cope under extreme climate events or disasters while 37 percent as being able to cope to some degree. As a community though, most individuals do agree strongly that they have the ability to cooperate well to withstand the impacts of climate change or any natural disasters and extreme climate events.

So to conclude, the people from all the four communities are vulnerable to some extent and the degree of vulnerability needs to be assessed in the next assessment phase. Which will ideally require; (1) the identification of vulnerable sectors and groups of individuals within each community, (2) identification of key coping strategies and (3) the need to measure the effectiveness and sustainability of these strategies.

The vulnerability of these people like every other indigenous groups living on remote islands is exacerbated by existing non-climate stresses and a culture that does not differentiate between natural and human systems.

The first factor reduces community resilience to a changing environment, given the issues described here so far. The second factor is the interconnectedness of the people with the land and marine resources. As we have noted CC impacts on the physical environment will consequently either reduce the productive function of providing necessary food and water resources, or have disastrous effects on intangible cultural heritage sites and community practices and threaten cultural identity and long term viability of these communities.

The issues raised here have to be taken seriously in this context and the connectedness already identified in this study needs to be explored further when designing a coping or adaptation strategy and plans under GIZ/SPC funding. Table 7 is a preliminary and arbitrary evaluation, which under present circumstances provides an idea on the ability of the villagers to cope under the impacts of CC. The details and levels of measurements can be referred to in Appendix 5



Do	Do Kuyawa Islanders differ from Obulaku, Tubowada and Tukwaukwa villagers in their ability to cope to CC Impacts?					
		Kuyawa Island	Obulaku	Tubowada	Tukwaukwa	
Inc	lependent Variable	Village	Village	Village	Village	
1.	Levels Incomes: [L, M & H]	L1-Low (77%)	L1- Low (75%)	L1- Low (63%)	L1- Low (56%)	
2.	Diversity of Income Sources: [F, S & M]	L1 – Few (1)	L2 – Some (2)	L2 – Some (2)	L2- Some (2)	
3.	Diversity of Food Sources: [F, S & M]	L2 – Some (3)	L2 – Some (3)	L3 – Many (4)	L2 – Some (3)	
4.	Crop Production Levels: [L, M & H]	L2-Moderate	L2-Moderate	L2-Moderate	L2-Moderate	
5.	Diversity of Water Sources: [F, S & M]	L1-Few (1)	L2 – Some (3)	L2=Some (2)	L2 – Some (3)	
6.	Accessibility to Main Govt. Services: [E, NSE & H]	L2 - NSE	L2- NSE	L2 - NSE	L1 - Easy	
Dependent Variable		3 x (L1) & 3 x (L2)	1 x (L1) & 5 x (L2)	1 x (L1), 4 x (L2) 1 x (L3)	2 x (L1) & 4 x (L2)	
Lev Mo	vel of Ability to Cope to CC Impacts: Low, oderate & High	Low to Moderate Ability to Cope to CC Impacts.	Moderate Ability to Cope to CC Impacts.	Moderate Ability to Cope to CC Impacts.	Moderate Ability to Cope to CC Impacts.	

4.9 What is the next course of Action?

This subsection basically discusses the way forward on what needs to be done taking into consideration information contained here as well as taking into consideration financial and administration issues that the GIZ/SPC could take into consideration in deciding whether to continue conduct a more detailed assessment.

The cost of conducting this scoping assessment has been very significant and GIZ/SPC could well use the information contained here to explore further the vulnerability of the communities already stated here in subsection 4.8 or decide not to peruse this further because of the cost and logistic issues involved. The team in fact were disadvantage with transportation and despite this a few key personnel in the district administration were able to support the whole operation until its conclusion.

We cannot deny that the communities to some degree are being affected by climate change, and with the socio-economic situation most villagers are in, CC impacts could exacerbate and worsen individual and household abilities to manage or cope when faced with CC impacts. Obviously a more proper vulnerability assessment and adaptive capacity assessment needs to be carried out as part of the process of determining sustainable coping and adaptation strategies in reducing climate risks and reducing the vulnerability of the systems and individuals themselves to future CC impacts (see Table 8). It has to be noted also that in this scoping we have not augmented all the collected data against any documentary report except for the soil nutritional studies conducted by ACIAR and information provided in the planning workshop conducted in October 2013 to verify the interview data.

The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences is influenced by certain factors in what is termed here as 'adaptive capacity'. One of the most important factors shaping the adaptive capacity of individuals, households and communities is their access to and control over natural, human, social, physical, and financial resources. Key factors that could or may be important to adaptive capacity that would need to be investigated further would be:

ŤŤŤ	Human: Knowledge of climate risks, conservation agriculture skills, good health to enable labour
Ť	Social: Farmer-based organizations such as cooperatives or women's groups
	Physical: Yam storage and other food storage facilities, opportunities to introduce and promote climate-tolerant and pest and disease-tolerant crops and fruit trees and down- stream food processing of staple local foods and creating marketing opportunities.
A	Natural: Reliable water source, productive land, utilisation of swamp lands for agricultural purposes.
5	Financial: Access to micro-insurance/banking situations-savings and loans, diversified income sources

Added to this process should be a broad-based land use plan and locally-based community land use plan (in the case of a pilot site) which must be developed together with the villagers. This integrated land use plan should be able to address some of the issues that the team have identified such as;

- (1) Where to grow forest resources (especially fruit trees) for food.
- (2) Where compacted land is and needs rehabilitating to increase garden land.
- (3) Where graves should be located and
- (4) Where water sources can be established
- (5) Where proper waste disposal systems can be built instead of dumping rubbish in the swamps
- (6) Where hazardous areas are how this can be incorporated into a local disaster management plan

Apart from the Integrated Land Use Plan, possible intervention areas that could be looked based on the findings so far, could well be in the areas of:

- (1) Water resource establishment and management
- (2) A packaged Food Security Program that could look at improving soil fertility, diversifying the food base and income source, food processing and packaging.
- (3) A well prepared package on Climate Change Awareness tailored toward ensuring all the members (children, youth, elderly and the uneducated and educated) understand what CC is and how it will affect them.

5. CONCLUSIONS

The main island of Kiriwina and the smaller outer islands have similar circumstances to other smaller islands around Papua New Guinea and the South Pacific Region. The main island of Kiriwina is 273 km² in size and has a total population of 37 500 people-comprising 19 530 males and 17 981 females, and a total household number of 7 559. The Kiriwina Islanders whilst being governed by the state system through the KRLLG, the Chiefdom system still has much authority in the affairs of the community.

The biophysical features of the islands greatly influence the behaviour of the people toward their use of the natural resources. The islands are uplifted coral limestone reefs elevated between 1-15 m.a.s.l and covered predominantly by a thin (0-30 cm) mantle of well drained and moderately low to low fertile soils. The islands' lowland humid type of climate is partially responsible for many of the issues and constraints already mentioned such as the high incidences of pest and diseases affecting crop production levels.

The original vegetation has been deforested and degraded throughout much of the island and what can be seen today is scrubland associated with grassland. There continues to be a high demand on the natural resources for energy sources (firewood), garden materials and housing materials. The high demand is directly driven by the increased human population. Much of the land is used intensely for gardening and whatever that is not used is left to fallow. Two farming system practised by the islanders are the 'yam and taro-based farming systems.

The majority of people earn less than K 500.00 annually. Most income comes from selling surplus subsistencebased agriculture products and marine products. Much of that income is spent on processed food products and other household goods as well as meeting church and cultural obligations. Strong cultural norms and obligations also play an important part of the Kiriwina Society, which have direct bearings on resource use and management, and livelihood activities.

A majority of the people (74%) have formal education, but most of them are educated up to primary school level only (Grade 6). And most of these people do not have any idea on what CC is; but many using local knowledge are well aware of changes in their own environments and relate these to CC. There is only one Secondary High School, no VTC and primary schools that do not have reading and writing resources let alone a handful of teachers teaching more classes or grades on low salary grades.

Most villages have small aid-posts within walking distance but almost many of these aid-posts do not have adequate basic medicinal supplies and people have to sometimes walk long distances to get to the nearest health centre. Some of the aid-posts are in need of repair and maintenance. The kinds of health services provided at Losuia range from our-patients, prenatal and antenatal services, dental and treatment of STDs and other common diseases and sicknesses as malaria, colds and flu to diarhoerrial sicknesses.

Apart from the provision of postal services in Losuia station, mobile phones are these days used to relay messages during emergencies. This is possible as most villages on the main Kiriwina Island and the large off-shore atoll islands have 3G mobile phone communication coverage. Coverage is limited on some far flung islands and it takes a while and some walking or roaming before coverage can be discovered.

Water and food security in the villages visited are not secured as these villages have few sources of water and food and the availability of both water and food are only on a short term basis. Most villages rely mostly on rainfall and underground sources such as shallow wells. The food security situation as per the FAO definition is only for a short-term. So long-term food security is therefore not assured.

There are evidences that impacts of CC are affecting the people such as sea level rise and the unpredictability in seasonal weather patterns. The majority of people are not likely to cope well during extreme climate events and other natural disasters simply because they reckon they do not have enough food resources and water sources, and do not know what to do during extreme events.

6. **RECOMMENDATIONS**

The following recommendations are what we think would be in the best interests of everyone concerned.

- 5. The communities are to some degree being affected by CC and with the kind of socio-economic situation most villagers' are in, CC and CV impacts could exacerbate and worsen individual and household abilities to cope under extreme adverse conditions. It is therefore logical, that a full vulnerability study be conducted to identify the vulnerable sectors and groups of individuals within each community, explore and identify more key coping and adaptive strategies and devise a system to measure the effectiveness and sustainability of these strategies. Some of the key factors that need to be investigated further can be referred to in Table 8 under sub-section 4.8.
- 6. A broad-based land use plan of the mainland and a community-based land use plan for the chosen pilot site must be developed together with the key provincial and district staff together with the village community and chiefs where possible. Simultaneously or prior to the development of the land use plan, a broad-based hydrogeological study needs to be undertaken to locate where possible ground water resources are on the main island. Given capacity issues with the mainstream government organisations like NDAL and NARI, it is further recommended that an NGO group or a professional Land Use Planner and a Hydro-geologist be engaged. The Hydro-geologist to commence and quickly complete the study and the Land Use Planning Specialist to be engaged full-time to take the lead role in planning this task with the support from NDAL, NARI and the Provincial Planning Office of Milne Bay Provincial Administration and the Kiriwina District Administration.
- 7. A Project Document [inclusive of an Annual Work Plan for 2015) be put together immediately. This project document should outline the objectives of the project, the beneficiaries, the activities (e.g. CC Awareness & Knowledge Management Products) outcomes and outputs of the interventions that CCCPIR would want based on information already presented here in this report as well as the full vulnerability study that would be conducted following the release and acceptance of this report.
- 8. That a meeting be convened immediately following the acceptance of this report so preparations can commence immediately towards conducting a full vulnerability study. At the same time this meeting should allow for a proper delegation of roles under existing MOUs with key stakeholders so that there is a clear demarcation of roles and extent of responsibilities for each stakeholder to take note of in the implementation of future activities.

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APPENDICES

Appendix 1.1 Group Interview/Focus Group Questionnaire

It should be noted here that some of the questions asked in this questionnaire designed for Group Interviews (Focus groups) will in some instances be repeated in a prepared questionnaire (Appendix 3.2) for the Individual Interview approach as well in the Visual Observations method (Appendix 3.3).

In this rapid assessment the PNG CCCPIR team should be innovative enough to use other observation equipment such as binoculars, smart phones to record conversations and digital cameras. Always seek permission from the interviewees before voice-recording long explanations to open questions.

Interviewer (s):		Time:		Date:	
Survey Approach/Method:	Group Interview / Focus gr	oups/Households 1	Province:		
1.1 District:	1	1.2 Name of LLG:			
1.3 Name of Ward:	1	4 Name of Village:			
1.5 Village Population:	2	Level of Assessment:	Preliminary	Assessment	
3. Evaluation Focus Livelihood Issues [Social & E		Economic], Climate Cha	nge & Environmer	ntal Issues	
4. Method Used:	Combined Elements of RRA	A & NARI questionnaire			
5. Group make up:	Total Male:	Total Female:	Schoo	ol children:	
(take group photo)					
A. BASIC SOCIO-ECON	OMIC INFORMATION				
A.1. Community Governance Systems	Structure & Social	Please tick or write a	inswers as require	ed with explanations	
A.1.1. How is the community g	overned/managed? (E.g. If	Chief 🗆 Village	Councillor 🗆 🛛 🔾	Councillor-Elect 🗆	
a community project is to be e	stablished, who should be	5			
approached to give the 'go-ah	ead'?).	Others 🗆 (Please expl	ain)		
A.1.2. Who participates in the o	decision-making process?	Men 🗆 🛛 Women	□ Others	□ (Please explain)	
Also include a question on wo	men's income generation			(
from any activities. Same ques	tion on youths income.				
A.2. Education & Social	Please tick or write a	inswers as require	ed with explanations		
A.2.1. What is the name of nea	rest Community School and	how far is it from your v	illage/here?		
Name of Community School:	Name of Community School: Distance from village:				
A.2.2. How many children from) your village go to school? P	lease estimate in numb	ers:		
A.2.3. How do children get to s	school?				
_					
Walk 🗆 Cycle 🗆 Vehi	icle(PMV) Private ve	hicle 🗆 🛛 non-moto	rised boat □ n	notorised boat \Box	
Hitching D Bo	arding with relatives	Other 🗆 (P	lease explain)		
A.2.4 Are there any challenges	regarding education of child	lren, if they are, what are	e they? (Please list a	and explain why?)	
	wat likele Cale and an alle and fa	· · · · · · · · · · · · · · · · · · ·	2		
A.2.5 What is the name of hear	rest High School and how fai	is it from your village/r	iere?		
Name of High School:		Distance from v	illage:		
A.2.6 How many children pass	A.2.6 How many children pass onto High School? Please estimate in numbers:				
A.2.7 How many of these are b	No. Boys:	No. Gir	ls:		
A 28 How do children get to s	chool?				
Walk Cycle Vehic	cle(PMV) Private v	ehicle□ non-mot	orised boat 🗆 🛛 n	notorised boat \Box	
Hitching 🗆	Boarding with relatives D] Othe	r 🗆 (Please explain	n)	
A.2.9. Can you name the nearest Vocational Training Centre?					

A.2.10 VTC distance from village?				
A.2.11 How many youths go to this VTC? Please estimate in numbers:				
A.2.12 How many of these are boys and girls? No. Boys: No. Girls:				
A.2.13 How do these youth get to the VTC?				
Walk Cycle Vehicle(PMV) Private vehicle non-motorised boat motorised boat				
Hitching Boarding with relatives Other (Please explain)				
A.2.14 Are there any challenges regarding higher education of children to if they are, what are they? (Please list and				
explain why?)				
A.2.15 What common social problems are in the community?				
A.2.16 How do you solve your law and order problems?				
A.3. Access to Services Please tick or write answers as required with explanations				
A.3.1 How do you travel to the major service centre within Kiriwina (health, education, markets, District Office)?				
Walk Cycle Vehicle (PMV) Private vehicle. non-motorised boat motorised boat				
Hitching D Bicycle Motorbikes O Other (Please explain)				
A.3.2 How long does it take to travel to your destination? (Please explain and give a numerical e.g. 3 hours)				
Hours D Davs D Weeks D Month D Other D				
A3.3. Your mode of transport is affordable. Strongly disagree / disagree / Agree / strongly agree				
A.3.4 How often do villagers travel to the major service centres? (Please indicate number of times in a period)				
Weekly (No. of Times): Monthly (No. of Times):				
A 3.5 How much is the transport fare (PGK) to your destination?- <i>Confirm info with District Office</i>				
A.3.6 How many vehicles are in the village? (Please list types and indicate number per type) <i>Get this info from the village</i>				
PMV Bus: PMV Truck (6 wheel): Private Vehicle: Other:				
A.3./ How many outboard motors/dinghies are in the village? Get this info from the village record keeper				
Privately owned: Community owned:				
A.3.8 Are there any transport problems? And if they are, what are they? (Use list below as a guide)				
1. Less frequent public transport				
2. High cost of fuel				
3. Lack of transport				
4. Poor road conditions				
5. Unfavourable weather				
6. Lack of safety and security				
7. Others (please explain)				
A.3.9 Additional comments to above				

A.4. Economic Related Issues & Information Please tick or write answers as required with explanations
A.4.1. What are the main sources of income (per annum)?
Rank according to income generation (most=1 least = 9). Indicate top 3 1. Sale of agriculture produce
2 Sale of marine produce
3 Sale of artefacts
4. Informal marketing
5 Pomittancos
S. Nemittances
6. Wages from formal employment
7. Self-employed (trade store)
8. Tourism
9. Barter (explain what is being exchanged)
10. Other.
A.4.2. Which income generating activities are women the major contributors?
A.4.3 Do you have challenges with the main sources of income? (Please list main source and explain challenges)
A.4.4. Do you have foreign tourists coming to your Yes □ (If yes what are they?) No □ (why not)
villages? And what is it that they come to see or enjoy?
B. QUESTIONS TO DERIVE BASIC CLIMATE CHANGE AND ENVIRONMENT RELATED INFORMATION
B.1. Natural Resources [Terrestrial, Marine, Freshwater] Please tick or write answers as required with explanations
B.1.1. Has there been permanent change in land cover? Describe changes in land cover and when this happened.
AND/OR Have there been permanent changes in coastline? Describe changes and give evidence.
Change: Description
B1.2 Are there any local traditional knowledge relating to weather and season indicators? E.g. significance of bird
behaviour etc.
B1.3 What products do you get from your forest/bush?
wild food, hunting, fuel-wood, housing materials, wood for artefacts, gardening materials, others
B.1.4 Who are the major users of the main products above? Mark M/F/Both hext to product above
B.1.5. Has the abundance/supply of forest products changed over the last 10 years? high increase in abundance(H), low
abundance (L), No change (NC), decrease (D)
For food: for firewood: for housing materials: for handicrafts:
Garden materials (specify) Other material:
B.1.6. What traditional practices are followed to manage terrestrial/land resources? Explain what you do and why.
B.1.7. What traditional practices are followed to manage your marine/freshwater resources? Explain what you do and why.
B.1.8 How many of you know about climate change? Please raise your hands. [Count the number of men, women, youth
B.1.8 How many of you know about climate change? Please raise your hands. [Count the number of men, women, youth etc.] Men Women: Youth: Children.
B.1.8 How many of you know about climate change? Please raise your hands. [Count the number of men, women, youth etc.] Men Women: Youth: Children:

B.1.9. Can anyone please explain in your own words what Climate Change is or what it means to you? (correctly answered, partly answered, vaguely answered, incorrect, no response)			
Do you think you are affected by climate change? yes / no			
What type of events have you experienced over time?			
Frequency of event from the past to recent?			
Impacts?			
B.1.10. Is climate change an issue? Yes □ (If yes, why?)		No 🗆	
B.2. Water Resources & Water Security	Please tick	or write answer	s as required with explanations
B.2.1. Which water source do you rely on the most (1=	Well		• -
high, 2 = moderate, 3=low, NA)	Spring		
Haw accessible are you to those water courses?	Borehole		
How accessible are you to these water sources:	Rainwater		
	Ctroom		
Who accesses and manages these water resources?	Stream		
(M/F/Both?)	Swamp		
	Other sour	ces (Please explai	n):
B.2.2. Have you noticed any changes in the wet season and season? What is the current experience?	l dry	Months of Rainf	all: [Fr: To:]
- more intense rainfall in the wet season			ppelis.[ri. io. j
- longer wet season			
- less rainfall in the wet season			
- shorter wet season			
- hotter seasons than usual (higher temps) – any particular	month?		
- longer dry season	monut		
- shorter dry season			
B.2.3. Are there any problems faced during these periods?	Wet condit	ions:	Dry Conditions (Droughts):
(Please list what these problems are in relation to the			
prominent water sources e.g. wells, spring, boreholes etc)			
B 2 4 Under normal conditions how would you rate the	Well:		
drinking quality of each of the main water sources?	Spring:		
	Borehole:		
Rank as following	Doinwater:		
1 -High – clean, clear water all the time	Ctroom		
3-Low - dirty sediments, turbid most of the time	Stream.		
	Swarrip		X
What are the main water pollutants?(Please explain)	Other sour	ces (Please explain	ז):
What are the main water polition strictions criease explain,			
B 2.5 What are the types of water storages and storage	Types of W	later Storage and	Capacities of Water Storages
volume for communal use and how many are there?	how many	?	
(Please list the types and their storage capacities e.g.			
tanks etc)			
B 2.6 Have you ever experienced water shortages?			
If yes, why was there a shortage?			
When did it happen?			

B.3. Food Resources & Food Security [Agriculture, Fisher	ies]	
B.3.3. Economic Crop(s):		Total earnings weekly: K
B.3.4 What is the average size of your food gardens? - Squa	are metres:	
B.3.5 Do you leave your land under fallow for some time? (Tick appropriate) Ye	es 🗆 No 🗆
If Yes, for how long?		
1) Two-three Months \square 2) Four-Six months	□ 3) S i	x-Twelve months
	L 3/3	
4) Two – Three years 5) Three - Five years	□ 6) Mor	e than five vears \Box
	,	,
If no, Why not?		
B.3.6. Are there incidences of reduced fallow periods? If yes	what are the impacts of	reduced fallow periods?
R 2.7 What are the "Taim Hangore" months if any?		
b.s.r.what are the Tain Hangere months, if any:		
B3.8. What are the three most important constraints to you	r farming practices?	
	un manda na lilva.	
Are you experiencing changes in physical conditions of you	ir gardens like.	
a. saltwater intrusion		
h change in soil fertility		
c increased parts and diseases		
d. others		
B.3.9. What are the main marine produce that you use as fo	od sources or income so	urces? (Please list in order of
Importance & indicate whether for food of income sources)	
B.3.10. Do you have livestock? If yes what types of livestocl	k do you look after?	
Yes (please list types) No	,	
B.3.11 What crops do men mainly plant? Where?	B.3.12What crops do w	omen mainly plant? Where?
B.4. Health and Sanitation		
		·u / 2
B.4.1 What is the name of nearest Aid Post, where is it locat	ted and how far is it from	your village/here?
Location:	Distance from village (km)	
	visitance norn village (km,	
B.4.2. What range of services does the nearest aid post prov	vide (e.g. outpatient, dent	al, prenatal, antenatal etc)? (Please
list) - confirm information with aid post/ ask the health cert	ntre for AIDS and STD's	
B.4.3. What would be the three (3) main diseases/sicknesses	s or health-related issues	you face in your village? Get statistics
from health centre		, ,
1.		
2.		
3.		

B.4.4. What types of toilets are in the village? List according to most common first (pit, flush, bush, beach, other)
B.4.5. How do you dispose of your household waste? Organic / Inorganic
B.4.6. Do you have traditional practices to address health and sanitation issues?
B 5 Energy Source & Information Comm. Technology
B.5.1. What are your main energy sources for cooking (e.g. firewood, kerosene etc)? Please list according to frequency of
use. For fuel wood, state source.
B.5.2. What are your main energy sources for lighting (e.g. kerosene, diesel, solar, candle, batteries, firewood, etc)? Please
list according to frequency of use.
B.6. Disaster Risk Management
B.6.1. When was the last cyclone, drought and/or flooding event in the community? (Please list these events and
Event: Month: Year
B.6.2 What were the impacts of these events?
B.6.3 How did you or the community respond to these events? And how effective was this?
B.6.4. Did you get external assistance immediately after the event? If yes, who provide the assistance? - Within the
community/from government/relatives outside Kiriwina/NGO's/church
What was provided?
B.6.5. Do you have a village Disaster Management Plan? If yes please explain how it was developed and by whom?
Have you ever had to use it?
If yes, was it effective?
If not effective, why not?
R 6.6 Is there a Community Evecuation Contro (Chalter?
If yes who built it?
When was it built?
What condition is it in?

B.6.7. How is your community forewa	arned of impending ext	treme weather events?			
Word of Mouth Blowing	Conch-shell 🗆	Radio 🗆	VHF/HF	Radio 🗆	
Visit from government officers □ Bells □	Mobile phone □	Garamut beating \Box	TV 🗆	Church/School	
Traditional Knowledge 🗆 (Please exp	plain this)	Other (explain) \Box			
C. QUESTIONS TO DETERMINE PROGRAMME	LEVEL OF COMMUNIT	IY NEED AND INTEREST TO	PARTICIPATE IN	N CCCPIR	
C.1. Has your community ever partic	ipated in any research	and development projects in	the past?		
If yes, how did the community participate and was the project successful?					
What are the legacies of this project? (E.g. infrastructure, new crops, new farming systems etc.)					
C 2. How involved were you in the p	raiact(s)? Mara vou in	volved in planning decision	making and impl	omontation?	
C.2. How involved were you in the pi		volveu în planning, decision-	making, and impr		
C.3. If your community is selected to this project is successful and benefits	be a site for piloting a s the community?	a climate change project, how	would you assist	in making sure	

Appendix 1.2 Individual Interview Questionnaire

The CCCPIR team member(s) / interviewer(s) must make sure not to raise any expectations of the individual being interviewed. And each member must be honest and straight to the point. It is expected in this individual questionnaire that some information need to be verified from the group approach, so every care has been taken to rephrase some of the questions here. Again confidentiality has to be maintained at all times reassuring the interviewee that information gathered from him or her will in no way be used for other purposes other than for the purposes intended here – that is to determine the vulnerability and coping ability of this individual to climate change impacts.

Interviewer (s):		Name of per	son interviewed:	Time:	Date:
Survey Approach/Metho	d: Individual Village	er/Farmer/Fishe	erman Interview	. Province:	
1.1 District:			1.2 Name of LLG:		
13 Name of Ward			1.4 Name of Villag	e [.]	
1.5 Village Population:			1.6 Sample Size In	terviewed [.]	
2 Level of Assessment:	Preliminan/ Assessm	ant	1.0 Sumple Size in	tervieweu.	
3 Evaluation Focus	Livelihood Issues [Soci	ial & Economic	1 Climate Change &	Environment	allssues
4 Method Used:	Combined Elements o		nd NARI questionnai	ro	1135003
5 Size of household (nur	nher eating from the	same not)		ie	
	DEPIVE BASIC SOCIO.				
A.1. Demographic Inform	nation	Please tick o	r write answers as i	required with	n explanations
A.1.1. Is the person to be in	nterviewed male or fem	hale? Male \Box		Femal	e 🗆
A 1.2. Can you indicate wh	at age group you fall in	1?			
< 20 years 20-29	years \Box 30-39	years □ 40	-49 years 🗆 50	0-59 years □	60 + years 🗆
A.1.3. What is your Marital	Status? (Please indicat	e).	-	-	
Never Married	Married □ De Fact	to 🗆 🛛 S	Separated \Box	Divorced \Box	Widowed □
A.1.4. Do you have children	n? If yes – how many? -	– Male	Female		
A.1.5 Are you originally fro	m this village? If not, w	vhere are you fr	rom?		
A1.6. Are you a landowner	in this village?	How	long have you lived i	n this village	?
A1.7 Have you ever lived a	nywhere outside of you	ur village?	How long have	e you been ou	it of the village?
A.2. Socio-economic					
A.2.1. What is the highest I	evel of formal education	on you have att	ained?(Please indica	te)	
Never attended school	Primary school		Secondary school		Certificate 🛛
Diploma 🗆	Degree 🗆	1	Master's Degree 🗆		PhD 🗆
A.2.2 How many of your ch	ildren go to school?				
A.2.3. Where do your child	ren go to school? (Plea	ise name schoo	ol)		
Primany school:	Secondary school		ocational:	Colle	200
Filling School.	Secondary school	. v	ocational.	Cone	-ye.
A.2.4. How do your childre	n get to school?				
Walk 🗆 Cycle 🗆	Vehicle(PMV) 🗆	Private vehicle	□ non-motoris	ed boat 🗆	motorised boat 🗆
Hitching D B	oarding with relatives		Other 🗆 (Please ex	plain)	
Δ25 Are there any particu	Ilar problems about the	e school if the	vare what are thew?	(Please list ar	nd explain why?)
A.2.3. Are there any particular			y are, what are they:	(רוכמצב ווצג מו	
A.2.6. How do you get to t	he Aid Post? How ofte	n do you visit t	he Aid Post? (Please	state how ma	any times)
Walk 🗆 Cycle	□ Vehicle((PMV)	Private vehicle		non-motorised boat 🗆
motorised boat 🗆	Hitching 🗆	Other	r 🗆 (please explain)		
Daily 🗆	Weekly 🗆	Mont	hly □	Yearly 🗆	
				-	

A.2.7. What are th	ie common social p	oroblems you face ir	n the village?		
A.2.8. What are th	e causes of these	social problems?			
	, think those probl	ame can be overcon	an or column		
A.2.9. HOW do you		enis can be overcon	ne or solved!		
A.2.10. How do ye	ou communicate? (E.g. mobile phones,	internet, radio, TV	etc.)	
How many peopl	e own mobile phor	nes in this household	d?		
What media do v	ou use for news?		Are vou	up to date with	the news?
What mode of co	mmunication do y	ou uso in omorgons	ics to relay inform	ation outsido?	
Do you use Interr	net?	Facebook?	Ot	her?	
A.3. Economic R	elated Issues & In	formation Ple	ase tick or write a	answers as requi	ired with explanations
Less than K	100 🗆	From K100) - K500 □	From	К501-К1000 🗆
From K1001	– 5000 🛛	From K500	01 – 10,000 🛛	Above	e K10,000 🗆
A.3.2. How do you	u spend your mone	ey? <i>Please indicate i</i>	n percentage (%) c	of the total incom	ne (note: all must add up to 100).
Clothes	Medical	School fees	Cultural obligati	ons	Food
Housing	Transport	Church	Household goo	ds & sundries	Others (specify)
A.3.3. What are the (M/F/Both)? Rank	e main sources of according to inco	income (per annum me generation (mos)? Who features pr t=1 to least= 8). Ir	rominently in this ndicate top 3	s activity, men or women
1. Sale of agricult	ure produce				
2. Sale of marine	produce				
3. Sale of artefact	S				
4. Informal marke	ting				
5. Remittances					
6. Wages from fo	rmal employment				
7. Self-employed	(trade store)				
8. Tourism					
9. Other					
A.3.4 How much of interest?	do you or a family	earn (PGK) from tou	rists visiting your v	village and seeing	g your customs/activities or sites
Household earnir	ıg: K				

B.1 Food Resources &	४ Food Security [Agriculture, Fishe	eries]						
B.1.1 Where do you no	ormally get your food supply for you	Ir family or household?	(Tick box)?					
Garden 🗆	Gathering from wild \Box	Store goods 🛛	Others (specify) \Box					
B.1.2 Do you leave you	ur land under fallow for some time?	(Tick appropriate)	Yes 🗆 No 🗆					
<i>If Yes, for how long?</i> 1) Two-three Months 4) Two – Three years <i>If no, Why not?</i>	If Yes, for how long? 1) Two-three Months 2) Four-Six months 3) Six-Twelve months 4) Two – Three years 5) Three - Five years 6) More than five years If no, Why not? If no, Why not?							
B.1.3. Are there incide	nces of reduced fallow periods? If ve	es what are the impacts	of reduced fallow periods?					
B.1.4. What are the "Ta	aim Hangere" months, if any?							
R15 When you have t	food curplus do you uso any mothor	ds of storing food for la	tor concumption (uso?					
B1.5. When you have i								
Yes 🗆	No 🗆							
If Yes, what crops are	If Yes, what crops are preserved and for how long, what methods are used, and how long do the food last?							
Name of food crop	Preservation Method		How long the food can be preserved?					
D16 What are the th	rea most important constraints to us	ur forming prostices?						
D.1.0. What are the th	ee most important constraints to yo							
B.1.7 What are the ma & indicate whether for	B.1.7 What are the main marine produce that you use as food sources or income sources? (Please list in order of importance & indicate whether for food or income sources)							
B.1.8 Do you have live	stock? If yes what types of livestock	do you look after?						
Yes 🗆	No 🗆	(If yes, please list types)					
B.1.9 What crops do men mainly plant? Where? B.10 What crops do women mainly plant? Where?								
B.2. QUESTIONS TO DERIVE BASIC CLIMATE CHANGE AND ENVIRONMENT RELATED INFORMATION								
B.2. Natural Resource	es [Terrestrial, Marine, Freshwater	1						
B.2.1. What materials of low(L) or very low (VL	B.2.1. What materials do you get from your forest/bush? Please indicate whether very high (VH), high (H), moderate (M), low(L) or very low (VL) level of use							
Wild food:	Hunting:	Firewood:	Housing materials:					
Material for handicraft	ts: Garden materials:	Other uses:						

B.2.2. What traditional practices do you use to manage your terrestrial/land resources? Explain what you do and why.									
B.2.3. What traditi	onal practices	do you use to ma	anage	your mar	ine/freshwate	er re	sources? Exp	olain what you d	o and why.
B.2.4 Does vour w	ife or sister (s)	/ or vou (if vou ar	e a wo	oman) hay	ve access to a	and i	use these re	sources? If ves o	r no please
explain why?		- j (j		- , -				,	
B.2.5. What do yo	u know about	climate change?							
Nothing at all \Box		A little 🛛		Some	e information		N	/ery knowledgea	able 🗆
				han a 2 U	f	:		ol of concorre (T	
B.2.6. Are you con	cerned about	the impacts of cili	mate c	nange? I	r yes, piease	inaic	ate your lev	el of concern. (I	ICK UNLY ONE).
Not concerned at	all 🗆	A little concern	ed □		Moo	derat	te 🗆	Very concer	ned 🗆
What are you con	cerned about?								
B.2.7. Please indic	ate the level to	which you agree	with t	the follow	ving stateme	nts:		<u></u>	
Statements abou	t me and my	community	Do ac	o not gree	Agree a little	Mo	agree	Strongly agree	V. strongly agree
				-			5		5
B.2.1. My househo	old and I have i	eliable water							
B.2.2. My househo	old and I have i	reliable food							
resources	hly manage of	ır nəturəl							
resources (forests,	resources (forests, ocean)								
B.2.3. I am continu	ally monitorin	g local							
B.2.4. I know what	to do when th	iere is an							
impending droug	ht or flood.			_			_		
cvclones are appr	to do if tidal s oaching	urges or							
B.2.6. Our village v	vorks well toge	ether and will							
meet future challe	enges								
		ADDITIONAL INF				N FO	OD CROPS	FOOD CROP	
Cron Species	Number	Usage Freque	ency		Order of Imr	orta	ance	Seasonality	Is the crop
crop species	of	osage i reque	licy	1= Ver	y High		ince	(Yes/No)	Available
	different	1= All the time		2 = Hig	jh				throughout
	types	2 = Sometimes		3 = Me	dium			(->Use	the year?
		3 = Once in a w	hile	4 = Lov	V			Seasonal	Voc/No
		4 = NOL at all		S = Ver	y LOW			Calendar)	res/NO
Food Crops and	ood Crops and Vegetables Food			Income Generatio	on	Custom/ History			
Yam									
Taro									
Banana									
Cassava									
Sweet potato									
Aibika									
Rice									
Others (Pls. List)									

Fruits and Nuts						
Pawpaw						
(Рарауа)						
Pineapples						
Banana						
Galip Nut						
Pau						
Okari						
Breadfruit						
Others - List						
Thank you very much for your time in completing this survey.						

Appendix 1.3 Visual Observations – Guiding Questions

The Visual Observatory approach is an important method which tries to capture information in a deductive manner. In the Visual Approach some questions may be asked to individuals whose surroundings are being observed, other than that most questions will be guiding ones for the observer to note when making visual observations. The CCCPIR team member(s) involved or using this approach should already have some data on geology, geomorphology, soils, drainage patterns, vegetation and land use patterns, and the condition and use of these resources. Every attempt should be made to fill in any information gaps using this approach (e.g. taking pictures of how people access and manage their resources, garden practise to how they secure their food supplies.

Observer/Interviewer:			Time:	Date:
Survey Visu	al Observation	as with Limited Questioning.	1 Province:	
Approach/Method:				
1.1 District:			1.2 Name of L	LG:
1.3 Name of Ward:			1.4 Name of V	/illage:
1.5 Village Population:			1.6 Sample Siz	ze Observed:
2 Level of Assessment:	Preliminary 4	ssessment	1.0 50111010 512	
3 Evaluation Focus	Livelihood Is	sues [Social & Economic] Clim	ate Change & Env	ironmental Issues
4 Method Used:	Combined El	amonts of PPA & PPA	late change & Linv	
E Site observed	Combined Li			
			65	
A 1 Demographic Informat	tion	Write your observation no	tos horo	
A 11 Maybe a photograph of	or two on the	white your observation no	tes here	
types of houses and the mat	arials used			
water storage on the house	construction			
(if its built on the ground on	stilts atc)			
(in its built of the ground of	stills etc)			
A.2. Social		Write vour observation no	tes here	
A.2.2. Maybe a photograph of	or two on the			
types of materials used to bu	uild the			
school/health centre/evacuat	tion centre,			
water capture and storage.				
A.3. Economic Related Issue	es &	Write your observation no	tes here	
Information		-		
A.3.1 Observe what is sold ar	nd by whom.			
B. OBSERVATIONS O	N THE NATUR	RAL ENVIRONMENTS (PHYSI	CAL SURROUNDI	NGS).
B.1. Natural Resources [Ter	restrial,	Write your observation no	tes here	
Marine, Freshwater]				
B.1.1. What type of farming s	system is			
used? And what is the most of	commonly			
grown crop/vegetable in the	garden?			
B.1.2. Note any pest and dise	eases and or			
presence of any invasive spec	cies. Again			
take photos were necessary.				
D12 And the second second second second	-1 1			
B.1.3. Are there any tradition				
dona in gordana?				
done in gardens?				
P14 Apyright of land door	adation?			
D.1.4. Any signs of land degra	auation?			
whether this is caused by ha	lural means			
or numan induced?				

B.1.5. Determine soil quality in the site where you are? Note that soil quality refers to structural properties, how much organic matter maybe present, has good aeration, fertile with pH between 5.5 -7.5.																											
B.1.6. Determine if the area is subjected to flooding/inundation or is prone to erosion. Estimate how much of the area is subjected to seasonal flooding and how much is permanent inundation (swamps).																											
B.1.7. Estimate in percentage (%) how much land is used, what it is used for and how much is reserved or under fallow or some form of regenerative state or conserved.																											
B.1.8. Water quality of existing water sources especially streams/creeks used for consumption or bathing.																											
B.1.9. Any stream-bank or coastal erosion that you can note and how far are the village houses from the streams or coastline. Estimate in meters and get photographs.																											
B.1.10. Drainage around the village and homes (poor/ good)																											
The survey	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	œ	7	6	л	4	ω	Ν	ч	NO.
---------------------------------------	--	--------------------	-----------------------	---	-----------------------------	--------------------------------	-------------------------	-------------------------------	-----------------------	-------------------------	----------------------------	-------------------	-------------------	--------------------------------	--	----------------------	------------------------------------	-----------------------------	------------------	------------------------------	--------------------	--------------------	---	-----------------------	---------------------------------	--------------------------	---------------------
/ team members who actually carried c	Mr. Tovesei Toboeta	Mr. Tom Cameron	Mr. Tolobuwa Olivilei	Ms. Theresa Paru	Mrs. Susan Kabeuya	Mr. Stanley Oa	Mrs. Siporah Moses	Mr. Ropsy Taudiri	Mr. Robeisi Muqwaqata	Mr. Richard Luvakesa	Chief Pulayasi Daniel	Mr. Peter Abraham	Mr. Moses Solomon	Mr. Mika Andrew	Mr. Mark Sailoia	Mr. Mado Asaeli	Mr. Lucas Kosau	Chief John Kasaipwalova	Mr. James Ernest	Mr. James Duks	Mr. Gem Moyona	Mr. Erami Killion	Ms Christine Fung	Mr. Ambrose Monumwesa	Mr. Alfred Vincent	Mr. Albert Milala	PARTICIPANTS
out the survey	Kiriwina Council of Chiefs	Kiriwina Rural LLG	Villager	GIZ/SPC CCCPIR Programme	Division of Community Dev.	National DAL	Villager	MB Provincial Government DAL	Kiriwina Rural LLG	District Administration	Kiriwina Council of Chiefs	Obulaku Ward	Tubowada Ward	National DAL	Kiriwina DA Education Sector	PNG Forest Authority	Kiriwina Health Sector	Kiriwina Council of Chiefs	NARI - Laloki	MB Provincial Government DAL	Kiriwina Rural LLG	Kiriwina Rural LLG	GIZ	Villager	Kiriwina Council of Chiefs	OCCD-Adaptation Division	ORGANISATION
	Representative of the Council of Chiefs*	President	Subsistence Farmer	Project Finance & Administration Assistant*	District Comm. Dev. Officer	Acting Chief Land Use Officer*	Women's Representative*	Acting Food Security Officer*	Area Manager	Consultant*	Paramount Chief	Councillor	Ward Recorder	PACC PNG National Coordinator*	District Education Advisor & Acting District	Project Supervisor*	District Health Extension Officer*	Chief and Member of the KCC	Aqronomist*	DAL Principal Advisor*	Vice President	Caretaker Nabusa	Deputy Team Leader & Land Use Planning Specialist	Subsistence Farmer	Chiefs Assistant and Body Guard	Project Officer*	DESIGNATION
	7391 1391	7339 6424	7008 7951	7068 2026		7345 2776	7103 3438		7307 4559	7090 3891	7384 0407	7266 3295	7205 3735	7377 3140		7147 7522	7065 9089	7191 3580	7390 9039			7171 8146	(+679) 9924956	7136 29775 / 6411 037			MOBILE PHONE NUMBER

Appendix 2. List of Participants Who attended the Meetings and Involved in the Survey

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Appendix 3. Program of Events & Order of Proceedings in Conducting Interviews

PROGRAM OF EVENTS							
STAGES	DATE	ΑCΤΙVITY					
Preparatory Stage	24-26 th April 2014	Finalising of Detailed Tentative Work Programme, Questionnaires and Preparations at OCCD Office in Pt. Moresby					
	27 th April 2014	Travel to Alotau					
	28 th April 2014	Meeting with the Provincial Administration particularly Provincial DAL, Disaster and Planning and PNG Forestry Authority.					
Meetings	29 th April 2014	Travelled to Losuia-Kiriwina Islands					
	30 th April 2014	Meeting with the Kiriwina District Rural LLG Officials					
Conducted Survey	1 st May 2014 2 nd May 2014 3 rd May 2014 4 th May 2014 5 th May 2014	Conducted Interviews at Tubowada Village Conducted Interviews at Obulaku Village Conducted Interviews at Kuyawa Island Rest Day [Sunday] Conducted Interviews at Tukwaukwa Village					
Debriefing and Departure	5 th May 2014	A debriefing was done in the evening amongst the team members and later briefed the Acting District Administrator and Vice President of the KRLLG.					
	6 th May 2014	Departed for Alotau					

ORDER OF PROCEEDINGS IN ALL VILLAGES

- 1. Open with a Word of Prayer
- 2. Introductions led by Tovesei Toboeta of the purpose of the visit and survey
- 3. The Team gets introduced by Tovesei Toboeta
- 4. A Team Member then elaborates further presents the Program for the day, outlining the objectives and expected Outcomes
- 5. Local Kiriwina Team Members recap the message and translate this to the people in the local vernacular
- 6. The Team Members then break up into interview groups [individual, focus]
- 7. Those Team Members who finish their interviews early proceed onto visiting the surroundings and garden sites and continue with their observations.

Monday 28th April 2014	Thursday 24th April 2014 and Friday 25th April 2014.	APPENDIX 4. DAYS AND DATES
Preparatory meeting in Alotau @ Masurina Lodge	Preparatory meeting in Port Moresby with national stakeholders @ OCCD Office	ACTIVITY AND ACTIVITY DETAILS
 Purpose: 1.) To welcome on board the 4 new provincial counterparts/members to join the CCCPIR team and 2) To brief them on the outcomes of the deliberations that took place in POM as well as the work plan for Kiriwina and finalise anything that the provincial counterparts may require incorporating or omitting. Objective: To ensure that the provincial team and the CCCPIR team are well informed and prepared to ensure expected outcomes are achieved as each activity is implemented. 	 Purpose: 1.) To deliberate on the survey approaches, baseline data that is available and compile or review the draft questionnaires used by various agencies to be used on the survey. 2) To also prepare a brief/presentation on the CCCPIR Project itself and the POM deliberations so that this can be made known in the Alotau meeting Objective: To ensure that the team is well informed and prepared to ensure the expected outcomes are achieved as each activity is implemented 	Y STAGE: KIKIWINA SCOPING STOL PURPOSE AND OBJECTIVE
 Outcome: The expected immediate outcome is that; the Provincial team members are well informed of what needs to be done at every stage of the execution of the work programme and that each member is conversant with the tools that will be used when the actual implementation of the reconnaissance work commences. The expected medium and long term outcomes in engaging these provincial team members is that; the provinces can be able to re-organise and be able to undertake such tasks or come up with similar projects in future. Outputs: 1) Equipment/Resources (GPS/Field-books/Maps/Pencils/Erasers etc) on hand 2) Confirmed plan of action/programme 3) Confirmed final survey template (s) 5) Briefs/presentation of the deliberations for Kiriwina Meeting readied & finalised. 6) A signed MOU with the MBPA 	 Outcome: The overall expectation is that the CCCPIR Team members are well informed of what needs to be done at every stage of the execution of the work programme and that each member is conversant with the tools that will be used when the actual implementation of the recomnaissance work commences. Outputs: 1)Equipment/Resources (GPS/Field-books/Maps/Pencils/Erasers etc) on hand 2) Confirmed detailed work plan or programme with expected outcomes**. 2) Agreed final survey template (s) 3) Agreed final survey template (s) 4) Briefs/presentation of the deliberations finalised for Alotau 	EXPECTED OUTCOMES AND OUTPUTS
The four (4) provincial officers who will be involved will be individuals representing the Provincial DAL, Disaster, Environment and Forestry Officers It is crucial to engage the provincial officers at this point in time when many similar kinds of climate change programs are on-going in the province, so that some of the activities (field visits) can be done by the provincial staff if the national implementation agencies are not able to meet deadlines	By then Christine should already be in POM at least a day earlier before the Preparatory meeting in POM (OCCD) The CCCPIR team (POM-based) including Christine Fung should depart Pt. Moresby on Sunday 27th April 2014 (<i>Please refer to</i> <i>the tentative trip programme prepared by</i> <i>James Ernest</i>) ** This is a draft work program outlining only the major activities and expected outcomes and outputs. This can be refined and finalised incorporating changes including the tentative program prepared by James.	REMARKS

DAYS AND DATES	ACTIVITY AND ACTIVITY	PURPOSE AND OBJECTIVE	EXPECTED OUTCOMES AND OUTPUTS	REMARKS
Tuesday 29 th April 2014	Meet District Administrator & LLG President	Purpose: I) To meet and brief the District 1.) To meet and brief the District I Administrator, the LLG President, I Councillors, selected District Officers I and village chiefs the purpose of the I CCCPIR team's visit and plans on I what the CCCPIR team will be doing I in the next four (4) days. I Objective: I To ensure that the DA, district staff, I LLG President, Councillors & village I Chiefs are informed about the I CCCPIR Project so that they become I	 Outcome: The expected immediate outcome is that; the DA and LLG President and the key District Officers are well informed of our plans and lend support where and whenever needed with this engagement and any future engagements or encounters. The expected medium and long term outcomes in engaging the district officers is to expose them and up-skill them to be able to undertake similar kinds of projects in future in close consultations with their provincial counter-parts. Outputs: Interim arrangements for the engagement of 2 district officers & 2 local village leaders 	After arriving from Alotau and checking in @ Butia Lodge, the meeting takes place between 1300hrs and 1500hrs.
Wednesday 30 th April 2014	Preparations for the Conduct of the Reconnaissance	Purpose: 1.) To meet the two district officers and 2 village leaders and arrange logistics.	Outcome: The expected immediate outcome is that; the CCCPIR team is mobile and able to visit villages and conduct the survey. Outputs:	The first half of the day will be meeting with the district officers and arranging logistics.
	Survey	Objective: To ensure that boats/dinghies/hire car are appropriate, operational and safe to use by the CCCPIR team whenever needed to complete the survey within the set dates	Confirmed dates of visit/survey with the identified village communities so that villagers are present on the agreed dates.	our arrival in Kiriwina; It is recommended here that the CCCPIR team with colleagues from the province and district spend the afternoon (1-4pm) of 30 th April just visiting the oossible sample villages for the team to meet the village councillors and familiarise themselves/ourselves with the area and confirm dates of visits/surveys to be conducted with the dentified village communities. The team then spends the evening (after meal) to discuss/consolidate/make any final changes for work to commence the next day.
Thursday 1 st May 2014 To Monday 5 th May 2014	Conduct the reconnaissance survey in identified/select ed sample villages	Purpose: 1.) To scope and ascertain against background information (baseline data) the situation on the ground/in villages and the surrounding environments the vulnerability and adaptive capacity of the people and natural resources to the impacts of climate change and climate change	Outcome: The expected immediate outcome is that; upon completion of the survey a preliminary focal entry point [sector(s) is identified as a result of the survey so CCCPIR Project can intervene and design an intervention program containing strategies on how to address identified climate change induced risks/issues affecting the communities – issues in any sector that put peoples' lives and the environment at risk.	By focal entry points/sectors reference is made to Component of the CCCPIR Programme - Implementation of Adaption & Mitigation Measures at the National Level through the key sectors of Agriculture, Fisheries and Forestry or Environmental. Environmental. There were many issues raised and noted in the Alotau Meeting in October last year (2013) and the team can make reference to some of the management interventions suggested then.
		risks induced by the impacts. Objective: Complete the survey within the set date and making sure data collected is adequate and relevant for the purposes of designing a Climate Change intervention program/or pilot project.	 Preliminary Analysis of Collected Data A preliminary Land Use Map of the Area and villages/village communities that are vulnerable to climate change risks. A list of possible adaptation and mitigation measures that could be piloted in selected vulnerable villages communities. Brief on the findings and the next course of actions to undertake after the completion of the survey. 	t is important to compile and analyse data collected at the end of each day so that the CCCPIR team is in a position to analyse this and list possible adaptation and mitigatory measures as each issue comes prominent. At the same time it s only proper to brief the DA and the village leaders what our oreliminary findings are and the next course of actions that may take place before the team departs Kiriwina.

APPENDIX 4. PREPARATORY STAGE: KIRIWINA SCOPING STUDY/WORK PROGRAMME – 2014 [CONTINUED]

Appendix 5. An Evaluation and Intended Statistical Analysis of Important Research Questions Based on Responses Gathered from the Scoping Assessment.

Research Questions	Research Hypothesis	Null Hypothesis	Statistical Test/Others
Are Kuyawa Islanders more likely to be greatly affected by climate change impacts than the other villages of Obulaku, Tubowada and Tukwaukwa?	Kuyawa Islanders are likely to be greatly affected by CC Impacts than the other villagers	All Village Communities are likely to be affected equally on the same degree or level of impact	Chi-Test ANOVA Test [The statistical packages that were to be used could not be accessed and even the R statistical is not so user friendly so decided to use the point and matrix system]
Do Kuyawa Islanders differ from Obulaku, Tubowada and Tukwaukwa villagers in their ability to cope to CC Impacts?	The Level of Ability of the Kuyawa Islanders to cope to CC impacts differ greatly from the rest of the villagers in Obulaku, Tubowada and Tukwaukwa.	The Level of Ability of the Kuyawa Islanders to cope to CC impacts will be the same as the rest of the villagers in Obulaku, Tubowada and Tukwaukwa.	ANOVA Test [The statistical packages that were to be used could not be accessed and even the R statistical is not so user friendly so decided to use the point and matrix system]

Table 5.1. Research Questions Hypothesis and Statistical Tests

Table 5.2. Variables and their Levels of Measurements

Research Questions	Independent Variable	Dependent Variable
Are Kuyawa Islanders more likely to be greatly affected by climate change impacts than the other villages of Obulaku, Tubowada and Tukwaukwa?	 Levels Incomes: [L, M & H] Three Levels of Income Diversity of Income Sources: [F, S & M] Three Levels of Income Sources Diversity of Food Sources: [F, S & M] Three Level of Food Sources Crop Production Levels: [L, M & H] Three Levels of Crop Production Diversity of Water Sources: [F, S & M] Three Level of Food Sources Standard of Housing: [L, M & H] Three Levels of Housing Standards 	Level of CC Impacts: Three Levels of CC Impacts
Do Kuyawa Islanders differ from Obulaku, Tubowada and Tukwaukwa villagers in their ability to cope to CC Impacts?	 Levels Incomes: [L, M & H] Three Levels of Income Diversity of Income Sources: [F, S & M] Three Levels of Income Sources Diversity of Food Sources: [F, S & M] Three Level of Food Sources Crop Production Levels: [L, M & H] Three Levels of Crop Production Diversity of Water Sources: [F, S & M] Three Level of Food Sources Accessibility to Main Services: [E, NSE & H] Three Levels of Accessibility to Govt. Services 	Level of Ability to Cope CC Impacts: Three Levels of Ability to Cope to CC Impacts

Table 5.3. Categorising Variables and their Levels of Measurements

Research Questions	Independent Variable	Dependent Variable
Are Kuyawa Islanders more likely to be greatly affected by climate change impacts than the other villages of Obulaku, Tubowada and Tukwaukwa?	 1. Levels Incomes: [L, M & H] Level 1 – Low [<k500.00]< li=""> Level 2 – Moderate [K501-K1000] Level 3 – High [K1001-5000] 2. Diversity of Income Sources: [F, S & M] Level 1 – Few [1 source] Level 2 – Some [2-3 sources] Level 3 – Many [>3 sources] 3. Diversity of Food Sources: [F, S & M] Level 1 – Few [1 source] Level 2 – Some [2-3 sources] Level 3 – Many [>3 sources] 4. Crop Production Levels: [L, M & H] Level 1 – Low [1-3 disease-free tubers/mound] Level 2 – Some [4-6 disease-free tubers/mound] Level 3 – Many [>6 disease-free tubers/mound] Level 1 – Few [1 source] Level 2 – Some [2-3 sources] Level 3 – Many [>3 sources] 6. Standard of Housing: [L, M & H] Level 1 – Low [All Bush Material] Level 3 – High [Permanent] </k500.00]<>	Level of CC Impacts: Level 1 – Low impact Level 2 – Moderate Impact Level 3 – High Impact
Do Kuyawa Islanders differ from Obulaku, Tubowada and Tukwaukwa villagers in their ability to cope to CC Impacts?	 1. Levels Incomes: [L, M & H] Level 1 – Low [<k500.00]< li=""> Level 2 – Moderate [K501-K1000] Level 3 – High [K1001-5000] 2. Diversity of Income Sources: [F, S & M] Level 1 – Few [1 source] Level 2 – Some [2-3 sources] Level 3 – Many [>3 sources] 3. Diversity of Food Sources: [F, S & M] Level 1 – Few [1 source] Level 2 – Some [2-3 sources] Level 3 – Many [>3 sources] 4. Crop Production Levels: [L, M & H] Level 1 – Low [1-3 disease-free tubers/mound] Level 2 – Some [4-6 disease-free tubers/mound] Level 3 – Many [>6 disease-free tubers/mound] Level 4 – Few [1 source] Level 5 – Some [2-3 sources] Evel 6 – Few [1 source] Level 7 – Kater Sources: [F, S & M] Level 8 – Many [>6 disease-free tubers/mound] Level 9 – Some [2-3 sources] Level 1 – Few [1 source] Level 1 – Few [1 source] Level 2 – Some [2-3 sources] Level 1 – Few [1 source] Level 2 – Some [2-3 sources] Level 3 – Many [>3 sources] 6. Accessibility to Main Services: [E, NSE & H] Level 1 – Easily Access to Govt. Services Level 2 – Not so easy to Access Govt. Services Level 3 – Hard to Access Govt. Services </k500.00]<>	Level of Ability to Cope to CC Impacts: Level 1 – Low Ability Level 2 – Moderate Ability Level 3 – High Ability

Table 5.4. Defining Variables and their Levels of Measurements

Table 5.4.1. Defining Variables for Research Question 1.

Are Kuyawa Islanders more likely to be greatly affe Tubowada and Tukwaukwa?	cted by climate change impacts than the other villages of Obulaku,
Independent Variable	Definition and Reasoning
1.Levels Incomes: [L, M & H] Level 1 – Low [<k500.00] Level 2 – Moderate [K501-K1000] Level 3 – High [K1001-5000]</k500.00] 	Taken form the questionnaire and the levels (coding as would have been use in the statistical package) are straight forward and according to the way we have perceived the situation on Kiriwina and not to some outside standard.
 2. Diversity of Income Sources: [F, S & M] Level 1 – Few [1 source] Level 2 – Some [2-3 sources] Level 3 – Many [>3 sources] 3. Diversity of Food Sources: [F, S & M] 	There are four sources that are reported here and include the terrestrial sources, fresh water, marine sources and others [remittances, wages etc.]. The more main sources of income (at least >50% earned from each source) the lesser the impacts are likely to be because people we assume will be able to use these sources to be able to fend for themselves
Level 1 – Few [1 source] Level 2 – Some [2-3 sources] Level 3 – Many [>3 sources]	There are four sources [terrestrial, freshwater, marine and trade stores] of food. The more sources of food the lesser the impacts of climate change.
4. Crop Production Levels: [L, M & H] Level 1 – Low [1-3 disease-free tubers/ mound] Level 2 – Moderate [4-6 disease-free tubers/mound] Level 3 – High [>6 disease-free tubers/mound]	We have not been able to collect the numbers of tubers but from the many photographs taken we have arbitrarily come up with three levels and use this as a reference point against the statements derived from the survey.
5. Diversity of Water Sources: [F, S & M] Level 1 – Few [1 source] Level 2 – Some [2-3 sources] Level 3 – Many [>3 sources]	Taking into account the rainfall data [although old records], we instead refer to the four main sources such as rainwater [tanks], shallow wells, closed underground wells, caves and subterranean sources. The more sources the lesser the impacts.
6. Standard of Housing: [L, M & H] Level 1 – Low [All Bush Material] Level 2 – Moderate [Semi-permanent] Level 3 – High [Permanent]	The impacts on the standard of housing are looked at from two perspectives (1) potential for damage by strong winds/cyclones (2) added advantage of collection of rainwater [volume and quality]
Dependent Variable	Definition and Reasoning
Level of CC Impacts:	
Level 1 – Low impact	A minimum number of independent variables with high income, many sources of income, many sources of food, high crop production levels, many water sources, more than 50% permanent houses in villages.
Level 2 – Moderate Impact	Some number of independent variables with moderate income, some sources of income sources, some sources of food, moderate crop production levels, some water sources and 30 % permanent houses or 50% semi-permanent houses.
Level 3 – High Impact	Many number of independent variables with low income, few sources of income, few sources of food, low crop production levels, few water sources and 10% permanent houses or 30% semi-permanent houses or all traditional bush material houses.

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Independent Variable	Definition and Reasoning
1. Levels Incomes: [L, M & H] Level 1 – Low [<k500.00] Level 2 – Moderate [K501-K1000] Level 3 – High [K1001-5000]</k500.00] 	Taken form the questionnaire and the levels (coding as would have been use in the statistical package) are straight forward and according to the way we have perceived the situation on Kiriwina and not to some outside standard.
2. Diversity of Income Sources: [F, S & M] Level 1 – Few [1 source] Level 2 – Some [2-3 sources] Level 3 – Many [>3 sources]	There are four sources that are reported here and include the terrestrial sources, fresh water, marine sources and others [remittances, wages etc.]. The more sources of income the lesser the impacts are likely to be because people we assume will be able to use these sources to be able to fend for themselves
3. Diversity of Food Sources: [F, S & M] Level 1 – Few [1 source] Level 2 – Some [2-3 sources] Level 3 – Many [>3 sources]	There are four sources [terrestrial, freshwater, marine and trade stores] of food. The more sources of food the lesser the impacts of climate change.
4. Crop Production Levels: [L, M & H] Level 1 – Low [1-3 disease-free tubers/ mound] Level 2 – Moderate [4-6 disease-free tubers/mound]	We have not been able to collect the numbers of tubers but from the many photographs taken we have arbitrarily come up with three levels and use this as a reference point against the statements derived from the survey.
5. Diversity of Water Sources: [F, S & M] Level 1 – Few [1 source] Level 2 – Some [2-3 sources] Level 3 – Many [>3 sources]	Taking into account the rainfall data [although old records], we instead refer to the four main sources such as rainwater [tanks], shallow wells, closed underground wells, caves and subterranean sources. The more sources the lesser the impacts.
6. Accessibility to Main Services: [E, NSE & H] Level 1 – Easily Access to Govt. Services Level 2 – Not so easy to Access Govt. Services Level 3 – Hard to Access Govt. Services	This is basically a measure of how quickly (shortest time possible) villagers can get emergency services or relief teams can be able to reach the villages during natural disasters or any other crises.
Dependent Variable	Definition and Reasoning
Level of Ability to Cope to CC Impacts: Level 1 – Low Ability	Many number of independent variables with low income, few sources of income, few sources of food, low crop production levels, few water sources and hard to access Govt. services.
Level 2 – Moderate Ability	Some number of independent variables with moderate income, some sources of income sources, some sources of food, moderate crop production levels, some water sources and not so easy to access Govt. services [especially obstacles such as bad weather or unavailability of transport or money].
Level 3 – High Ability	Few number of independent variables with high income, many sources of income, many sources of food, high crop production levels, many water sources and easily have access to Govt. services.

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