Executive Summary

The vulnerability of the people of Saoluafata and Lano are a cumulative impact of exposure, to climate related risks reflecting both climatic conditions and location of human settlement, assets and infrastructure and the capacity of the people to cope with the climate related risks. Communities have been adapting in the past and still are adapting today, however, extreme climate related extreme events are increasing which have greatly impacted on the livelihoods of the people and their socioeconomic and physical environment.

The Community Vulnerability and Adaptation Assessment (CV&A) findings from Saoluafata and Lano represent what most communities of Samoa are facing with respect to the challenges from climate extremes and variability. The direct impact of tropical cyclones, long periods of droughts, sporadic rainfall, and increase temperature, high storm surges have impacted greatly on the lives of the community and their resources.

The destruction of crops from cyclones, droughts and flooding has impacted on their income and consumption. They are more prone to health hazards with favourable conditions for vector and waterborne diseases. The poor quality water during intense rainfall and salinisation of coastal springs from high storm surges affects their everyday life. The communities have become more dependent on their families overseas for assistance to recover from cyclones and provide sources to rebuild and support their families for everyday living such as school fees for the children, food for consumption, support the visits to the hospital and many more.

Saoluafata and Lano communities are coping with the changes they are facing and their strategies range from soft solutions to hard physical barriers such as seawalls and reclamation to save and protect their lands from coastal erosion and inundation.

Adaptation options identified were well discussed and researched not only by the experts but also with the help from the community experts. Adaptations options identified and prioritise were considered with issues such, as empowerment of the community will be addressed, reduction of risk to climate variability and future climate change and improve the livelihoods of the communities. If the communities are empowered and contain enough support system then it is believed they will survive the existing climate changes and extreme events.

Adaptation options identified and prioritized with consensus from the communities opted mostly for soft solutions and some hard solutions that will help improve the livelihoods of the communities. Saoluafata has prioritized the implementation of coastal protection mechanisms such as seawall, and revegetation, promote education and awareness programs, watershed management and reforestation programs. These measures will reduce the risk of land loss, inundation and improve the livelihood of the people.

Lano community hope to see the uplift of the existing ford as the only solution to the flooding together with well planned drainage systems. Others include, conserving their mangroves, restoration of coastal springs by protecting them from high waves and storm surges, education and awareness programs target different issues such as preparedness from natural disasters, resilient crops and best practices, health issues which needs to be improved through these educational programs.

Introduction

Communities of Saoluafata and Lano are particularly vulnerable to climate change. Their capacity to adapt to changes in climate are limited and constrained by many factors which include a lack of awareness and understanding of the rapid changes happening around them. They have adjusted to a changing climate for centuries although the scope of their adaptation is very gradual and involves a learning by doing process. Samoa is susceptible to climate-related risks such as drought, flashfloods and tropical cyclones, and communities have limited capacity to deal with these risks.

This vulnerability and adaptation assessment study focuses on two pilot communities (Saoluafata and Lano) under the "Capacity Building for the Development of Adaptation Measures in Pacific Island Countries" (CBDAMPIC) project. They are the most vulnerable to coastal erosion and flooding, affecting the mainstay of their livelihoods. The purpose of this assessment is not only to gather information but to help these communities build their resilience and capacity to adapt to a changing climate. This is an innovative work for Samoa and hopefully lessons learnt from this pilot project will be of benefit to the wider Samoan community.

Samoan Context

Samoa has a total land area of 2,934km^2 and an exclusive economic zone (EEZ) of 12,000 km$^{2.}$ It is located between latitudes 13^0 15' S and 14^0 5' S and longitudes 171^0 23' W and 172^0 48' W, which places it within the tropical cyclone region. Samoa is an oceanic volcanic archipelago formed in a westerly direction. The climate is typical of small tropical islands, geographically isolated from big landmasses. The rainfall and humidity are usually high. Distinctive wet and dry seasons are experienced only on the leeward (northwestern) sides of the main islands, Savaii and Upolu. Temperatures are generally high and uniform throughout the year with the southeasterly trade winds blowing almost throughout the year. Severe tropical cyclones affect Samoa and are most likely to occur during the summer months of December to February. Samoa is also vulnerable to anomalously long dry spells that coincide with the EL Nino Southern Oscillation (ENSO) phenomenon.

About 70 percent of Samoa's population and infrastructure are located in the coastal area, as reported in our Initial National Communication Report (1999). Nearly all the coastal settlements are located in low-lying areas, thus making them more vulnerable to climate change and sea level rise. This vulnerability is exacerbated during extreme weather events as clearly demonstrated in the devastating impacts caused by cyclones Ofa (1990) and Val (1991). The cyclones caused severe damage to agricultural plantations, infrastructure, natural resources and the country's biodiversity. This had serious implications for Samoa's socio-economic base, thus making climate change and variability an issue of great concern.

Reconnaissance surveys of communities around Samoa all points to a general agreement that the climate is changing. Awareness is now building that waves are higher than they were a decade ago and there is no longer a clear distinction between the dry cold winter and the hot wet summer season. Comments have also been articulated on the frequency and severity of storm events resulting in millions of dollars of damaged infrastructure, increasing landward movement and erosion of coast lines, droughts causing commercial and subsis-

tence agricultural losses to farmers and the country's economy, damaged coast lines, coral bleaching and an increase in waterborne diseases. These are some of the new experiences and issues that the people of Samoa have had to address as a result of a changing climate.

Samoa's vulnerability to climate change is enhanced by human activities and development in the country. This includes the extraction of beach and alluvial sediments that supply the coast; truncation of beach profile by seawalls and prevention of sand deposition by wave reflection, trapping of long shore drift on the uplift side of groynes and reclamations and erosion of down drift coast and the destruction of protective saline and coastal vegetation.[1]

Climatology

Meteorological data collected by the Observatory for more than 101 years have shown an increase in average temperature of about 1 to 2 degrees (see table 5 and figure 1). This increase in temperature is consistent with the projected changes provided by the International Panel on Climate Change. Also, the Sea Level and Change monitoring Project (AUSAid funded project) that monitors sea-level change have indicated an increasing trend (as of May 2002) of 3.7mm per year, a rate of increase higher than the global average of 1 to 2 mm per year. Given the figures mentioned, increase in temperature and sea level coupled with increased precipitation (volume and intensity), warmer oceans, and an increase in tropical cyclones and storm surges, will undoubtedly impact negatively on Samoa's environmental, social and economic sectors.

At the local level, communities are already feeling the changes in the general climate from a not very distinct hot-wet and dry-cold season, to days becoming hotter than before, and tropical cyclones becoming intensive and damaging. Communities are also experiencing heavy sporadic and intense rainfalls that cause major flooding and landslips in some parts of the country. The increase in spring tides and strong waves is also an indicator of sea level change as fishermen have observed. The community of Lano has also reported that there have been times of low tides leaving corals exposed to direct sunlight and heat. Samoa's communities will likely be able to cope with a gradual increase in mean temperature and precipitation, however, a sporadic increase and variability is damaging particularly to fishermen or farmers whom need to plan their cropping calendar accordingly. For the general community, an increase in the occurrence of floods as well as frequency and intensity of tropical cyclones is alarming and is a major issue.

The anticipated changes for the Pacific region have direct bearing on Samoa's future climate. An expansion of warm regional sea surface temperatures usually suppressed to the west equatorial Pacific region will likely present some warming of local coastal waters. This will in turn influence ambient air temperatures and the rainfall distribution patterns across the island group. Warmer waters will likely affect the fisheries sector while rising sea-levels will mean greater risk to inundation and salt water intrusion into local freshwater springs. The IPCC Third Assessment Report (2001) states a relative increase in minimum and maximum temperature, giving rise to a general change in overall mean. Future climate, may correlate with an increase in climate variability and changes in mean annual precipitation amounts in various parts of the region including possible changes in the aspects of rainfall (e.g. an increase in the frequency of high intensity rainfall periods).

[1] Ibid

Overall Temperature Increase for Samoa

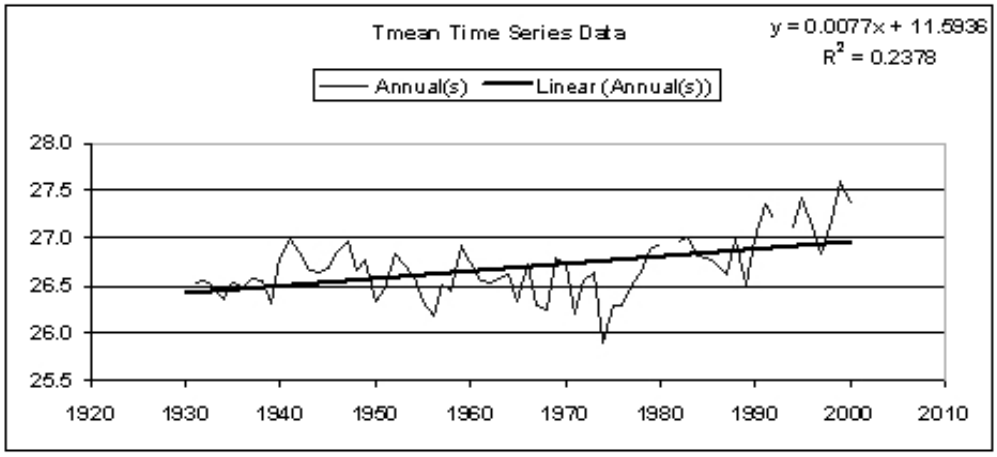


Figure 1. Overall Temperature Increase for Samoa
Source: Samoa Meteorology Division

Climate Element	Trend
Maximum Temperature	0.67°C increase
Minimum Temperature	0.18°C increase
Mean Temperature	0.59°C increase
Precipitation	49.28mm increase

Table 5: Climate Parameters in Apia
Source: Samoa Meteorology office

Pilot Sites

Communities in Samoa are facing challenges and threats from climate change, sea level rise, climate variability and extreme events. The availability of funds from Canada enabled the government of Samoa and the National Climate Change Country Team (NCCT) to select communities that are at high risk and most vulnerable to these threats. Given the funds available for activities, only two sites were selected i.e. Saoluafata in Upolu and Lano in Savaii.

Saoluafata Community

Saoluafata Village has been identified as one of the most vulnerable communities to coastal erosion and flooding. Activities such as land reclamation and sand mining have exacerbated their vulnerability to climate change and sea level rise. The area is characterized by steep headlands and narrow coastal plains. Relatively well-developed fringing and barrier reefs are found along the coastline. The coast is exposed to the north and east, with no significant area of sheltered lagoon. Most settlement is found along the coast with plantations generally located on the tops of the headlands at some distance from the village[2] Village houses, the primary school, pre-school and churches are located in the coastal area of the village. The village *malae* or heritage and cultural ground are also located near the coast. This sacred ground is where village meetings and all cultural activities are held. Dead trees in the lagoon where the beach was before the cyclones characterize existing beachfront at Saoluafata Reclamation by individual families is a continuous process but reclaimed land can only withstand erosion for a short period of time. A wetland area was used for a *tilapia* nursery and along the edges there exist three coastal springs that supported the village in the past with their water supply. A government built seawall to protect the road and other government assets ends at the boundary where Saoluafata village starts. The village also has a marine reserve, which is managed by the village with assistance from the Fisheries Division. A

Saoluafata map

Household Income Source	Total	%
Plantation	50	27.6
Salary and Wages	46	25.4
Remittances	34	18.8
Old Age Pension	22	12.2
Fishing	12	6.6
Business	5	2.8
Gifts / Donations	5	2.8
Handicrafts	4	2.2
Other	2	1.1
Traditional	1	0.6

Table 1: Household income source for Saoluafata
Source: Government of Samoa, 2001

[2] Government of Samoa, 2002

Land Tenure	%
Customary	81.1
Freehold	16.2
Church	1.6
Government	1.1
Leased	0.0

Table 2: Land tenure in Saoluafata
Source: Government of Samoa, 2001

road has been built inland making it easier to have access to upland areas for plantations and currently a large area has been cleared for village playground.

Saoluafata has a population of 674 people and a total of 88 households. Almost a third of the households in Saoluafata Village receive their main source of income from plantations, followed by salaried jobs and remittances sent from overseas (see Table 1). Less than half the village has completed secondary school (see Table 2). Just over 80% of the land in the village is held in customary tenure (see Table 3). This means that most land is owned by families residing in the village.

Saoluafata Village has a pre-school and primary school. The nearest District Hospital is in Lufilufi Village. A doctor and nurse both visit Saoluafata twice a month. The village has also established their own health care centre. Electricity and piped water are available to all homes in the village. The water supply is not efficient at all times as the village often faces shortages in its piped water supply and must turn to the coastal springs as an alternative for their source of water.

Lano Community

Lano village is found in the district of Faasaleleaga IV on the island of Savaii. The coastal plain is very narrow and the slopes behind are partially cleared for copra and taro cultivation. The beach is composed of moderately exposed coral sand with occasional beach rock formations. The coral reef is relatively narrow (200-800m) and the lagoon is shallow (max 1m at low tide) and sandy with patches of seagrass. Main Coast Road transects the village parallel

Lano map
Source: Ministry of Natural Resource & Environment

Household Income Source	Total	%
Plantation	58	18.6
Remittances	53	17.0
Fishing	44	14.1
Traditional	35	11.3
Handicrafts	27	8.7
Old Age Pension	25	8.0
Other	25	8.0
Salary and Wages	21	6.8
Gifts / Donations	17	5.5
Business	6	1.9

Table 3: Household income source for Lano
Source: Government of Samoa, 2001

Land Tenure	%
Customary	57.0
Freehold	38.7
Church	3.8
Government	0.4
Leased	0.0

Table 4: Land tenure in Lano
Source: Government of Samoa, 2001

to the coastline while Lano Road and Talalupelese Road are access roads leading to the plantations. Sologa stream runs through the village, opening up into the sea at Samaile and Leaosamoa in Lano village . Estuaries and springs appear to have been altered by construction of the main road. The associated elevated causeways have occluded seawater movement upstream for all but the highest tides. Mangroves are present below the causeways (on the seaward side). Freshwater ferns and hibiscus dominate the banks above the causeways and the water is often eutrophic (FAO/UNDP).

Lano village has a population of 720 people and a total of 98 households. Just under 20% of households derive their main source of income from the plantations followed by remittances sent from relatives working overseas and fishing (see Table 1). Just over 40% of people in Lano have completed secondary school (see Table 2). Close to 60% of the land in the village is held in customary tenure (see Table 3).

Most families reside along the shoreline with plantations located inland, miles from the coast. The village is divided into three sub villages working together through their council of 'matai'. A secondary school is located upland while most churches, community buildings and facilities are located in the coastal area. Lano Village is an example of a subsistence society, where the young men work in the plantations and the women help the men with fishing. All families in Lano have plantations, which derive income used for food, church activities and schooling for the children.

Both pilot communities are vulnerable to climate change and sea level rise. The projected changes in climate will surely affect these communities and further exacerbate their vulnerability to climate related risks .

Methodology

The purpose of the community vulnerability and adaptation assessment in Saoluafata and Lano Village was to characterize the nature and extent of the community's vulnerability to climate change, current coping capacity, and identification of appropriate options that can be undertaken to enhance adaptive capacity to climate related risks. The methodology entailed a participatory research approach geared towards empowering communities to assess their own vulnerabilities and find ways and means of addressing them.

Faletua and Tausi focus group session in Saoluafata

A Community Vulnerability and Adaptation Assessment Core team (CV&A) was trained by SPREP and the Ministry of Natural Resources and Environment. This core CV&A team visited the pilot sites Saoluafata and Lano on several occasions carrying out participatory CV&A with full community involvement. The team held a total of five focus group sessions with the Matai (chiefs), Faletua and Tausi (wives of Matai and women elders), schoolchildren and Sunday school, Nuupaia (daughters of Matai) and Aumaga (untitled men). These meetings were facilitated by the team comprised of a facilitator, note taker while a participant would record the main points raised on white butcher paper. Household interviews were also conducted at random in the village by two members of the CV& A team; one posing the questions and one recording discussion.

The questions posed, in a semi-structured and open-ended manner, provided the team with local insight, based on personal experience, into how climate impinges on the livelihood of the village. The attributes of climate for which they are particularly sensitive were noted. The ways in which they deal or cope with climate was documented. Possible adaptation strategies were then prioritized by local residents (see appendix for focus group and household interview questions).

A fieldwork was also carried out as a ground-truthing measure and also to quantify the magnitude of the effects of climate related changes in the community.

After the consultation process a full-scale awareness program was carried out by the team to raise the level of awareness of communities on the science of climate change and also on how human activities enhance vulnerabilities. This provided the opportunity to clarify many issues relating to climate change, variability and extremes and lessons learnt from other projects to broaden the understanding of the community on how they can adapt better to current and future changes thus reducing their vulnerabilities. It was a two-way session as the community played a bigger role, by sharing traditional knowledge and expertise in finding solutions to adapt to climate change.

School children focus group session in Saoluafata

An opportunity was also given to the future generation of Saoluafata to discuss climate change and vul-

Women's Committee focus group session - Lano

nerability issues. Children of all age group attended the night session and their understanding was also tested and observed by the team.

The CV&A consultations for both pilots also benefited from tools developed by the World Bank funded Infrastructure Asset Management Project. Coastal Hazard Zone Maps was a critical tool used as it already identified infrastructure location and it's susceptibility to hazards.

Data Analysis

Aumaga focus group session - Lano

All the notes recorded by the note-takers in the focus groups and household interviews were translated from Samoan to English. They were then analysed jointly by the CV&A team using a framework whereby insights related to types of vulnerabilities, current coping mechanisms and suggested adaptation strategies were cross-referenced with expert assessments from the various government experts who are members of the team. The findings from the community-level assessment and the data analysis and interpretation are presented in detail below.

Results of Vulnerability Assessments

Saoluafata

Land loss and inundation

Source: BECA International & Government of Samoa

The village of Saoluafata is particularly vulnerable to coastal erosion and inundation. This has caused loss of land, homes, threatened school buildings and the village malae[3]. . During tropical cyclone Ofa and Val 1990/1991, the village was affected mostly by associated storm surges and upland flooding. The storm surges destroyed homes and properties along the coast with the highest waves reaching the main road located approximately 100m inland. Currently the high seas and frequent occurrences of storm surges plus the refraction effect of the government built seawall adjacent to the village is accelerating the coastal/beach erosion in Saoluafata.

Deteriorating Marine Environment

A coastal settlement at risk to erosion

The marine environment in Saoluafata village is being stressed considerably by the warming of the ocean around the village, a result of the current climate variability affecting Samoa and the Pacific as a whole. Fishermen have reported coral bleaching or the visible whitening of coral in the village marine reserve. These village fishermen have also stated that due to bleaching some corals do not recover thus affecting the total fish catch that they usually get in the area. The corals are impacted adversely not only from warming waters but also from sedimentation during flood events.

Salinisation and contamination freshwater springs and wetland ecosystem

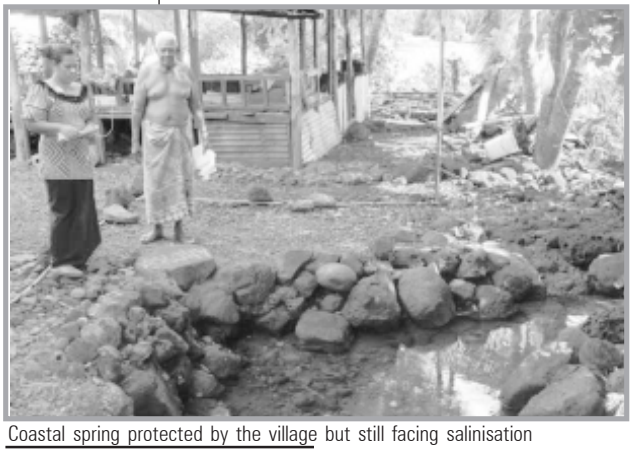
Evidence of coastal erosion

The village of Saoluafata have three coastal springs (Vaituiolo, Vaisave,
Mulivai) that the villagers use to drink from in times of water shortages and also for cooking. These freshwater bodies have suffered from salt-water intrusion due to storm surges making it unsafe for consumption. Not only are they affected by salt water intrusion but also by flooding when debris and sediments flow-in thus affecting quality. The villages believe that the possible cause of the salinisation problem is that the river flow is too weak while the sea flow is too strong. (spring water lens are very thin, which sea water can easily penetrate and thus becomes salty).

Temporary seawall built by one household residing along the coast

The villagers depend on these coastal springs during times of drought as experienced in 1997 and 1998. It was recorded that during the last drought, the villagers had to buy water from water trucks and some who could not afford still used the salinated springs for consumption. After the village was hit by cyclones and water supply destroyed, most people depended on these springs. Even though it was not safe for consumption, the villagers had no choice but to drink from these salinated springs. Today, the villagers still use these springs for consumption and other purposes, especially as they still experience water shortages for tap water is not sufficient, and often supply is limited to certain hours of the day.

A special feature of the village is their wetland ecosystem *"vaituloto"*. This wetland ecosystem plays a major role in the lives of the village people. People use it for swimming and fishing. Recently the village established a nursery where they introduced *"tilapia"* mainly for the village consumption. This effort didn't survive as the wetland became too salty for the tilapia specie's survival. The wetland has also become shallow due to deposition of sand during cyclones and current high waves where sand filtration process is currently happening[4]. The wetland also suffers from deposition of debris from upland during flooding events. Floodwaters running down the slope loads the wetland ecosystem with debris and runoff adversely affecting the wetland's biodiversity. This has affected the village enormously, especially those depended on this wetland for fishing and protection from extreme events.



Coastal spring protected by the village but still facing salinisation

[4] Sand slowly deposit mouth of the wetland

Destruction of Crops

The community is currently facing major problems with their crops and plantations. The main source of income for the village is from their plantations, which contributes 27% compared to other sources, such as remittances. Not only are they dependent on their crops for income but also for consumption as the village is mainly a subsistence community. The *phytophora* taro leaf blight in 1993 wiped out the community's main income earner after cyclone Ofa and Val. Cyclone Heta (2004) again severely damaged root crops and today the people depending solely on rice as their daily staple. . The soil has become infertile due to continuous erosion of topsoil from flooding events and it is difficult to grow and get a better crop yield. Taro size has become small and quality low and not good for selling. Banana as an alternative has also been affected. The leaves wilt while the banana fruits do not mature well for consumption. Since the taro leaf blight, new pests have also affected the village taro plantations such as "saga"[5] a new taro pest the villagers believe is caused by a variable climate (intermittent rain and sun for a period of time). The variability damages the crops and provides a favorable condition for the development of pest and diseases. Other pest such as "african snail" is a major problem as it affects not only crops but also plants and there is still no effective method developed yet for their eradication. The villages are continuing to treat this problem manually by collecting African snails and eliminating or destroying them by dropping into salt water, which requires time and labour.

The drought period in 1997/1998 ended in loss of crops and lack of food for the villagers. Not only was the drought impact realized in the drying up of plants themselves but also through the shortage of water needed for plantations to grow and bear fruit. This has resulted in decreased quantity and quality of root crop production, particularly that of taro and yams. The soil had lost its fertility due to the lack of moisture. Again, this had implications for households who depended on income derived from the sale of produce at the market. Plantations are often flooded, leading to a decline in crop production. Flooding events can lead to landslides that wash away the topsoil resulting in soil degradation. Households have had to move their plantations farther upland due to the decreased fertility of the soil. This accelerates the problem of soil erosion due to families clearing land for plantation. They move upland, as the soil fertility is better opening the gateway for more erosion problems.

Crops	Diseases	Others
Taro, Giant taro	Taro leaf blight, saga, small fruits, african snail	-Cyclones- food gardens and plantations damaged & destroyed. -Crops grown, vulnerable to change in weather and heat, not growing well -Drought crops dried up easily 19997-98 almost all crops died.
Bananas	Wilted leaves while fruits not matured.	
Vegetable gardens	African snail, insects	
Breadfruit	Bear fruits all year round, hardly matured.	

Table 6. Summary of diseases, pests hazards affecting crops in Saoluafata.

Health risks from water and vector borne diseases

Health related issues have also been identified by the Saoluafata community as a major vulnerability they are facing due to climate variability, change and extreme events. From the table below it summarizes diseases and health problems faced by the community and especially the children and the older people who are the main victims.

[5] Plant hopper insect that can destroy the whole taro plant from the crop to the leaves.

Causes	Diseases
Poor water quality during flooding	Diarrhoea
	Typhoid
	Skin disease
Dust during dry periods	Red eyes (more frequent outbreaks)
Intense rainfall and heat stress	Flu like symptoms and coughing, diarrhoea, skin diseases, dengue fever

Table 7. Current diseases experienced by the community

Outbreaks of water and vector borne diseases according to the villagers of Saoluafata are closely linked to the variability in rainfall and temperature. Red eye has become common among children, which was also observed during the consultation, outbreaks of dengue fever a vector borne disease, diarrhoea and typhoid (water borne diseases) is on the increase and it is common and contagious. People believe that due to increased rainfall and hot and humid temperature combination, vectors find it very conducive for massive population build-up. Skin diseases such as rashes and dry skin usually occur during period of intense heat accompany by flu, diarrhoea and dengue fever outbreaks.

Prioritized Vulnerability	Current Coping Strategy
Coastal erosion & inundation	- Reclamation (2 families), -Temporary seawall (2 families), - Village made drainage system - Banned sandmining
Salinisation & Sedimentation H_2O	None
Destruction of crops	- Plant new species, pesticides control - Plantation competition - Community replanting program
Coral bleaching	- Replant corals in marine reserve and support from fisheries division - Clean up by village
Health	- Counter approach

Table 9 - Vulnerabilities & Coping Strategies for Saoluafata

Conclusion on Vulnerability

Given the current and projected changes in climate, sea level and extreme events, the existing coping strategies undertaken by the Saoluafata community are not enough to curb the current problems they are facing let alone any future change, thus the community is very vulnerable.

They do not have what it takes to protect its people and their heritage from problems caused by climate change. Already the community is suffering from land loss, social problems, loss of income, heath hazards and with increased intensities of floods and storm surges imposed by climate change, this will again leave the community with unbearable impacts that will take years to rebuild.

Temporary seawall built by one household residing along the coast

Frequent and intense cyclones and more drought periods will surely again hit crops thereby wiping out their source of income. Sea level rise and more storm surges will accelerate land loss causing social problems among the villagers, leaving unfortunate families landless, as they do not possess what it takes to protect them from coastal erosion. Importantly the village malae is threatened and the village heritage is at stake. This is ranked as high priority to the community. With projected sea level rise and frequent cyclones for Samoa, this village will lose their identity and co-existence. Salt water intrusion, is already threatening the community freshwater supply and increase sea level will destroyed their fresh water springs.

Increase temperature and warming of the sea also poses threats not only to their supply of food from the sea but loss of their marine biodiversity. Coral bleaching is already a problem in the village and with projected warming will worsen this condition.

Coastal spring protected by the village but still facing salinisation

Frequent floods impose by sporadic intense rainfall due to El Nino like conditions that Samoa will suffer from, can affect Saoluafata as they suffered in the past. The topography of the village makes it vulnerable to floods plus their on-going activities with deforestation of uplands for plantation makes them more vulnerable. Intense floods will affect their crops, water supply, existing infrastructure and properties.

Vulnerability Profile

(* = Low Vulnerability, ** = Medium Vulnerability, *** = High Vulnerability, **** = Critical Vulnerability)

Vulnerabilities identified	Who is vulnerable	Vulnerability level	Causes of Vulnerability
i. Loss of land to due to erosion from the sea	▪ 60% of the village ▪ 12 family homes ▪ School ▪ Village malae ▪ Village infrastructure	****	▪ Sea-level rise ▪ Storm surges/ cyclones ▪ Households live on the coast near the sea
ii. Flooding, inundation of land & sedimentation	▪ 85% of the village ▪ Village school ▪ Marine & freshwater ecosystems ▪ Village infrastructure	***	▪ Intense rainfall ▪ Cyclones ▪ Location ▪ Graphic features (households live on flat land opposite high land ▪ No proper drainage system ▪ Deforestation of upland areas
iii. Lack of quality water supply	▪ 100% of the village is affected.	***	▪ Sea level rise ▪ Storm surges ▪ Sporadic intense rainfall ▪ Location of coastal springs near the sea and roads ▪ Deforestation of upland areas
iv. Destruction of crops	▪ 100% of the village is affected as all families have plantations for income earning and consumption.	***	▪ Droughts ▪ Intense rainfall ▪ Cyclones ▪ Climate variability ▪ New airborne pests & diseases
v. Coral bleaching less fish stock	▪ 100% of the village is affected, as all depend on the sea for consumption and income.	***	▪ El Nino ▪ Droughts ▪ Increase temperature ▪ Sedimentation intense rainfall

Table 8 - Pilot Community Prioritized Vulnerabilities

Adaptation Assessments

Current Coping Strategies and CapacityCoping capacity is the ability of the community to cope with adverse impacts of climate change and climate variability. In this context it is the capacity to respond or recover from climate extremes and variability such as cyclones, storm surges, flooding and others that the community is vulnerable to. Saoluafata have faced many risk in the past and challenges in the past and threatened for what the future holds from climate change and variability. It is obvious that villager's are doing all it can but cannot suffice the impacts and risk pose by past extreme events and future climate change.
In the face of climate variability and change, coupled with social and economic hardships that households in the village face daily, some have adapted. Largely it is the people who have the money because of work, families overseas that can afford to adapt. From 12 households living along the coast only two families are able to build seawall and reclaimed land for protection from erosion. However these seawalls are poorly built and unable to withstand against high waves and winds. They would not be sufficient in protecting the coastline against a future tropical cyclone and associated storm surges.

Some households residing on the hillside have built barriers and dug drainage ways to redirect flood waters. This has proved to be effective in protecting homes against moderate rainfalls but

Prioritized Vulnerability	Current Coping Strategy
Coastal erosion & inundation	- Reclamation (2 families), -Temporary seawall (2 families), - Village made drainage system - Banned sandmining
Salinisation & Sedimentation H_2O	None
Destruction of crops	- Plant new species, pesticides control - Plantation competition - Community replanting program
Coral bleaching	- Replant corals in marine reserve and support from fisheries division - Clean up by village
Health	- Counter approach
Damage houses	- Aid from families living overseas mainly New Zealand & Australia assisted in rebuilding.
Limited financial sources for food and education.	- Rely heavily on families overseas for money to needs of some families especially those who suffer crop loss

Table 9 - Vulnerabilities & Coping Strategies for Saoluafata

insufficient during major flooding events. Often, the drainage ways only divert floodwaters to the neighbouring house.

Most households rely on the remittances sent from relatives working overseas both as a regular source of income and to assist in the recovery from an extreme event. Money sent from family overseas has gone towards repairing houses damaged by flooding and tropical cyclones, purchasing food in the event of decreased crop production and replanting plantations.

There is a shared attitude amongst people in the village that there is little they can do to better cope with climate change risks without external assistance. Their outlook is that they can only respond to the damages that result from extreme events and hope that they are able to retain their livelihoods.

It appears that the village of Saoluafata lacks the necessary financial resources, materials, equipment and skills to effectively cope with the risks associated with climate change. The strategies currently employed can only be temporary solutions and would not be sufficient if such events as flooding or tropical cyclones increased in frequency or magnitude.

Adaptation Options

Adaptation options identified and prioritise not only will enhance the capacity of the community to withstand external risks but also will assist to uplift burdens impose by climate change impacts to families and the community. The table below summarise urgent and prioritise adaptation measures that needs to be implemented in one-way or another to reduce the vulnerability and risk faced by the community and benefited the community as a whole.

Adaptation options identified

Vulnerability	Priority Adaptation Measure
Coastal erosion & inundation	▪ Construct a seawall ▪ Rehabilitation/revegetation of coastline
Salinisation & sedimentation of freshwater systems	▪ Restore freshwater springs ▪ Maintenance of existing village water tank ▪ Construct proper drainage system ▪ Replanting mangroves
Destruction of crops	▪ Reforestation upland / Watershed management program ▪ Awareness program on invasive species & resistant crops
Coral bleaching	▪ Replanting corals

Table 10 - Summary of priority adaptation measures.

The village proposed that a seawall be constructed to protect coastal settlements and properties and the main road from coastal erosion and storm surges associated with tropical cyclones. The safety and security of those living along the coast are the primary concerns of the village. The people feel very strongly about protecting the malae and the burial grounds of their ancestors, both located near the coast. Their land is their heritage and their home; the people of Saoluafata see retaining their land as a priority to them.

The people of Saoluafata would also like to see a proper water drainage system installed for the entire village. The self-constructed drainage course ways constructed by individual households has proved to be insufficient. The village requires a proper drainage system to redirect rainwater during flooding events. This can assist in protecting plantations, houses and properties on the hillside from flooding and destruction during intense rainfall.

It was suggested that the clearing of trees on the hillside be prohibited. This would help prevent soil erosion resulting to the contamination of their drinking water supply. Planting of trees along the coastline can help protect the shore against erosion. It was agreed that the ban on sand mining be enforced, which exacerbates coastal erosion.

The people of Saoluafata felt that a village food supply ought to be stockpiled in the event that an extreme event would destroy the plantations. The "*aumaga*"[6] in particular requested assistance with plantations to better control invasive species and crop diseases. Both measures would help in enhancing food security for the village.

Adaptation Capacity

The adaptive capacity of the community is very limited compared to the impacts they face from climate change and climate variability. It is evident that only those who have the means to bounce back are able to restore their lives to normal. Most families depend on aid and remittances from families overseas which are still not sufficient to enable them to rebuild and move forward. The field visit has verified this with most families still losing land as evidenced by existing threats to their home foundations. It is also noted that whatever attempts they made to try and reduce the risks often seem insufficient to protect themselves from future events. What was seen being implemented with very limited resources are poorly planned measures that each individual family felt was necessary yet have counter effects such as whilst their attempts have protected their assets but at the expense of others. Other families have built their own drainage system to protect them from flooding which consequently have redirected the problem yet worsen the vulnerability of other families.

[6] Men who are not matais that work in the plantation and serve the matais of their families.

The community shows strength in community programs, which have been successful in terms of crop production and food security, but it takes months and a great deal of energy from individuals to achieve this purpose.

It is evident that most of adaptation measures prioritise by the community can only be done and achieve with external assistance and expertise, which the community lacks. The community can only support and provide labour while resources and technical assistance must be provided.

In the table below adaptation options have been assessed based on costs and benefits (social, economic, environmental) to the communities. Seawall came up as a priority adaptation measure to protect and slow the process of loss of land even though it is more costly then other adaptation measures. From the Core CV&A Team's expert judgement, this would be the best option because families whom have had the means were able to construct sea walls on their portion of the beach-front, however, in the process it had transferred the erosion problems to other parts of the beach front often ones that are owned by community members that have no funds to be able to carry out their own adaptation. It would be important that assistance be provided to the people who do not have the means to carry out their own sea walls. Soft solutions were also identified such as rehabilitation of coastal areas, awareness programs to create public awareness and reforestation and watershed management to control soil erosion, flooding and sedimentation. Table 11 provides the solutions the community and government experts have agreed upon to be implemented to reduce vulnerability and enhance capacity of the Saoluafata community.

Adaptation Option Evaluation Summary (*=Low, **=Medium, *= High)**

Adaptation Option	Cost	Benefit	Comment
1. Build seawall to protect malae, school, and houses.	***	***	This has been prioritized as the urgent need to protect the school, malae and houses. The community offering the labour and some resources such as rocks needed for the seawall.
2. Rehabilitation coastal areas by revegetation along coastlines and mangroves in the wetland.	*	**	There is a need for this except current vegetation cannot stop erosion.
3. Restore freshwater springs	*	***	A solution to this is to protect the coast from high wave energy and sedimentation.
4. Maintenance existing village water tank	*	**	This could assist the community with water need.
5. Proper drainage system	**	***	This is a priority to reduce the impact of flooding.
6. Reforestation/watershed management program	*	***	Important for the village to sustain their biodiversity and their water supply
7. Awareness program	*	***	Increase knowledge of the community will complement efforts to adapt to climate change

Table 11 - Adaptation Option Evaluation Summary

Conclusion on Adaptation

Saoluafata community cannot adapt on their own. Their vulnerability is increasing with very limited capacity to cope with the impacts impinge on their livelihood from extreme events and climate variability. There are numerous disastrous impacts threatening their livelihood, which they are trying to cope with daily with whatever limited resources they have.

They do not have the capacity and the knowledge to implement appropriatemeasures and their vulnerability exceeds their limitations because of their own activities. There is greater need for awareness and capacity building in particular the resources to counteract the impacts of climate change. This is a subsistence community which basically need daily provisions of food supply to survive.. However the impacts of climate change not only adversely impose on their daily living but have also strained whatever limited resources they have. Families income source have been affected which contributed to their dependency and vulnerability to existing climate variability and future climate impacts.

Implementing the Priority Adaptation Options

Implementation of adaptation measures was discussed and agreed upon with other government ministries through their representative in the task team and community committee members. The implementation plan was drawn up taking into consideration all the priority issues highlighted during consultation and follow up dialogue with committee members who have been selected by the community to work together with the task team to draw up a plan. This was taken back to the community for confirmation and ensure support when implemented.

Prioritisation

The process of consultation with the community and experts was the first step to screening the vulnerabilities and adaptation measures needed to reduce vulnerability. Selections and development of criteria for prioritisation was developed during the consultations with different groups. These were summarized and further discussed in the community group session with opportunity given to rank each adaptation measure. Priority adaptation measures identified for Saoluafata community was the outcome of a consensus from all the groups and experts involved in the process.

Means of Implementation of Priority Adaptation Options

Implementation of priority adaptation measures will be implemented by the Ministry of Natural Resources and Environment taking a lead role with assistance from other Ministries through the task team and Saoluafata community. It is vital to use limited resources from the CBDAMPIC project to implement most urgent adaptation identified. Others will be addressed through other financial mechanisms the Ministry is seeking. The development of the implementation plan was a result of thorough consultation with relevant stakeholders and the community.

Approach to adaptation

Climate Risks	Vulnerabilities	Solutions & Reasons	Expected Outcome
Cyclones	Damage to buildings and properties - Endangered lives - Plantations destroyed - Water contamination - Sedimentation in wetlands - Alteration of coastline - Loss of land	· Construct a seawall on the seaward side of the village to protect the school, land and heritage (Malae) of the village. · Strengthened existing sea walls built by families. · Management of domestic sand mining to protect coastline and ensure sustainable use of the resource. · Planting trees and other vegetation in coastal areas and enable vegetation to grow. · Install water tanks for families to ensure availability of safe drinking water and prevent health hazards. · Provide adequate drainage along and under the new village road to prevent flooding and sedimentation on lowlands. Existing drainage build by families is only a temporary means to protect but also diverts the problem to other neighbouring families. · Restoration of coastal springs in the village to ensure availability of safe drinking water. · Implement an appropriate programme to control invasive species and crop diseases. · Reforestation and banned clearing of trees on the hillside to prevent flooding, soil erosion, water contamination during heavy rains. · Implement measures to protect the wetland from storm surges and sedimentation during flooding periods. · Continuous awareness programmes on climate change and other environmental issues such as water management and conservation. · Health education programmes and improves health facilities	· Improved ability of the village to protect itself from climate related risks. · Enhance resilience and prevent disastrous consequences of global warming and sea level rise. · Reduced impact on the natural environment and the livelihoods of the people. · Assist less fortunate families with economic limitations to build their capacity to adapt to climate change related risks in the long term. · Ensure the protection of the village heritage and preservation of cultural significance of communal assets. · Ensure long-term sustainability of sources of food and income security. · Improved health and well being of village people. · Continuous availability and supply of safe drinking water for the village. · Increased land productivity and environment protection. · Increased capacity and understanding of adaptation measures to climate risks.
Flooding	Endangered lives - Diseases - Damages to houses and properties - Contamination of water supply and sources - Contamination of coastal water springs - Soil and land fertility decrease - Land inundation - Corals affected due to		
Storm surge	Coastal erosion - Loss of land - Schools and homes are threatened by visible erosion - Salinisation of coastal springs (source of water supply for the village) - Wetland affected due to the sedimentation of sand		
Droughts (1997/1998)	Plantations and almost all crops died. -Food supply decreased -Income reduced -Coral Bleaching		
Climate Variability -Intense rainfall -Hot suns -Seasonal changes	Increase health problems such as pink eyes, flu-like symptoms, diarrhoea and typhoid -Land prone to flooding with intense rainfall -Prone to landslides -Vegetable gardens and plantations infested with pests -Contamination of drinking water -Mango and breadfruit seasons varies -Size and quality of fruits changes		

Proposed Implementation Plan

Existing Vulnerabilities	Solutions	Activities	Responsible	Implementation Guidelines
Coastal Erosion	- Construct a seawall on the seaward side of the village to protect the school, land, and heritage (malae) of the village - Strengthened existing sea walls built by families - Management of domestic sand mining to protect coastline - Planting tress and other vegetation & enable vegetation to grow.	1.1Establish nursery and planting of suitable trees and plants to protect the coast. 1.2Environmental impact assessment and cost benefit analysis for coastal protection mechanisms 1.3Identify sites for sand mining.	MNRE/ Village MNRE / MOW MNRE/ Village	- Village to assist the Project with reforestation as one vital measure to reduce flooding. - Conduct consultations with the village to explore options in controlling Sandmining; - Prepare environmental impact assessments for feasible and priority adaptation measure
Salinisation & sedimentation of freshwater	- Restoration of coastal springs in the village - Repair existing village water tank - Provide adequate drainage along and under roads to prevent flooding and sedimentation - Reforestation in the uplands - Implement measures to protect the wetland from storm surges and sedimentation during flooding periods.	2.1 Assess the nature of salinisation on the freshwater springs in the village 2.2 Identify possible solutions 2.3 Implement feasible solution to prevent salinisation and sedimentation of freshwater ecosystems. 2.4 Provide adequate drainage systems.	MNRE/ Water Authority MNRE/ Water Authority/ Village MNRE/ Water Authority MNRE/ Families MOW	- Fully assess the problem of salinisation of coastal springs - Encourage families to consult with MOW on proper drainage systems.
Destruction of crops due to flooding and pests	- Implement programmes to control invasive species and crop diseases. - Educate farmers in ways of protecting their plantations before a cyclone strikes. - Encourage agriculture extension office to work side by side with the community.	3.1 Assess the nature of the problem 3.2 Watershed management Program. 3.3 Reforestation of upland areas. 3.4 Awareness programs on invasive species.	MNRE/ MAFFM Crops Division MNRE/ Watershed Division MNRE/ Forestry Division MNRE/ MAFFM	- CCCT with the assistance from the crops division to explore options to reduce - crop failure during time of droughts and pest outbreaks. - Villagers should guide the project with buffer zones for reforestation

Lano Village

Results of Vulnerability Assessment
Salinisation and shortage of safe drinking water

Puka stream - Freshwater pool now contaminated by saltwater intrusion

Lano village is suffering today from flooding events and droughts. These two extremes have crippled the village in terms of drinking water supply especially from coastal springs, which play a major role not only in supplying water for consumption but more significantly a symbol of their cultural identity and heritage. The name of each spring is a result of an event from a tale, myth or legend that have cultural significance to the village. For example the origins of *"faalupega" (*honorific titles) of Lano have evolved from such events. The entire village was flooded as a result of intense rainfalls and consequently piped water supply was occasionally shut off. The village had to resort to collecting water from freshwater pools. These freshwater pools are currently being salinated and most times not safe for consumption. Today, the village water system is sourced from another village through water pipes, but due to population increase it is acutely insufficient thus supply of water each day is limited only to a couple of hours. The droughts of 1997 and 1998 have lead to water shortages throughout the village for months and they have to again resort to water springs for supply, which was barely sufficient for the whole village. Traditionally, the village of Lano has been heavily reliant on coastal springs since the very beginning. It was their main source of water for consumption and cooking. Most of these springs are already salinated due to salt-water intrusion whilst some have disappeared due to coastal erosion and high seas. Their locations today can still be identified, but springs have totally disappeared. The ones that still exist are further down inland in the mangrove areas. These springs are usually contaminated during flooding events from upstream sediments which may also include fertilizer or pesticides from farmers' plantations. The table below shows quality test for three springs, Lano communities still depend on for consumption.

Source	Total Dissolved solids (mg/L)	Conductivity cm	Salinity (mg/L)
Puka Stream	940	1372	411.6
Matofa Stream	1091	1613	483.9
Vai o le fee	988	1482	444.6
Guilines Values	500	1000	250

Table 12 Results of Testing (samples from Lano Springs)
Samoa Water Authority Report

Results above indicate that the amount of salts and inorganic salts and organic matter from all the 3 sites are high and not fit for consumption. According to experts, 300-600 mg/l of dissolved solids (TDS) is considered an acceptable level with over and above considered to be unhealthy and can be a health risk particularly for infants.

Land loss and inundation

Coastal settlements at risk to erosion

Loss of land to coastal erosion is a major vulnerability the community of Lano village are facing to day particularly families living close to the shoreline. It was noted that most families have not moved inland after the cyclones, and most have rebuilt. This is due to absence of roads, electricity and infrastructure needed for resettlement inland. Rising seas and high storm surges, sandmining activities have eaten away land at a faster rate of approximately 5 meters per year. The destructive action of storm surges coupled with sea level rise and further exacerbated by sand mining has resulted in a significant loss of land along the coast. Deforestation along the coast has further worsened the situation. Coastal settlements remain vulnerable to sea level rise and coastal erosion. Shifting boundaries along the coast has lead to disputes among landowners. The residents are very concerned for their security in the event of increased sea level rise and tropical cyclones. The road protects most family lands near the coast, but a great deal of land has been lost already.

Human lives affected by waterborne and vector borne diseases

There is always an outbreak of diseases after floods with people suffering from skin diseases, stomachaches, and flu. This may have been due to the fact that floods last for days or even a week or two. The ford built after cyclone Ofa blocks the flow of river and poor drainage have caused floods to last for weeks. The long period of flood have contaminated water supply and provide better environment for mosquitoes to breed, also cause unhealthy environment for people to live. It has been noted outbreaks of these diseases usually occur following periods of floods in the village. It was observed at the time of the consultation, the low flow of the river through the ford has allowed the sand to deposit at the mouth of the river and making the water stagnant threatening the village with vector borne diseases. This has raised a number of concerns for the villagers, having been victims of mosquito borne diseases in the past. The people of Lano are also experiencing a warmer and more variable climate. They believe that this may be the cause for the increase in cases of flu, severe headaches, diarrhoea, skin diseases and an overall lower level of health for the children.

Evidence of eutropication in Puka Stream

Areas of the village that weren't prone to flooding are also now extremely vulnerable due to the ford, so when the river overflows and blocked by the ford, it tends to spread through out the whole village.

Intense rainfall that now occurs approximately once a month and the fear of floods always worries the community. Stagnant water bodies have developed near houses. Swampy areas are flooded during periods of intense rainfalls. . What the village fears most are the lives of its people especially young children who sometimes are washed out to sea as well as the elderly who are unable to help themselves during times of floods. Fortunately victims were saved during these periods of floods yet they are still very vulnerable and fear the worst is yet to come.

Current Health Hazards experienced by Community

Causes	Health Hazard
Flooding	- Expose to water borne diseases such diarrhea, typhoid - Endangered lives during flooding events especially young children washed away - Skin diseases
Intense rainfall and excess heat	- Flu

Table 13: Current Health Hazards experienced by Community

Wetland Ecosystem

The ford in Lano Village

Lano village is flanked by a bionetwork of mangrove ecosystems that support fish stocks villagers depend on for consumption and at times to earn some income. Stories shared by the old folks during the consultation reveal how this ecosystem played a central role in the lives of the villagers. In the past, they did not have to go fishing in the deep sea. The "Puka" river was able to supply the whole village with stock of fish they needed. Unfortunately, no one fishes there anymore as the river very shallow and stagnant. Sediment from flooding events accumulates in the stream leading to eutropication. This has impacted adversely on the mangroves and its associated biodiversityas some fish species that the villages used to rely on as a source of food are not present today. Deforestation near watershed catchments has also contributed to the increased erosion, destruction of the wetland and mangrove ecosystem. The ford according to the villager's is one of the main causes of this flooding problem and biodiversity loss.

Deteriorating Marine Resources

Lano village is experiencing among other things coral-bleaching problem. This is a village that depends very much on the sea for subsistence livelihood. Not only men fish but women also play a big role in this task. They voiced their concerns on less fish catch they are now facing compared to a decade ago. Most of their reefs and corals are turning white and they believe it is a consequence of rising seas, warmer waters and high waves.

The decreases in fish catch and extinct of fish species such as "faagoa" is believed to be caused from reef destruction, sedimentation of mangroves and unsustainable fishing methods.

Destruction of crops

The warmer climate has lead to drier soils and poorer crop growth leading to poor yields. Plantations are facing new diseases, such as the *lega* (taro leaf blight). They the villagers have also observed changes in the seasons for many crops

. The *ulu* (breadfruit) trees now bear fruit year round but the fruit has decreased in quality. Tropical cyclones used to occur only in the first few months of the year; they can now occur year round. Much of the vegetation has dried up and plantations have suffered a decrease in crop production. A severe shortage in food supply was felt and some households experienced famine and have depended on aid food from the government and church for months. These

impacts of climate variability have affected the village's main income earner and the standard of living among the villagers.

Crops	Diseases	Others
Taro	Taro leaf blight, saga (family of fruit flies)	Cyclones- food gardens and plantations damaged & destroyed. - Crops grown, vulnerable to change in weather and heat, not growing well - Drought crops dried up easily 19997-98 almost all crops died.
Breadfruit	Bear fruits all year round, hardly matured	
Bananas	Wilted leaves while fruits not matured.	
Vegetable gardens	African snail, insects	

Table 14: Summary of diseases, pests hazards affecting crops in Lano

Conclusion on Vulnerability

The community of Lano had suffered severely from the adverse impacts of climate variability in the past until today. Their experience with tropical cyclones, floods and droughts as well as projected changes in the future will place the village in a vulnerable state from the impacts of climate variability and long-term change. Their coping mechanisms, which are far from adequate to support and protect themselves during these disastrous events will add even more to their vulnerability state and defenselessness against future physical events.

Frequent floods caused by random intense rainfall will vastly affect the village, not only will it endanger lives but will also wipe out their crops and contaminate the water sources as had been experienced in the past. Subsequently, past flooding have also impacted quite adversely on their health as well as inflicting huge damage to their homes, properties including domestic and cropping farms. Overall, the whole livelihood issues of the people are at risk here for their main source of survival is adversely impacted upon
Families who are less fortunate have suffered more, as they lack adequate resources to rebuild.

More droughts have harmed the community's income generating capacity as they rely heavily on fruits and crops from land not only for consumption purposes but also for improvement in their standards of living. Most of these families also depend on fish catch from their coastal marine environment. As shortage of water is already a problem, the impact of salt-water intrusion into their coastal springs has increased the risk level they come face to face with daily. These people have very little alternative choices if droughts hit again.

Sea-level rise is currently eroding their shorelines consequently affecting families living on the coastlines. The fast rate of erosion will eventually in the future leave families landless, causing land disputes and other social problems. Salinisation of freshwater springs will deprive the village of freshwater supply and with increasing threats from sea level rise there will bound to be nothing much for the villagers to depend on during droughts given also that water shortages periods are now frequently experienced by the community.

The vulnerability of Lano village is greater in view of there coping capacity being acutely insufficient to adapt and cope with many changes brought about by climate change and sea

level rise. This is a community that has suffered greatly from the impacts of tropical cyclones, flooding events, droughts during periods of El Nino and accelerated erosion. They could only respond when an event occurs. This situation coupled with their own doings and actions like for example deforestation, reclamation to name a few makes them even more vulnerable and prone to danger when disaster strikes.

To reduce the risks and vulnerability of the community to climate change and sea level rise, good planning and implementation of urgent needs that the community sees fit will not only reduce vulnerabilities but assist also in building communities capability to adapt and survive the changing climate.

Vulnerability Profile

Pilot Community Prioritized Vulnerabilities

(* = Low Vulnerability, ** = Medium Vulnerability, *** = High Vulnerability, **** = Critical Vulnerability)

Vulnerabilities identified	Who is vulnerable	Vulnerability level	Causes of Vulnerability
Flooding, inundation and sedimentation	~ 85% of the village ~ Human lives ~ Water supply ~ Mangrove ecosystems ~ Households houses and infrastructure	****	~ Ford ~ Sporadic Intense rainfall ~ Cyclones ~ No proper drainage system ~ Deforestation
Salinisation and sedimentation of fresh water springs	~ 100% of the village ~ Health affected ~ Lack of safe drinking water supply	***	~ High seas
Deterioration of mangrove ecosystem	~ 90% of the village ~ Village fish supply decreased ~ Affect coastal protection	***	~ Ford affect natural flow of water ~ Sedimentation from flooding events ~ increase flooding events ~ Deforestation upland areas
Destruction of crops	~ 100% of the village ~ Farmers mostly depended on plantations for living	***	~ Natural hazards ~ Crop diseases ~ Proximity to river banks ~ Location of plantations mostly upland ~ High soil erosion rate
Loss of land and houses inundated	~ 30% of the village ~ Houses and land	***	~ high storm surges ~ strong winds and waves during tropical cyclones ~ Flooding

Table 15: Vulnerability Profile

Adaptation Assessments

Current Coping Strategies and Capacity

For Lano, coping capacity is the manner in which they use existing resources to protect themselves and recover from impacts of past extreme events and climate variability. Strengthening of their existing coping capacity will increase their resilience to the impacts of climate change and climate variability. The community is directly affected by flooding when occur it destroys almost everything from crops to water springs to homes and eventually affects the

health of the community. Community work and effort is seen being the response to most of the problems faced by the community with assistance from the government through its ongoing programs. The protection of coastal springs was a community project carried out by the youth to protect the remaining coastal springs. Introduction of community by-laws was introduced to control overexploitation of marine resources with the hope to recover the fish stock.

Vulnerabilities & Coping Strategies for Lano

Prioritized Vulnerability	Current Coping Strategy
Land inundation from flooding	None
Salinisation and sedimentation of fresh water springs	Protect some springs by building cement walls on the edge of springs.
Coastal erosion	Government build seawall but does not cover the whole village.
Destruction of crops from cyclones, droughts, pests and diseases	Introduce new species
Coral bleaching	Control use of destructive methods of fishing
Health	Counter approach, treat when affected
Destruction of houses during cyclones	Find shelter at the church and school building
Loss of income	Depend on assistance from families overseas

Table 15: Vulnerabilities & Coping Strategies for Lano

During the tropical cyclones of 1990 and 1991, many residents of Lano took refuge at the church, the school building or with the Pastor's family. Their own houses could not withstand the high winds and waves. In response to cyclones, households used coconut leaves to make blinds to shield their houses against future high winds and rains. Some used ropes to tie their rooftops down to large trees nearby. Others would nail iron-roofing sheets around their houses to withstand high winds and waves

Their daily income from selling produce at the market was disrupted due to the destruction of plantations. They could not afford to repair the damage done to houses, properties and plantations particularly when they still had other financial commitments such as *faalavelaves.* Most households relied on overseas development aid, remittances sent from relatives and assistance from the government and church for food and materials to rebuild their houses. Some are still recovering from the effects of the cyclones. The village began selling their sand for commercial use as another source of income. The government provided a rock seawall to protect the roads at the same time protecting families alongside the roads

The village of Lano does not currently have effective coping strategies to deal with climate change risks. They can only attempt to repair the damage done following an extreme event. They lack the necessary financial resources and equipment to deal with climate change risks. The strategies employed above can only be seen as temporary solutions and would not be sufficient if such events as flooding or tropical cyclones increased in frequency or magnitude
Adaptation Options

The range of adaptation options identified and prioritized was done parallel to the vulnerabilities of communities that were identified during the consultation and assessment process. Options ranges from soft solutions where community is seen as the key implementer. The table presents vulnerabilities and range of options that can help reduce the risk or vulnerability of the community to existing and threatening impacts of climate change and climate variability.

Adaptation options identified

Vulnerability	Priority Adaptation Measure
Destruction of crops, houses, and endangerment of lives during flooding periods	- Replace ford with proper bridge to allow free flow of water - Reforestation program and ban clearing of trees on the hillside - Drainage system to control flooding - Awareness programs - Appropriate program to control crop diseases and promote agro forestry - Restoration of coastal springs in the village to ensure
Salinisation and sedimentation of wetlands and drinking water	availability of safe drinking water - Install water tanks for families - Conserve mangrove ecosystem
Coastal erosion and inundation from flooding and storm surges	- Establish a marine reserve - Planting trees and rehabilitate vegetation on coastal areas - Manage sandmining in the village

Table 16: Adaptation options identified

The village proposed that a new bridge be built to replace the existing ford. A raised bridge is required to allow for the flow of water from Puka river to the sea. This will assist in the event of flooding. Currently, the ford blocks the water from flowing freely, thereby flooding the whole village. It was interesting to find out that the village uses canoes when flooding to travel around the village and to get from one family to another. Further assessment done by the experts together with village members have concluded to best uplift the existing ford to allow flow of water rather than build a new bridge which requires more resources while achieving the same goal.

It was suggested that a seawall be constructed to protect coastal settlements and properties from coastal erosion and sea level rise. It is crucial that a ban be placed on sand mining, which only exacerbates coastal erosion.

The people of Lano would also like to see a proper water drainage system installed for the entire village. The village requires a drainage system to redirect rainwater during flooding events.

The village also requires water tanks. Their piped water supply is not a reliable source of clean drinking water, particularly during a flooding event when debris and runoff collect in the source. Freshwater pools are no longer a source of drinking water since they suffer from salt-water intrusion. Water tanks would also safeguard the village against drought, when their water source is apt to dry up. It was also suggested that new water wells be dug. The existing wells have been contaminated by salt water. Food and water supply should be on hand in case plantations are destroyed or the water supply system shuts down.

Adaptation Capacity

The existing adaptive capacity of Lano community will not suffice their needs to survive with pressure from climate impacts and sea level rise. Their survival depends mainly on their community effort and community programs and projects to assist with some needs. However the extreme impacts faced by the community have show their low level of resilience to tropical cyclones, and extreme flooding events when occurred. They need assistance and especially

guidance and awareness to build their capacity to understand and enable them to adapt and to ensure resilience to unpredictable climate related events.]

Lano is vulnerable to the impacts of climate change, this has been seen as it has impacted on almost everything they depend on, from destruction of their crops, salinisation of water sources, declining fish supplies and more where the community depends on. This has limited their capacity to cope cause already their support system is already being impacted and affected.

With the projected climate change and uncertainties, the livelihood of this community is threatened and need great support to enable them to support themselves and the community as one to survive for decades to come.

Evaluation of Adaptation Options

In the table below adaptation options have been assessed based on costs and benefits (social, economic, environmental) to the communities. All the adaptation options itemized in the table are important in terms of looking holistically at how the community's adaptive capacity can be improved. However, the community felt that the issue of the ford is of high priority and needs to be actioned. The CBDAMPIC project is already facilitating this by working with relevant officers in the Public Works, the Ministry of Finance and the Ministry of Natural Resources, Lands and Survey and Environment to get the bridge funded by a Samoan Government World Bank loan. The project will continue to assist in the addressing of this issue by working on the base line data and EIA assessments.

It is concluded from the evaluation that all options will benefit the community greatly and should be considered for implementation. Only hard solutions will cost more if implemented but all have promising beneficial outcome to the community in terms of increasing their resilience to climate related extreme events.

Adaptation Options Evaluation Summary (*=Low, **=Medium, ***=High)

Adaptation Options	Cost	Benefit	Comment
Replace ford with proper bridge	***	***	This is the priority for the village to reduce the risk from future flooding events. Engineers have looked at the options and one is to replace the ford with a new bridge and the other to build the ford higher up and add more pipes to allow the flow of water
Reforestation & Watershed management	*	***	The village is willingly to work together with the project to achieve this. The cost involve initial setup such as the nursery and workshops. It's vital for the village to sustain their environment.
Proper drainage system	**	***	This will assist in reducing the impact of flooding in the village
Install water tanks	***	***	Installation of water tanks will assist the community with water problems.
Restoration of Coastal Springs	**	***	The solution is the protection of the coast from high wave energy and sedimentation during flooding.
Conserve mangroves	*	***	This will benefit the village not only will it strengthens protection from high storm surges but also enriches biodiversity and fish stock.
Establish Marine Reserve	*	***	A marine reserve is needed to replenish the marine ecosystems. The cost will cover the initial setup of the marine reserve.
Manage sandmining	*	***	The community has proposed to band sandmining.
Awareness Programs	**	***	This is vital in targeting areas that community need assistance with such as promoting agro forestry, risk assessments and other issues that will complement efforts to adapt to climate change.

Conclusion on Adaptation

The assessment concluded that Lano community could not cope or adapt at their own volition. Disastrous experience with climate cyclones, drought, flooding, storm surges have placed their capacity to the test. Their existing coping strategies cannot protect the community from threats imposed by climate change and variability on their livelihoods. Community effort has enabled reactive adaptation in the past, however their vulnerability exceeds their existing coping mechanisms hence it is vital that the community of Lano is assisted to build their resilience to current and future climate change.

Implementing the Priority Adaptation Options

Implementation of adaptation measures was discussed and agreed with other government ministries through their representative in the task team and community committee members. The implementation plan was drawn up taking into consideration all the priority issues highlighted during consultation and follow up dialogue with committee members who have been selected by the community to work together with the task team to draw up a plan. This was taken back to the community for confirmation and ensure support when implemented.

Prioritisation

Prioritisation of adaptation options was considered in the process due to lack of resources, financial constraints and lack of capacity to take on the activities. There was a need to establish criteria for making selections among options identified. It was important to select options that really correspond to the needs and the vulnerability of the community. Criteria's such as cost effectiveness, alleviation of poverty/ hardships, improve health quality, promote or sustain safety of the community, food security were considered during discussions and prioritisation process. These were discussed in different consultation groups and results were summarized and discussed again in the whole community with experts facilitating the process. The prioritise adaptation measures is the result of further consultations and consensus among the whole community.

Means of Implementation of Priority Adaptation Options

The implementation Plan set out and agreed by all stakeholders and the community have defined the roles of each responsible agent. The Ministry of Natural Resources is the lead Ministry to monitor and work together with other relevant agencies and the community with the implementation of priority measures. Other solutions will be addressed through other financial mechanisms the Ministry is seeking and support from other agencies and non government organizations.

Proposed Implementation Plan

Climate Risks	Vulnerabilities	Solutions & Reasons	Expected Outcome
Cyclones	- Endangered lives - Plantations and forest destroyed - Water contamination - Sedimentation in wetlands (Mangroves) - Alteration of coastline - Loss of Land - Coral destruction	· Replace ford with a proper bridge to allow free flow of water and minimize risks of flooding. · Construct a seawall on the seaward side of the village to protect families residing along the coast. · Management of domestic sand mining to protect coastline and ensure sustainable use of the resource. · Conserve mangrove ecosystems in Lano. · Establish marine reserves in the village. · Planting trees and rehabilitates vegetation on coastal areas. · Install water tanks for families to ensure availability of safe drinking water and prevent health hazards. · Provide adequate drainage along and under the new village road to prevent flooding and sedimentation on lowlands. · Restoration of coastal springs in the village to ensure availability of safe drinking water. · Implement an appropriate programme to control invasive species and crop diseases. · Reforestation and banned clearing of trees on the hillside to prevent flooding, soil erosion, water contamination during heavy rains. · Implement measures to protect the · wetland from storm surges and sedimentation during flooding periods. · Continuous awareness programmes on climate change and other environmental issues such as water management and conservation. · Health education programmes and improves health facilities	· Improved ability of the village to protect itself from climate related risks. · Enhance resilience and prevent disastrous consequences of global warming and sea level rise. · Reduced impact on the natural environment and the livelihoods of the people. · Assist less fortunate families with economic limitations to build their capacity to adapt to climate change related risks in the long term. · Ensure the protection of the village heritage and preservation of cultural significance of communal
Flooding	- Endangered lives (especially children) - Diseases - Damages to houses and properties - Contamination of water supply and sources - Plantations and livestock destroyed - Soil and land fertility decreased - Land inundation for weeks - Corals and fish stock affected due to sedimentation - Eutrophication of the mangrove ecosystem and river - Coastal erosion		
Storm Surge	- Loss of land - Coastal settlement threatened by evident erosion - Salinisation of coastal springs (source of water supply for the village) - Deposition of sand in the mangrove areas make it shallow and upset ecosystems - Plantations and almost all crops died		· Ensure long-term sustainability of sources of food and income security. · Improved health and well being of village people. · Continuous availability and supply of safe drinking water for the village. · Increased land productivity and environment protection. · Increased capacity and understanding of adaptation measures to climate risks
Droughts (1997/1998)	- Shortage of water supply - Food supply decreased/ decrease crop production - Income reduced - Coral bleaching - Reduce fish stock - Increase health problems such as flu like symptoms, diarrhoea, typhoid		
Climate Variability -Intense rainfall -Hot Suns -Seasonal changes	- Land prone to flooding with intense rainfall - Plantations infected with pests - Contamination of drinking water - Breadfruit seasons varies - Size and quality of fruits changes		

Existing vulnerabilities	Solutions	Activities	Responsible agents	Expected Results
1. Destruction of crops, houses and endangerment of lives during flooding periods	· Replace ford with a proper bridge to allow free flow of water and minimize risks of flooding. · Reforestation program and ban clearing of trees on the hillside · Drainage system to control flooding · Awareness programs · Health education programmes and improves health facilities · Implement an appropriate programme to control invasive species and crop diseases.	1.1 Reforestation of upland areas and establish a nursery for the community 1.2 Awareness programmes to raise awareness on impacts of deforestation. 1.3 Cost estimate and EIA for a bridge to replace existing ford. 1.4 Assessment to improve the drainage systems in the village	MNRE/ MAFFM/ Village MNRE/ MAFFM MNRE/ MOW MNRE/MOW	~ Village/families to identify with related problems caused by deforestation and to assist the project to identify buffer zones for reforestation. ~ Identify appropriate measure to replace existing ford, which is one vital cause of flooding in Lano
2. Salinisation and sedimentation of wetlands and drinking water	· Restoration of coastal springs in the village to ensure availability of safe drinking water. · Install water tanks for families to ensure availability of safe drinking water and prevent health hazards.	2.1 Assess ways to better restore coastal springs 2.2 implement appropriate measure to restore and ensure safe drinking water for the village	MNRE/SWA MNRE/SWA/ Village	~ Need a full assessment of salinisation problem and identify appropriate action. ~ Implement most appropriate solution to improve coastal water springs in the village
3. Coastal environment deteriorating from flooding and storm surges.	· Conserve wetland ecosystem · Marine reserve needed to improve the marine environment. · Planting trees and rehabilitates vegetation on coastal areas. · Manage sandmining in the village	3.1 Re-vegetation of coastal areas 3.2 Establish marine reserve in the village 3.3 Establish village mangrove ecosystem as conservation area. 3.4 Sustainable management of Sandmining, by identifying possible sites.	MNRE/Village MNRE/ Climate Change Core Team MNRE MNRE/Village	~ Areas of erosion to be planted as soon as practical with suitable coastal species. ~ Experts from the CCCT and Marine division to assist in establishing a marine reserve for the community. Consultation with the village to ensure proper management of Sandmining.
4. Lack of awareness on climate change impacts	· Continuous consultation and awareness program in the community on issues pertaining to impacts of climate change and the communities' vulnerability.	4.1 Prepare climate change materials for awareness programs 4.2 Road show by the country team incorporating different issues, targeting the whole community	MNRE/ CCCT	~ Prepare materials relevant to the community for awareness and education during the period of the project.

Conclusion and Recommendations

The community vulnerability and adaptation assessment was an opportunity to work together with the two pilot communities to identify their urgent and immediate needs as well as to help enhancing capacity and raising awareness on issues and problems faced with the communities concerning threats impose by climate change, SLR climate variability and extreme events.

Both pilot communities faced high risk and low resilience to the adverse impacts of climate change with limited adaptation capacity. The limitations brought by frequent exposure to extreme events, hardships faced by individual families, social factors such as community obligations, customary tenure system, lack of awareness and unsustainable activities.

The impacts of climate change are greatly felt by both communities. Saoluafata and Lano both suffer from flooding, destruction of crops, vector and waterborne diseases, salinisation and contamination of coastal springs, damages to homes, affect income source and change of lifestyle. Families have grown to depend on remittances and external sources to rebuild. Communities have adapted to the impacts in a reactive manner and they see a greater need to implement measures to protect them from future disastrous events and increase their resilience to climate impacts. Priority measures identified to be implemented will help restore confidence and comfort to communities not only in reducing the risk but providing opportunities and empowerment.

Generally, there is an enormous feeling of unease on what climate change, variability and especially frequent occurrences of extreme events and what it can do to the people. The impacts are disastrous and felt by both Saoluafata and Lano communities thus the need for immediate action. This project has built the commitment not only from the community but Government and relevant stakeholders as well.

Implementation of adaptation measures prioritized should be a priority for the CBDAMPIC project and the government of Samoa.

Adaptation Recommendations

- The community of **Saoluafata** has prioritized the construction of a seawall to protect the village from existing erosion and for long term and projected sea level rise and extreme events.
- Soft solutions recommended also include the:
- Construction of a coastal protect mechanism to protect the coastline ;
- Rehabilitation and revegetation of coastline;
- Provide proper drainage along and under the new village road;
- Promote education and awareness programs;
- Replanting of mangroves in the wetland ecosystem;
- Maintenance of existing village water tank to secure quality water supply;
- Implement watershed management program and reforestation; and
- Promote agroforestry and resilient crops
- The community of **Lano** on the other hand prioritized the elevation of the existing ford, which was identified as the main cause of flooding during intense rainfall. Conserva-

tion of the mangrove ecosystem was another priority as it will not only conserve the biodiversity and ensure fish stock for the community but also act as a natural protection from storm surges during times of cyclonic activity and extreme. Salinisation of coastal springs are yet another urgent matter and needs to be addressed. Reforestation of upland areas has been highly recommended as a soft solution with community committed to support such a program

- To reduce the risk of flooding there is a need to elevate the ford to allow free flow of water and prevent eutropication
- To reduce erosion, sedimentation and flooding reforestation program needs to be promoted as well as impose restriction on land clearance
- Provide adequate drainage systems in the village to control flooding
- Promote awareness and education programs
- Promote agroforestry and resilient crops
- Conduct further research to identify the appropriate measure to reduce salinisation of coastal springs
- Rehabilitation of coastal areas and village management of domestic sandmining.

REFERENCES

BECA, Internationals and Government of Samoa.2001 *Coastal Infrastructure Asset Management Plan Strategy*. Government of Samoa.

FAO/UNDP. Year? *The Inshore Resources of Savaii, Western Samoa: Coastal Inventory and Fisheries Database.* FAO/UNDP Field Report No. 5. Apia, Samoa: FAO.

Government of Samoa. 2001. *2001 Census of Population and Housing.* Apia, Samoa: Department of Statistics, Government of Samoa.

Hay, J.E., N. Mimura, J. Campbell, S. Fifita, K. Koshy, R.F. McLean, T. Nakalevu, P. Nunn and N. de Wet. 2003. *Climate Variability and Change and Sea-level Rise in the Pacific Islands Region: A Resource Book for Policy and Decision Makers, Educators and other Stakeholders.* Apia, Samoa: South Pacific Regional Environment Programme and Japan Ministry of the Environment.

Jones, R.N., K.L. Hennessy, C.M. Page, K.J.E. Walsh and P.H. Whetton. 1999. *An Analysis of the Effects of the Kyoto Protocol on Pacific Island Countries, Part 2: Regional Climate Change Scenarios and Risk Assessment Methods.* A research report prepared for the South Pacific Regional Environment Programme, Apia, Samoa. Canberra, Australia: CSIRO.

Lal, M., Harasawa, H. and K. Takahashi. 2002. Future climate change and its impacts on small island states. *Climate Research.* 19(3):179-192.

Nurse, L.A. and G. Sem. Chapter 17: Small Island States. In: McCarthy, J.J., O.F. Canziani, N.A. Leary, D.J. Dokken and K.S. White. 2001. *Climate Change 2001: Impacts, Adaptation, and Vulnerability – Contribution of Working Group II to the Third Assessment Report of the International Panel on Climate Change.* Cambridge: Cambridge University Press.

SPREP 2002. CV & A: (A Guide to Community Vulnerability and Adaptation Assessment and Action) South Pacific Regional Environment Programme, Apia, Samoa.

APPENDIX 1:

FOCUS GROUP SESSION QUESTIONS

Session One: Understanding the Nature of their Vulnerability to Climate Change

The following twelve open-ended questions will be posed by the group leader to the participants. Discussion amongst participants is to be encouraged. The main points raised will be recorded on chart paper with appropriate titles.

1. What are some problems, difficulties or challenges that you face in the village?

   This is to remain very open and general. A wide variety of problems may be expressed, whether related to climate or not. Regardless, the insight gained here will help us put climate related risks, identified later on, in context.

2. Are you affected by weather or climate conditions? If so, which ones?

   If the participants require prompting, the group leader may choose to ask about drought, flooding, storms, high winds, erosion, saltwater intrusion, water supply etc…But be careful to avoid posing leading questions.

   This question should result in a list of climate related stresses faced by the village. Depending on the length of the list, the group may choose to focus on three or four. Each climate related stress will be examined in turn for questions 3-5:

3. What is the severity of this climate related stress? How frequent does this climate related stress occur? *i.e. once a week, once a month, twice a year etc.*

4. What locations or areas in your village at a risk to this climate related stress?

5. How, and in what way, does this climate related stress impact your daily life or your livelihoods in the village?

6. Can you talk about what years, say over the past ten, were particularly problematic for your village? How so? In what way? How were you affected by the tropical cyclones of 1990 and 1991? The drought of 1997/98? Or what about the heavy rains on May 18 and 19th of this year?

7. How did you (or do you) deal with, cope with or respond to these climate related stresses? *i.e. what are your coping mechanisms / strategies?*

8. How successful or ineffective were (or are) these strategies or responses?

9. In your opinion, how well would these strategies fare in the future if such climate conditions or events identified became more frequent or more severe?

10. In your opinion, have you observed/noticed any changes in climate in your village over time? How so? In what way? What, if any, implications has this had?

11. How are you forewarned (if at all) of severe climate events? By news, radio, word of mouth? What are the methods of communication for disseminating this sort of information?

12. What assistance or support do you receive (if any) from the Mayor to deal or respond to climate related risks?

Session Two: Prioritising Adaptation Options

1. In light of the vulnerabilities to climate change voiced by the group, what are some possible adaptation strategies, options, projects that could be implemented in your village to help you cope or deal with climate related risks? *(These could be either preventative or responsive options)*

   All suggested adaptation options should be recorded on the chart paper.

2. What criteria do you feel to be important when considering which adaptation option to implement?

   All suggested criteria should be recorded on the chart paper. The adaptation options and criteria are then entered into the matrix (see CV&A Workshop Report for further guidelines on the use of this tool).

3. How would you score each adaptation option against the selected criteria? *(It was suggested scores would range from 1 to 5. Enter scores into matrix on the chart paper.)*

4. How would you weigh each criteria according to its relative importance in the village?

   The weight assigned to the criteria is multiplied by the score received by the adaptation option. The numbers are then summed for each adaptation option. A new matrix is created with the final scores. The adaptation option with the highest score reflects the option deemed to be the most favourable by the group.

5. What do you think about the outcome of this exercise? Do you believe this adaptation option to be the most appropriate strategy to address climate change in your village?

APPENDIX 2:

HOUSEHOLD INTERVIEW QUESTIONS

1. What is your role in the household? *Interviewers should ask to speak to either the head or the elders of the household.*

2. What is the total number of people in your household? What is the number of male, female, children, adults and elders in your household?

3. What are your household's sources of income? *i.e. fishing, farming, remittances from overseas.*

4. What do you believe are the main problems faced by your village?

   This is to remain very open and general. A wide variety of problems may be expressed, whether related to climate or not. Regardless, the insight gained here will help us put climate related risks, identified later on, in context.

5. Are you affected by weather or climate conditions? If so, which ones?

If the participants require prompting, the group leader may choose to ask about drought, flooding, storms, high winds, erosion, saltwater intrusion, water supply etc…But be careful to avoid posing leading questions. This question should result in a list of climate related stresses faced by the household. Each climate related stress will be examined in turn for questions 6 and 7:

6. What is the severity of this climate related stress? How frequent does this climate related stress occur? *i.e. once a week, once a month, twice a year etc.*

7. How, and in what way, does this climate related stress impact your daily life or your livelihood (source of income)?

8. What years, say over the past ten, were particularly problematic for your household, in relation to climate conditions? How so? In what way? How were you affected by the tropical cyclones of 1990 and 1991? The drought of 1997/1998? Or what about the heavy rains on May 18 and 19th of this year?

9. How did you (or do you) deal with, cope with or respond to these climate related stresses? Do you carry out any preventative methods in expectation of these climate events?

10. How successful or ineffective were (or are) these strategies or responses?

11. In your opinion, how well would these strategies fare in the future if such climate conditions or events identified became more frequent or more severe?

12. What do you think about the adaptation options that were proposed in your focus group? If implemented, how would this option affect your household? Do you believe the selected option to be an effective strategy for your village to cope with climate change? Can you offer other suggestions for how your village could better deal with the risks associated with climate change?

13. In your opinion, have you observed/noticed any changes in climate in your village over time? How so? In what way? What, if any, implications has this had?

14. How are you forewarned (if at all) of severe climate events? By news, radio, word of mouth? What are the methods of communication for disseminating this sort of information?

15. What assistance or support do you receive (if any) from the Mayor to deal or respond to climate related risks?

APPENDIX 3a:

Consultation Findings - Lano

Existing vulnerabilities	Solutions	Activities	Responsible agents	Expected Results
1. Destruction of crops, houses and endangerment of lives during flooding periods	· Replace ford with a proper bridge to allow free flow of water and minimize risks of flooding. · Reforestation program and ban clearing of trees on the hillside · Drainage system to control flooding · Awareness programs · Health education programmes and improves health facilities · Implement an appropriate programme to control invasive species and crop diseases.	1.1 Reforestation of upland areas and establish a nursery for the community 1.2 Awareness programmes to raise awareness on impacts of deforestation. 1.3 Cost estimate and EIA for a bridge to replace existing ford. 1.4 Assessment to improve the drainage systems in the village	MNRE/ MAFFM/ Village MNRE/ MAFFM MNRE/ MOW MNRE/MOW	~ Village/families to identify with related problems caused by deforestation and to assist the project to identify buffer zones for reforestation. ~ Identify appropriate measure to replace existing ford, which is one vital cause of flooding in Lano
2. Salinisation and sedimentation of wetlands and drinking water	· Restoration of coastal springs in the village to ensure availability of safe drinking water. · Install water tanks for families to ensure availability of safe drinking water and prevent health hazards.	2.1 Assess ways to better restore coastal springs 2.2 implement appropriate measure to restore and ensure safe drinking water for the village	MNRE/SWA MNRE/SWA/ Village	~ Need a full assessment of salinisation problem and identify appropriate action. ~ Implement most appropriate solution to improve coastal water springs in the village
3. Coastal environment deteriorating from flooding and storm surges.	· Conserve wetland ecosystem · Marine reserve needed to improve the marine environment. · Planting trees and rehabilitates vegetation on coastal areas. · Manage sandmining in the village	3.1 Re-vegetation of coastal areas 3.2 Establish marine reserve in the village 3.3 Establish village mangrove ecosystem as conservation area. 3.4 Sustainable management of Sandmining, by identifying possible sites.	MNRE/Village MNRE/ Climate Change Core Team MNRE MNRE/Village	~ Areas of erosion to be planted as soon as practical with suitable coastal species. ~ Experts from the CCCT and Marine division to assist in establishing a marine reserve for the community. Consultation with the village to ensure proper management of Sandmining.
4. Lack of awareness on climate change impacts	· Continuous consultation and awareness program in the community on issues pertaining to impacts of climate change and the communities' vulnerability.	4.1 Prepare climate change materials for awareness programs 4.2 Road show by the country team incorporating different issues, targeting the whole community	MNRE/ CCCT	~ Prepare materials relevant to the community for awareness and education during the period of the project.

APPENDIX 3b:

Consultation Findings - Saoluafata

Climate Risks	Vulnerabilities	Solutions & Reasons	Expected Outcome
Cyclones	Damage to buildings and properties - Endangered lives - Plantations destroyed - Water contamination - Sedimentation in wetlands - Alteration of coastline - Loss of land	· Construct a seawall on the seaward side of the village to protect the school, land and heritage (Malae) of the village. · Strengthened existing sea walls built by families. · Management of domestic sand mining to protect coastline and ensure sustainable use of the resource. · Planting trees and other vegetation in coastal areas and enable vegetation to grow. · Install water tanks for families to ensure availability of safe drinking water and prevent health hazards. · Provide adequate drainage along and under the new village road to prevent flooding and sedimentation on lowlands. Existing drainage build by families is only a temporary means to protect but also diverts the problem to other neighbouring families. · Restoration of coastal springs in the village to ensure availability of safe drinking water. · Implement an appropriate programme to control invasive species and crop diseases. · Reforestation and banned clearing of trees on the hillside to prevent flooding, soil erosion, water contamination during heavy rains. · Implement measures to protect the wetland from storm surges and sedimentation during flooding periods. · Continuous awareness programmes on climate change and other environmental issues such as water management and conservation. · Health education programmes and improves health facilities	· Improved ability of the village to protect itself from climate related risks. · Enhance resilience and prevent disastrous consequences of global warming and sea level rise. · Reduced impact on the natural environment and the livelihoods of the people. · Assist less fortunate families with economic limitations to build their capacity to adapt to climate change related risks in the long term. · Ensure the protection of the village heritage and preservation of cultural significance of communal assets. · Ensure long-term sustainability of sources of food and income security. · Improved health and well being of village people. · Continuous availability and supply of safe drinking water for the village. · Increased land productivity and environment protection. · Increased capacity and understanding of adaptation measures to climate risks.
Flooding	Endangered lives - Diseases - Damages to houses and properties - Contamination of water supply and sources - Contamination of coastal water springs - Soil and land fertility decrease - Land inundation - Corals affected due to sedimentation		
Storm surge	Coastal erosion - Loss of land - Schools and homes are threatened by visible erosion - Salinisation of coastal springs (source of water supply for the village) - Wetland affected due to the sedimentation of sand		
Droughts (1997/1998)	Plantations and almost all crops died. -Food supply decreased -Income reduced -Coral Bleaching		
Climate Variability -Intense rainfall -Hot suns -Seasonal changes	Increase health problems such as pink eyes, flu-like symptoms, diarrhoea and typhoid -Land prone to flooding with intense rainfall -Prone to landslides -Vegetable gardens and plantations infested with pests -Contamination of drinking water -Mango and breadfruit seasons varies -Size and quality of fruits changes		

APPENDIX 4:

Details: Extimates of Production Costs & expected Income Loss due to flooding

1. Taro Production Costs (Maturity = 6 months)

	Expenses
Plantating materials	300
Yield	500 (12/20)
Weedicides	$138 (5ltrs Gramozone)
Extablishment costs	
(Labour)	200
Maintenance	900
Total net loss	2038

The above figures is an estimate of crops lost during past and recent flooding experience by Lano village.

CONTENTS