# **Coastal Infrastructure Management Plan**

# **Vaisigano II District**



# Implementation Guidelines

November 2006

## Participants in the Plan

Village Meetings:

The CIM Plan is a Partnership between the Government of Samoa and the villages within the Plan area. Both partners have responsibility for different levels of infrastructure in the local communities and the Plan gives an integrated approach to the provision of services and improvement of resilience now and in the future.

This Plan incorporates the Faipule District of Vaisigano II.

The Committee for the Faipule District of Vaisigano II, confirms the participation of the Villages in the preparation of this Coastal Infrastructure Management Plan for Vaisigano II District in partnership with the Government of Samoa and its adoption as a Management Plan for the implementation of the Coastal Infrastructure Management Strategy.

Village Representatives:

	O	nourable Minister, Min	istry of Natural Resources, Environment & Meteorology	
	Signed:		Marie Contraction of the Contrac	
			Date:	
•	Samoa Land Corporation		Chief Executive Officer, Ministry of Natural Resources, Environment & Meteorology	
•	Samoa Communications Ltd	; 	Signed:	
•	Electric Power Corporation			
•	Samoa Water Authority			
•	Ministry of Finance			
•	Ministry of Women, Communit Development (including Interna	5	implementation of the Coastal Infrastructure Management Strategy.	
•	Ministry of Natural Resources, I Meteorology	Environment and	the participation of the Government of Samoa in the preparation of this Coastal Infrastructure Management Plan and its adoption as a Management Plan for the	
•	Ministry of Works Transport an Planning and Urban Manageme		The Planning and Urban Management Agency, as lead organization of Government, on behalf of the participating Government Departments and Corporations, confirms	
	e Government of Samoa adopts t the implementation of the Coas		cture Management Plan for the Faipule District of Falealupo as a Management Plan nagement Strategy (CIMS).	
Go	vernment Departments and Corp	porations:		
	e CIM Plan Committee representions on the draft CIM Plan we	0	in the area met on 23 September, 2005.  Committee on 2006.	
•	Papa	22 September, 2005	Marresi Trivarione Suma Grasi Linio Sopo	
•	Sataua	16 September, 2005	Tusatane Talete Number Jovia . Lefona, Ro La	
•	Fagasa	15 September, 2005	Faitan Koneference Vijagasa uma	

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#### Glossary

Coastal Hazard Zones - Defined areas landward of the coast which are or are considered likely to be subject to the effects of hazards over a

defined assessment period. In this study, reference is made to four coastal hazard zones: ASCHs (areas sensitive to coastal hazards); CEHZs (coastal erosion hazard zones); CFHZs (coastal flood hazard zones) and CLHZs (coastal

landslip hazard zones).

"Do Minimum" option - A Management option that involves continuing with the present maintenance and upgrading programme on an as and

when required basis.

Emergency Management To provide communities with skills, facilities and materials so that they may adapt, respond and recover more quickly

in the event of emergencies.

Hazard - A source of potential harm or a situation with a potential to cause loss.

*Infrastructure* – Built structures and networks which support the national, regional or local community.

at the time of extreme events.

Secondary infrastructure Infrastructure that contributes to the every-day development of the community.

Implementation Guidelines - A document to guide land use and resource practices to achieve specified goals, objectives and policies and provide a

framework for the implementation of defences and works.

Issue – A specific concern regarding both cause and effect.

Land and Resource Use - The use of land and resources by the community for social, economic or other benefit (e.g. land use includes areas used

for villages or crops, resource use includes activities such as sand mining, gravel extraction or fishing).

Monitoring – Process of measuring the effectiveness or impacts of projects and works against predicted standards, levels or

outcomes.

*Resilience* - The ability to be adaptive, responsive and quick to recover.

Community Resilience – The ability for the community to be adaptive, responsive and quick to recover from the adverse effects of

hazard.

Natural Resilience – The ability of natural systems to be adaptive, responsive and quick to recover from coastal processes or

hazards.

*Risk* – The chance of something happening that will have an impact on objectives. It is measured in terms of consequence

and likelihood. In the Coastal Infrastructure Management Plan context it is the likelihood that infrastructure will be

subject to coastal hazards and the potential for loss of property, life or land due to natural processes.

Stakeholders - Those people and organisations who may affect, be affected by, or perceive themselves to be affected by, a decision or

activity. The term stakeholder may also include interested parties.

Strategy – Direction or course of action to achieve a defined vision.

Susceptibility - The degree to which infrastructure at risk is likely to be damaged by coastal hazards and how easy/difficult,

expensive/cheap it is to replace. In the context of the CIM Plan the term susceptibility is equivalent to the term

vulnerability as the Samoan phrase for both susceptibility and vulnerability is the same.

Vision - A desired destiny.

## Acknowledgement

This plan reflects the partnership between each of the villages within the District and the Government of Samoa in the management of coastal infrastructure. Its preparation involved substantial contributions from many people; in particular, the village representatives to the District Committee, the support from the Ministry of Women, Community and Social development and the Pulenu'u in each village, without whom the plan would not have been completed.

 $In \ addition \ we \ also \ wish \ to \ recognise \ the \ significant \ contribution \ of \ the \ key \ government \ stakeholders, \ in \ particular:$ 

- Ministry of Works, Transportation and Infrastructure
   Samoa Water Authority
- Electric Power Corporation
- Samoa Telecommunications

- Ministry of Natural Resources, Environment and Metorology
- Ministry of Agriculture and Fisheries
- Samoa Land Corporation

On behalf of everyone involved, we extend our sincere thanks to each of these groups for enabling this plan to be developed.

## Introduction to the CIM Plan

#### The Strategic Vision

The District Coastal Infrastructure Management (CIM) Plan for Vaisigano II District has been prepared as part of the Government of Samoa's Second Infrastructure Asset Management Programme (SIAM-2). The CIM Plan is one of the primary means of implementing the CIM Strategy, which was formally approved by the Government of Samoa in February, 2001, as providing the Strategic direction for the management of public and private infrastructure within the coastal area, taking into account both the natural environment and local land and resource use.

The Strategy has as its central vision "Resilience - Coastal Infrastructure and Communities Resilient to Natural Hazards". The CIM Plan takes this vision and provides the practical tools with which the communities and the government, in partnership, can implement the Strategy.

To be resilient is to be adaptive, responsive and quick to recover so that communities are environmentally, socially and economically sustainable.

(CIM Strategy, January 2001).

#### The Aim of the CIM Plan

The Aim of the CIM Plan is to help communities and government improve resilience by identifying actions and solutions. Not all the solutions may be actioned immediately but the plan will ensure that issues and options are identified for the long-term improvement in resilience of both infrastructure and communities.

The CIM Plan will:

- 1. Improve the community's awareness of coastal hazard risks;
- 2. Enable the community and infrastructure providers to reduce coastal hazard risks in villages;
- 3. Enable the community and infrastructure providers to better adapt, respond and recover from cyclones and other emergency events.

#### Structure of the Plan

The CIM Plan consists of two parts each serving a separate and distinct purpose.

- *Plan Development*, which describes the process undertaken in preparing the CIM Plan in conjunction with representatives of the Communities involved, the Government and other stakeholders with interests in the Plan area.
- *Implementation Guidelines*, which describes the Plans and Actions recommended as outcomes of the process, together with the partner responsible for implementing these outcomes. The participants of the CIM Plan preparation process are acknowledged in the *Implementation Guidelines*.

## Implementation Guidelines

## Purpose of the Implementation Guidelines

The Implementation Guidelines describe the solutions proposed that will increase the resilience of the villages in the Plan area and the ways these solutions can be implemented. The solutions are presented for each of the infrastructure items that have moderate to low resilience. Where one solution will provide benefits to other items of infrastructure these "Other Benefits" are also noted. Implementation is considered to be the joint responsibility of both the villages and the government in partnership. The government is responsible for the provision of national and district "Public", infrastructure, while villages are responsible for local and community infrastructure. The responsibility for implementing the proposed actions is also defined. Solutions for both District infrastructure and Village infrastructure, and the responsibility of both partners, should be considered together as they combine to provide for the integrated management of all coastal infrastructure.

The solutions for village infrastructure will usually be the responsibility of the Village and Families in the village to implement. Advice and resources may be available from government to assist the village in implementing these solutions. In most situations these solutions will also provide benefits to both village **and** district infrastructure and should be considered an integral part of managing coastal infrastructure at both levels.

#### Duration of the Plan

The CIM Plan should be reviewed at five-yearly intervals. During the Plan period, the solutions implemented will be monitored to ensure that they are effective in improving resilience. Some solutions are likely to take longer than five years to implement and the review will take the progress of these into account.

The review of the *Implementation Guidelines* and the solutions proposed will be undertaken:

- 1. As part of the Five-yearly CIM Plan review programme.
- 2. Once implemented, the solutions will be monitored on either an annual or five-yearly basis to check the effectiveness of the solution. Detailed implementation of the solution will determine the monitoring requirements and Key Performance Indicators.

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## 1 Description of Vaisigano II District Environment

#### **Physical Setting**

The Faipule District of Vaisigano II is located on the north-western edge of the island of Savaii. Like all of Samoa, its physical landscape is the result of relatively recent volcanic events. Lava flows at many places provide a hard rocky coastline broken into small bays edged with white coral sand. Coral reefs 100 to 200 metres offshore protect the coastline to some extent, but the reefs were severely damaged three times during the last 15 years by the cyclones of Val, Ofa and Hetta.

Away from the coast, relatively fertile but seasonally dry land rises to an elevation of 300 metres. Both along the Main North Coast Road and along adjacent work roads, housing and plantations are now scattered across the landscape. During the rainy season landslips and heavy runoff frequently make local work roads, including the road down to Papa's coast, impassable.

There are four rivers in the district but all are seasonal. There are also springs in each of the three original coastal villages. All are now disused. Water for parts of Sataua and Fagasa is piped (un-metered) from a bore, but most people have to rely on rainwater collected in private roof tanks. There is often a water shortage in the district and water must then be purchased from other villages.

#### Social Setting

According to the latest census, the Vaisigano II District has a population of 1482 persons.

The district contains 3 main villages, Fagasa, Sataua and Papa. Originally all three villages were located in the three largest bays along the coast where there was some level land to build on. But buildings on this land proved to be particularly vulnerable to flooding and damage during the recent cyclones, so most development in the lowest coastal areas of these bays has moved up hill. Virtually all of the village of Papa has now moved away from the coast for safety reasons.

There has not been any significant recent change in the local population but because many residents, and public buildings have moved inland away from the hazardous coastal area, the villages of Sataua and Fagasa look less intensively populated than they were. In these two villages, there is new development occurring inland along the plantation roads. In the Papa-uta area, most of the development is fairly new. The recent changes in all three villages have resulted in a haphazard pattern of development.

The one notable exception to the extensive relocation of development away from the coast is the District Hospital at Sataua. This facility remains located on a prominent lava outcrop directly on the coast. The coastline in the immediate vicinity has been strengthened to withstand wave damage and the hospital structures themselves appear to have been recently rebuilt to withstand considerable winds.

The Main North Coast Road is an important part of the district's infrastructure as it provides the only access to primary services such as local schools, shops and health facilities (Sataua District Hospital). In Fagasa and Sataua it runs close to the coast before turning inland to Papa-uta.

Primary services such as power and telephone generally follow the Main North Coast Road.

Work roads to the village plantations extend inland from the Main North Coast Road. These are mostly unsealed and have no power or telephone services along them.

## **Economic Setting**

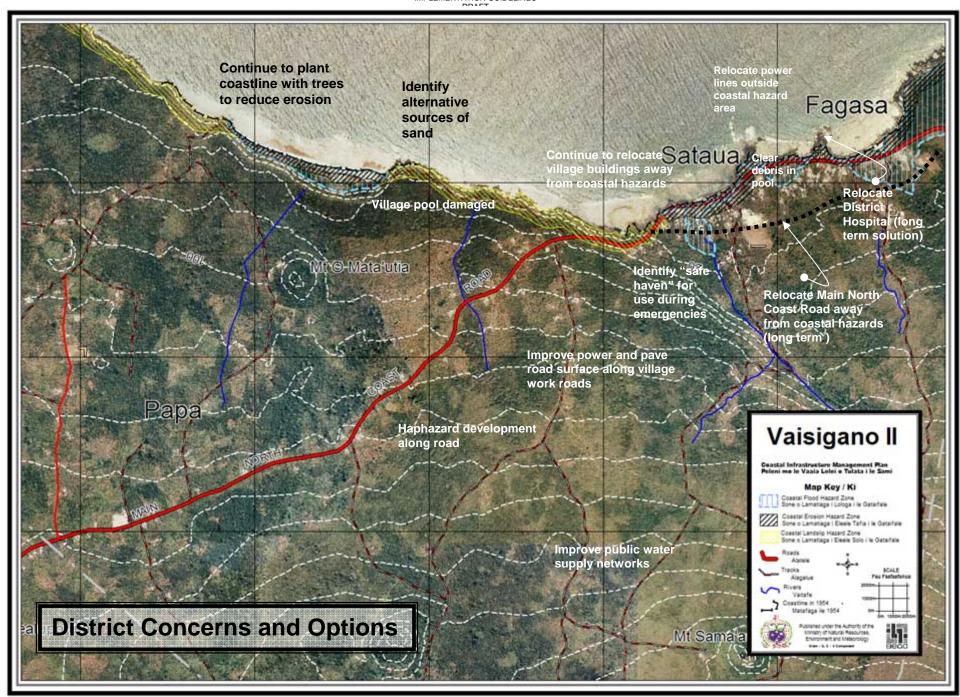
The cash economy of the District is dominated by traditional plantation work and fishing, although there are some employment opportunities in local shops and at both local schools and the District Hospital at Sataua. There are also employment opportunities at nearby tourist facilities, businesses, government departments and schools at Vaisala and Asau.



# 2 Vaisigano II District Infrastructure

## CIM Plan Solutions

Infrastructure	Best Solutions and Other Solutions Proposed	Other Benefits	Implementation Guidelines
Main Coast Road	<ul> <li>Relocate the Main North Coast Road inland from the coast to improve resilience and reduce risk from natural disasters</li> <li>Approximate length of road 2,000m         Approximate cost WST460,000         Cost Benefit ratio         (10% Discount Rate) 1.34     </li> <li>Responsibility: MWTI</li> <li>Best Solution</li> <li>Improve culverts and drainage ditches to reduce flooding behind the road.</li> <li>Responsibility: MWTI/Villages</li> </ul>	<ul> <li>Improved rate of recovery.</li> <li>Improved access to elevated areas.</li> <li>Improved coastal protection</li> <li>Safer village houses and roads,</li> <li>Improved tourism potential</li> <li>Improved sustainability of natural resources</li> </ul>	<ul> <li>Consult landowners about dedicating areas for new road</li> <li>Prepare Environmental Impact Assessment for relocated road.</li> <li>Undertake regular inspections and maintenance of road and drainage.</li> <li>Provide for works in budget programmes</li> </ul>
Coastal protection	<ul> <li>Plant appropriate tree species along coastline to reduce erosion.</li> <li>Government to assess the sustainable levels for sandmining in the District.</li> <li>Identify alternative sustainable sources of sand for commercial supply.</li> <li>Establish marine protected areas or ban of coral damaging activities</li> <li>Responsibility: Village/MNREM</li> </ul>		<ul> <li>Village/Families to recognize the role that vegetation plays in stabilizing coastal areas.</li> <li>Coastal areas to be planted as soon as possible with suitable species.</li> <li>MNREM to advise on appropriate tree species and where possible, provide seedlings.</li> <li>Village to share control with Government over sand mining activities.</li> <li>Government to investigate the feasibility of establishing a marine reserve in this area.</li> </ul>
Electricity lines in CEHZ and CFHZ	<ul> <li>Provision of underground electricity</li> <li>Relocate electricity lines away from CEHZ and CFHZ at reasonable distance from family houses</li> <li>Responsibility: EPC</li> </ul>	Improved safety and access.	<ul> <li>Ensure regular maintenance of electricity lines.</li> <li>Provide for works in budget programmes</li> </ul>
Telephone network	<ul> <li>Provision of underground telephone network</li> <li>Provision of upgraded cell phone coverage</li> <li>Responsibility: SamoaTel</li> </ul>	Improved resilience and rate of recovery	Provide for works in budget programmes
Main water supply	Upgrade the existing public water networks in the district with a better pump to pump the water from the wells for district distribution  Responsibility: Samoa Water Authority	<ul> <li>Improved resilience and rate of recovery</li> <li>Healthy communities</li> </ul>	<ul> <li>Investigate improved water reticulation network</li> <li>Regularly test water quality for health safety</li> <li>Provide for works in budget programmes</li> </ul>
District hospital	<ul> <li>Strengthen the seawall around the hospital and buildings to resist strong winds</li> <li>Relocate the hospital further inland (long term solution)</li> <li>Responsibility: Samoa Health Authority</li> </ul>	<ul><li>Improved resilience and rate of recovery</li><li>Healthy communities</li></ul>	<ul> <li>Monitor seawall and building condition on a regular basis</li> <li>Identify alternative sites for relocation</li> </ul>
Seawalls	<ul> <li>Maintain existing seawalls along the coast to protect the villages and the government infrastructure         <i>Responsibility: MWTI</i></li> <li>Sand deposited ashore from the cyclones could be used for beach replenishment         <i>Responsibility: MNREM</i></li> </ul>	Reduced damage costs	<ul> <li>Undertake condition assessment of seawall</li> <li>Obtain permits for construction/ maintenance of seawalls</li> <li>Consult with villages on suitable sand source for replenishment</li> <li>Undertake environmental impact assessment on effects of beach replenishment</li> <li>Obtain permits/development consents for beach replenishment</li> </ul>
Emergency Management	<ul> <li>Identify schools and churches outside of the CEHZ and CFHZ as safe havens.</li> <li>Prepare a District Emergency Response Plan identifying resources needed for the safe havens.</li> <li>Prepare signs in English and Samoan to be erected throughout the District identifying actions in the event of emergencies including a location map of nearest emergency facilities and safe haven.</li> <li>Responsibility: MNREM/District/Village</li> </ul>	<ul> <li>Improves preparedness of District for cyclones.</li> <li>Improves resilience and ability to respond</li> </ul>	<ul> <li>District response plan should include procedure for who prepares, maintains and opens the safe haven as well as procedures to notify villagers and visitors in an emergency and to maintain and replenish supplies.</li> <li>Identify location of facilities on CIM Plan maps.</li> </ul>



Vaisigano II coastline



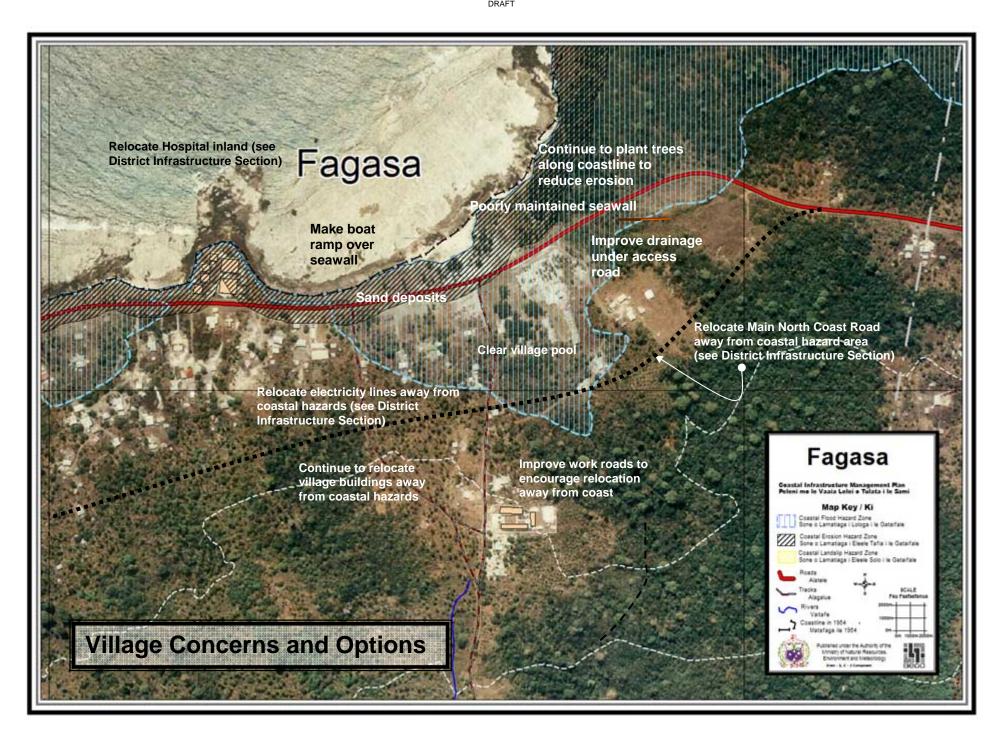
District Hospital in very exposed location



# 3 Fagasa Village Infrastructure

## CIM Plan Solutions

Infrastructure	Best Solutions and Other Solutions Proposed	Other Benefits	Implementation Guidelines
Village houses, churches and other infrastructure in CEHZ and CFHZ	<ul> <li>Where reclamations or other major coastal works are proposed Government and village to manage processes by requiring villagers to get the appropriate permits and consent.</li> <li>Responsibility: MWTI/Village / Families</li> <li>Continue to relocate outside or set back from CEHZ and CFHZ when buildings require replacement. Alternatively, ensure any investment in structures located within the hazard zones takes into account the potential for damage from coastal erosion and flooding.</li> <li>Responsibility: Village / Families</li> <li>Best Solution</li> <li>Consider building foundations at a level that takes into account the CFHZ.</li> <li>Responsibility: Families</li> <li>Avoid development in the Coastal Landslip Hazard Zone (CLHZ).</li> <li>Responsibility: Families</li> </ul>	<ul> <li>More resilient to natural hazards,</li> <li>Safer houses</li> <li>Better use of economic resources</li> </ul>	<ul> <li>Family decision when building to provide long-term protection from flooding.</li> <li>Village / Family decision to relocate in long term or build new houses away from the coastal hazard areas.</li> </ul>
Village work roads	Improve culverts and drainage ditches to reduce flooding behind the road.  Responsibility: MWTI/Village	<ul> <li>Improves health of the community</li> <li>Improves resilience and rate of recovery</li> </ul>	Ensure inspection, upgrade and maintenance works programmed in annual budget
Water supply	Clear sand and gravel debris currently covering the village pool  Responsibility: Village / Families	<ul> <li>More resilient to natural hazards</li> <li>More reliable water supply</li> <li>Improves health</li> </ul>	<ul> <li>Prepare plans for pool upgrades</li> <li>Obtain appropriate permits and development consents.</li> </ul>
Coastal protection	<ul> <li>Identify a sustainable source for domestic sand in the vicinity.</li> <li>Beach replenishment at critical locations along the beach to protect the local coastal road and infrastructure against inundation and coastal erosion</li> <li>Responsibility: MNREM/Village</li> <li>Plant suitable species of trees or other vegetation in the coastal areas.</li> <li>Responsibility: MNREM / Village / Families</li> </ul>	<ul> <li>Improved protection and resilience.</li> <li>Safer houses.</li> <li>Improved tourism opportunities</li> <li>Improved sustainability of natural resources</li> </ul>	<ul> <li>Prepare Environmental Impact Assessments for identified sand sources and effects of replenishment.</li> <li>Obtain appropriate permits.</li> <li>Liaise with MNREM Forestry Division (Asau) regarding appropriate tree species and possible seedling supply.</li> <li>Village to recognize the role that vegetation plays in stabilizing coastal areas.</li> </ul>
Boat slipway	Construct a proper boat slipway for village boats for access when the sea wall is maintained  Responsibility: MWTI/Village	<ul> <li>Improved tourism opportunities</li> <li>Improved sustainability of natural resources</li> <li>Better use of economic resources</li> </ul>	<ul> <li>Prepare plans for slipway</li> <li>Obtain permits and development consents.</li> </ul>





Vegetation helping to reduce coastal erosion

Fagasa coastline with existing boat ramp (centre right)

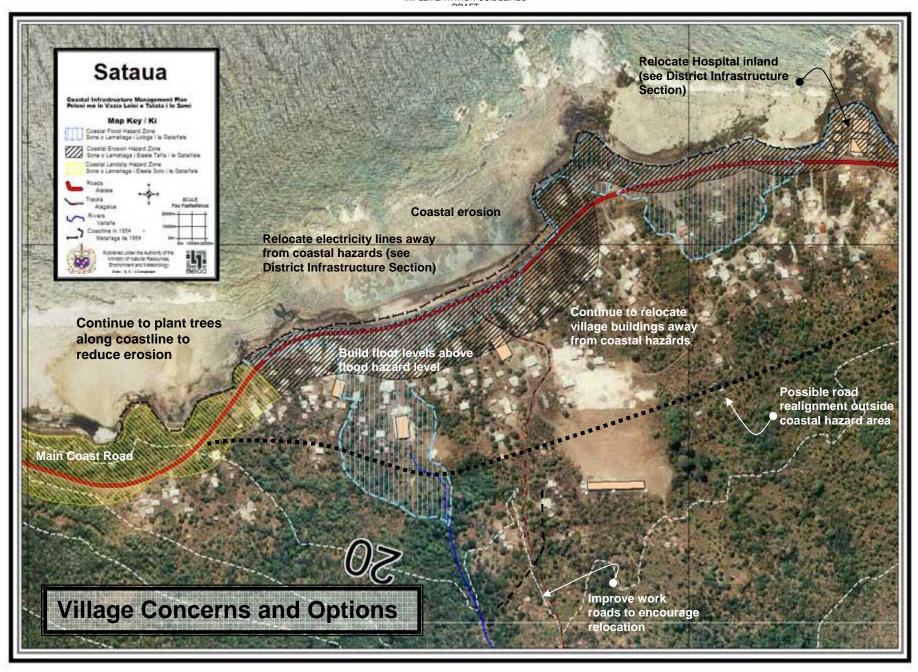


# 4 Sataua Village Infrastructure

## CIM Plan Solutions

Infrastructure	Best Solutions and Other Solutions Proposed	Other Benefits	Implementation Guidelines
Village houses, churches and other infrastructure in CEHZ and CFHZ	<ul> <li>Where reclamations or other major coastal works are proposed Government and village to manage processes by requiring villagers to get the appropriate permits and consent.</li> <li>Responsibility: MWTI/Village / Families</li> <li>Relocate outside or set back from CEHZ and CFHZ when buildings require replacement. Alternatively, ensure any investment in structures located within the hazard zones takes into account the potential for damage from coastal erosion and flooding.</li> <li>Responsibility: Village / Families</li> <li>Best Solution</li> <li>Consider building foundations at a level that takes into account the CFHZ.</li> <li>Responsibility: Families</li> <li>Avoid development in Coastal Landslip Hazard Zones (CLHZ)</li> <li>Responsibility: Families</li> </ul>	<ul> <li>More resilient to natural hazards,</li> <li>Safer houses</li> <li>Better use of economic resources</li> </ul>	<ul> <li>Family decision when building to provide long-term protection from flooding.</li> <li>Village / Family decision to relocate in long term or build new houses away from coastal hazard zones.</li> </ul>
Village work road	Improve culverts and drainage ditches to reduce flooding behind the road.  Responsibility: MWTI/Village	<ul> <li>Improves health of the community</li> <li>Improves resilience and rate of recovery</li> </ul>	Ensure inspection, upgrade and maintenance works programmed in annual budget
Water supply	Clear sand and gravel debris currently covering the village pool  Responsibility: Village / Families	<ul> <li>More resilient to natural hazards</li> <li>More reliable water supply</li> <li>Improves health</li> </ul>	<ul> <li>Prepare plans for pool upgrades</li> <li>Obtain appropriate permits and development consents.</li> </ul>
Coastal protection	<ul> <li>Identify a sustainable source for domestic sand in the vicinity.</li> <li>Beach replenishment at critical locations along the beach to protect the local coastal road and infrastructure against inundation and coastal erosion</li> <li>Responsibility: MNREM/Village</li> <li>Plant suitable species of trees or other vegetation in the coastal areas.</li> <li>Responsibility: MNREM / Village / Families</li> </ul>	<ul> <li>Improved protection and resilience.</li> <li>Safer houses.</li> <li>Improved tourism opportunities</li> <li>Improved sustainability of natural resources</li> </ul>	<ul> <li>Prepare Environmental Impact Assessments for identified sand sources and effects of replenishment.</li> <li>Obtain appropriate permits.</li> <li>Liaise with MNREM Forestry Division (Asau) regarding appropriate tree species and possible seedling supply.</li> <li>Village to recognize the role that vegetation plays in stabilizing coastal areas.</li> </ul>

Note: Refer to Maps to see proposed alignments and locations of intervention solutions.

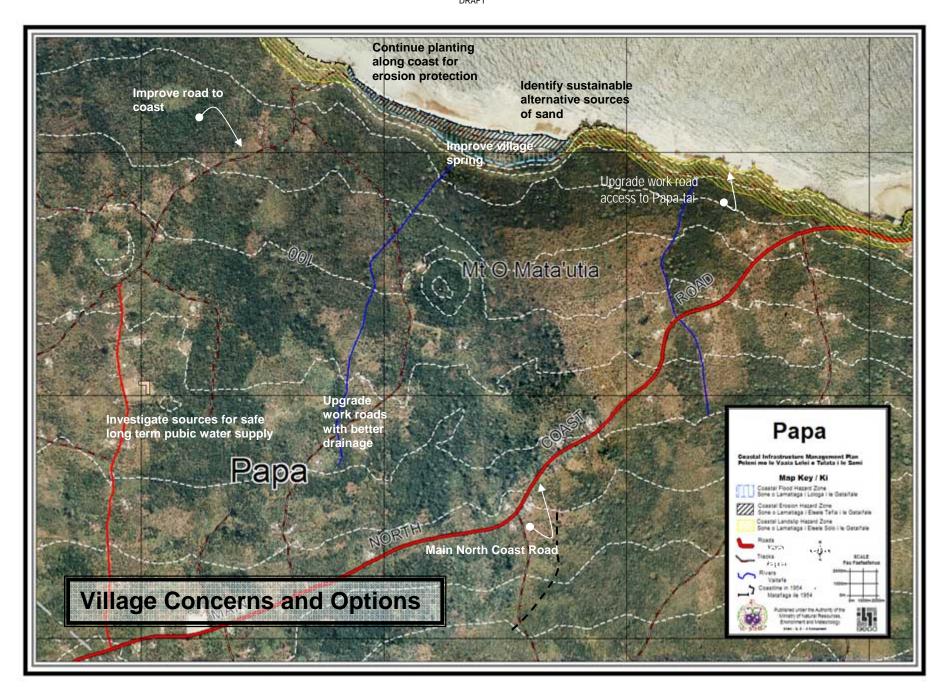




# 5 Papa Village Infrastructure

## CIM Plan Solutions

Infrastructure	Best Solutions and Other Solutions Proposed	Other Benefits	Implementation Guidelines
Village houses and other infrastructure in the hazard zones	<ul> <li>Where reclamations or other major coastal works are proposed Government and village to manage processes by requiring villagers to get the appropriate permits and consent.</li> <li>Responsibility: MWTI/Village / Families</li> <li>Relocate outside or set back from CEHZ and CFHZ when buildings require replacement. Alternatively, ensure any investment in structures located within the hazard zones takes into account the potential for damage from coastal erosion and flooding.</li> <li>Responsibility: Village / Families</li> <li>Best Solution</li> <li>Consider building foundations at a level that takes into account the CFHZ.</li> <li>Responsibility: Families</li> <li>Avoid development in Coastal Landslip Hazard Zones (CLHZ)</li> <li>Responsibility: Families</li> </ul>	<ul> <li>More resilient to natural hazards,</li> <li>Safer houses</li> <li>Better use of economic resources</li> </ul>	<ul> <li>Family decision when building to provide long-term protection from flooding.</li> <li>Village / Family decision to relocate in long term or build new houses away from coastal hazard zones.</li> </ul>
Coastal access road	Upgrade access road into Papa-tai     Responsibility: MWTI / Village / Families	<ul> <li>Improve access to village pool</li> <li>Improve potential opportunities (palolo, etc)</li> </ul>	Review if more intensive use of coast is proposed, or if Papa village water supply not improved
Water supply	<ul> <li>Investigate reliable water supply for Papauta         Responsibility: SWA / Village / Families     </li> <li>Clear village pool at Papa-tai         Responsibility: Village / Families     </li> </ul>	<ul> <li>More resilient to natural hazards</li> <li>More reliable water supply</li> <li>Improves health</li> </ul>	<ul> <li>Prepare brief to investigate village water supply</li> <li>Prepare plans for pool upgrades</li> <li>Obtain appropriate permits and development consents.</li> </ul>
Coastal protection	<ul> <li>Identify a new sustainable source for domestic sand in the vicinity.</li> <li>Responsibility: MWTI / Village / Families</li> <li>Beach nourishment using the debris deposited on land by the cyclones</li> <li>Responsibility: MWTI / Village / Families</li> <li>Continue planting vegetation in coastal areas and protect plants from damage</li> <li>Responsibility: Village / Families</li> <li>Establish marine protected areas</li> <li>Responsibility: MNREM / Village / Families</li> <li>Clear rubble and coral rocks on the reef blocking the natural flow of the sea in the inshore reef</li> <li>Responsibility: MNREM / Village / Families</li> </ul>	<ul> <li>Improved protection and resilience.</li> <li>Safer environment</li> <li>Improved tourism opportunities</li> <li>Improved sustainability of natural resources</li> <li>Improved marine biodiversity</li> <li>Reduced damage costs</li> </ul>	<ul> <li>Investigate suitable sand resources for replenishment</li> <li>Investigate potential effects of depositing sand</li> <li>Consult with affected villages</li> <li>Obtain appropriate permits for depositing sand</li> <li>Liaise with MNREM Forestry Division (Asau) regarding appropriate tree species and possible seedling supply.</li> <li>Village to recognize the role that vegetation plays in stabilizing coastal areas.</li> <li>Investigate potential effects of clearing reef</li> </ul>



Papa-tai spring

Papa-tai spring

Papa-tai value a la castal road

