

**INTEGRATED WATER RESOURCES MANAGEMENT DEMONSTRATION PROJECT  
PROPOSAL**



***Ngerikiil Watershed Restoration***

***for***

***Improvement of Water Quality***



**REPUBLIC OF PALAU**

**2007**

Prepared on behalf of Water Safety Plan Program National  
Steering Committee for Sustainable Integrated Water  
Resources and Wastewater Management (IWRM) Project

## Table of Contents

<b>Country: Republic of Palau</b> .....	<b>1</b>
<b>Title: Ngerikiil Watershed Restoration for the Improvement of Water Quality</b> .....	<b>1</b>
<i>A.Executing Body</i> .....	<i>1</i>
<i>B.Cost of Project</i> .....	<i>1</i>
<i>C.Project Purpose</i> .....	<i>1</i>
<i>D.Project Summary</i> .....	<i>1</i>
<i>E.Eligibility to GEF</i> .....	<i>1</i>
<i>F.Linkages to Regional/National Priorities and Programs</i> .....	<i>2</i>
<i>G.Name and Post of Government Representative endorsing the Activity</i> .....	<i>2</i>
<i>H.Project Objectives and Activities</i> .....	<i>3</i>
<i>I. Project Management Structure</i> .....	<i>10</i>
<i>J.Stakeholders and Beneficiaries</i> .....	<i>11</i>
<i>K.Long-term Sustainability Strategy</i> .....	<i>12</i>
<i>L.Replicability</i> .....	<i>12</i>
<i>M.Monitoring and Evaluation Process</i> .....	<i>12</i>
<i>N.Co-Funding</i> .....	<i>13</i>
<b>Annex A: BUDGET</b> .....	<b>15</b>
<b>Annex B Workplan</b> .....	<b>21</b>



**Integrated Water Resource Management Project**

**Proposal A: Demonstration Proposal Paper for Palau**

**Country: Republic of Palau**



**Title: Ngerikiil Watershed Restoration for the Improvement of Water Quality**

***A. Executing Body***

The National Steering Committee for the Water Safety Program, pending establishment of the National Water Committee.

***B. Cost of Project***

GEF Funding: US\$ 587,400      Co-Funding: US\$1,763,500

***C. Project Purpose***

The purpose of this project is to promote proper watershed and integrated management practices. The promotion of proper watershed practices will reduce land degradation while preserving ecosystem stability, functions, and services such as soil and watershed protection, water purification and nutrient retention.

***D. Project Summary***

The project proposes to demonstrate proper maintenance and management of a critical water source through re-introduction of native plant species to help stabilize the soil, use of bioindicators as low-cost monitoring tools, and proper mitigation of road drainage, with outcomes to be replicated within the Republic and the region. The demonstration project will be in the Ngerikiil Watershed in the State of Airai, Republic of Palau.

***E. Eligibility to GEF***

Within the GEF Operational Strategy for International Waters this project tackles water and environmental problems using an IWRM approach across GEF Strategic Programme III: Balancing overuse and conflicting uses of water resources in transboundary surface and groundwater basins (*with a specific focus on SIDS to protect community surface and groundwater supplies while reducing sewage releases*).

The geographical nature of small island developing states (SIDS) allows IWRM approaches to rapidly demonstrate the multiple benefits of tackling water resource management in an institutionally horizontal

manner, whilst applying a ridge to reef approach, tackling technical and socio-economic issues with communities and civil society at large to demonstrate equity, efficiency and environmental sustainability.

The project will also tackle, through IWRM approaches, many of the issues under GEF Strategic Programmes I and II through identifying and understanding multiple stresses on fragile coastal environments and linking these to freshwater and land management, especially upstream practices

***F. Linkages to Regional/National Priorities and Programs***

Under the Strategic Action Programme for the Pacific International Waters, this project addresses these priority areas: pollution of marine and freshwater from land-based activities and physical, ecological, and hydrological modification of critical habitats, using integrated watershed and coastal management as a solution.

The proposal is also compatible with the following International and Regional Multilateral Agreements to which the Republic of Palau is a signatory and supports several on-going activities support by GEF under these various REAs.:

- Convention on Biological Diversity
- The Ramsar Convention on Wetlands
- The Cartagena Convention and Protocols
- The United Nations Convention to Combat Desertification (UNCCD)
- The Strategic Action Programme for the Pacific International Waters
- Pacific Regional Action Plan on Sustainable Water Management

It will contribute to regional programs as a prerequisite to a regional Global Taxonomic Initiative (GTI) proposal that was approved in 2004 by UNEP/CBD/GTI for development for GEF mid-level funding for monitoring freshwater streams and support a current GEF-funded project in Palau for capacity building for sustainable land use.

This Demonstration Project also addresses National priorities of water source protection, watershed management, reforestation and increase of endemic and native plants, environmental awareness, environmental enhancement, protection of human health, alleviating poverty and safe drinking water.

This project will be linked to an ongoing Ecosystem Based Management project in Central Babeldaob with similar goals. Using these same techniques will ensure uniformity by following an established precedence developed in Palau.

***G. Name and Post of Government Representative endorsing the Activity***

Honorable Temmy Shmull

Minister of State

Republic of Palau

## H. Project Objectives and Activities

### i. Background

The IWRM Demonstration project area will be the Ngerikiil Watershed in the State of Airai on the island of Babeldaob. Within this watershed lies the water source for Airai and Koror, serving 78% of the population of Palau.

The Ngerikiil Watershed area covers 28.5 square kilometers (11 square miles or 7,040 acres) of Airai State, Babeldaob Island. The sub-watersheds of Ngerikiil include the Ngerikiil, Ikoranges, Kmekumel, Edeng, Oikull, and Airai. The watershed has been an area of importance to Palau as a major water source (water intake built in 1985) and therefore, of interest for a watershed protection project for many years.

Five critical resource concerns were identified through a resource assessment completed by the USDA Natural Resources Conservation Services. In order of their level of threat to the main watershed objectives the critical resource concerns are:

- Soil Erosion and Sedimentation
- Nutrient, Fertilizer and Pesticide Pollution
- Solid Waste Disposal
- Invasive Species
- Wildlife Habitat Loss



Map 1: Location of Ngerikiil Watershed and its sub-watersheds and streams

11

Source: NRCS Ngerikiil Resource Assessment (2004)

Source: NRCS Ngerikiil Resource Assessment (2004)



*Ngerikiil River*



Given the importance of the watershed to the livelihood of a large percentage of the population, improved water quality is a high priority for the local and national government. The high costs of comprehensive water quality monitoring have precluded the compiling of a complete data record that could be used for a variety of watershed related programs, including water quality and sediment control, native species habitat enhancement, and recreational opportunities such as tourism, swimming, and fishing.



The main source of pollution is sedimentation. The causes are poor erosion controls, loss of riparian buffers, and poor land-use practices. Sedimentation is also an issue for the coastal areas, where the sediment covered reefs have no live coral. Heavy rainfalls in the in the watersheds cause immediate sediment loading into the rivers. This effects coral reefs and seagrass beds on the coast as well as impacting treatment public water supply systems.



Increased sedimentation onto reefs has a negative impact on biodiversity. It leads to coral death and decrease in fish numbers, therefore indirectly impacting subsistence fishing. Also, increasing sedimentation in the rivers increases the need to use more chemicals to reduce turbidity levels to drinking water standards and also increases the use of disinfectants to ensure safe drinking water. This translates to an increase in expenditures on chemical supplies. Simple filtration systems do not remove enough turbidity and this causes reticulated water from such systems unpotable regardless of disinfectant levels. In such instances, human health is at risk if public water systems are the main drinking water sources.



Clearing forest for development purposes and agricultural farming have caused higher sediment loads into the rivers and out to the coral reefs. Research by the Palau International Coral Reef Center (PICRC) has indicate higher sedimentation rates in the past few years. They found higher sediment rates on coral reefs

near watersheds with larger deforestation (for development and agricultural purposes) than near watershed with relatively pristine forests. Soil erosion is affecting water quality, decreasing depth of the rivers, and covering seagrass beds and coral reef patches. This is impacting the flora and fauna of the rivers and adjacent coastal areas.

Among the watersheds in Palau, the Ngerikiil watershed is one of the more developed areas. This project will attempt to stabilize river banks and revegetate the riparian buffer zone to decrease sedimentation into the Ngerikiil river and study the effectiveness of such buffer zones given the high amount of rain that Palau receives annually. Sediment studies will be done in conjunction with water quality monitoring to determine success of revegetated buffer areas. These sediment studies will be tied into the coral reef research conducted by PICRC and mangrove studies on nutrient loading and climate change conducted by the USDA Forest Service.



In addition, public awareness campaigns for watershed awareness and protection will support this project. The Palau Conservation Society (PCS) has been very active throughout Palau with watershed campaigns through local community leaders and groups. They are working directly with communities living and working within the watershed. PCS is planning on using modeling tools as an alternative method of awareness raising. Outreach campaigns will assist with the sustainability of the IWRM project by relaying ongoing activities and initiatives to the local communities and stakeholders. Several of the planned activities for the Demonstration Project, such as the revegetation of the buffer zones, will utilize volunteers and community groups to ensure a sense of ownership and stewardship. By involving the local communities, not only does the water source for Koror and Airai have protection, but the people directly impacting these sources are more understanding towards watershed issues.

Accurate assessments of surface water quality in the watershed provide a key indicator of the overall health of the watershed. On top of this, biological indicators may be used as one of the water quality parameters to be monitored. A clean water source can be assured several different ways (the least of which involves several tonnes of cement). However, surveying aquatic macroinvertebrates and bird and insect populations can lead to the assurance of biological success of the project.



Another main impact the area is the compact road. Drainage from certain parts of the road impacts the river above the intake. This project will explore correcting the drainage problems. The success will be used on all other drainage of the road on different parts of the islands. The road system will be looked at to see if there should be a design for runoff water so it can be caught at the roadway and controlled until it may be discharged at a stable outlet and with a non-erosive velocity. To alleviate pressure on the current landscape, water is drained through an open channel along the roadside. This project will study the effectiveness of catch basins on the uphill side of the road and whether the water can be diverted to run through existing culverts to the other side of the ridge into the adjacent watershed (away from the intake) or be discharge over an energy dissipating structure. Study of the water chemistry will be looked at to determine any potential uses for this water.

Development within the watershed has been limited recently with land-use regulations created by the Airai State Public Lands Authority. However, there is no information on how effective this has been. Existing policy and regulations need to be reviewed for proper support and structure. This need involves

development and adoption of a comprehensive Management Plan for the watershed, which includes formulation of an integrated long-term monitoring program for water (and/or soil) quality. Many of these activities planned will use results from the Demonstration Project. On top of all these needs is the necessity of finding sources of long-term funding to assure financial sustainability of the watershed without support from unsustainable economic development.

Recognizing the over-riding importance of the water resource to the demands of Koror, Airai, and adjacent environments, the State government of Airai, with support from the National government, is seeking to find ways to ensure long-term sustainability of the area.

Based on this background, the project proposes to demonstrate proper maintenance and management of a critical water source through re-introduction of native plant species to help stabilize the soil, use of bioindicators as low-cost monitoring tools, and proper mitigation of road drainage, with outcomes to be replicated within the Republic and the region.

This proposed project will aid in the achievement of long-term local and global environmental benefits. This will occur through the promotion of best management practices for land use planning and management. The promotion of proper watershed practices will reduce land degradation while preserving ecosystem stability, functions, and services such as soil and watershed protection, water purification and nutrient retention. Globally benefits include carbon uptake and storage, and the preservation of species diversity.

Using these same techniques will ensure uniformity by following an established precedence developed in Palau.

*ii. Components, Outputs and Indicators*

Component	Output	Indicator	Baseline	Aims
<b>Component 1. Improvement surface water quality</b>				
1.1 Survey pollutant sources	1.1.1 Sanitary surveys completed	Surveys completed by yr 3 & 5	Year 1 baseline	Surveys used for identifying problem areas to be corrected
	1.1.2 Pollutant sources mapped	Map completed by year 1	Year 1 Map	Maps used for management of catchment  Less pollutants entering river and coastlines
	1.1.3 Pollutant sources reduced	Pollutant sources reduced by 10%	Year 1 baseline	Sources removed or control, buffer zones in place and effective

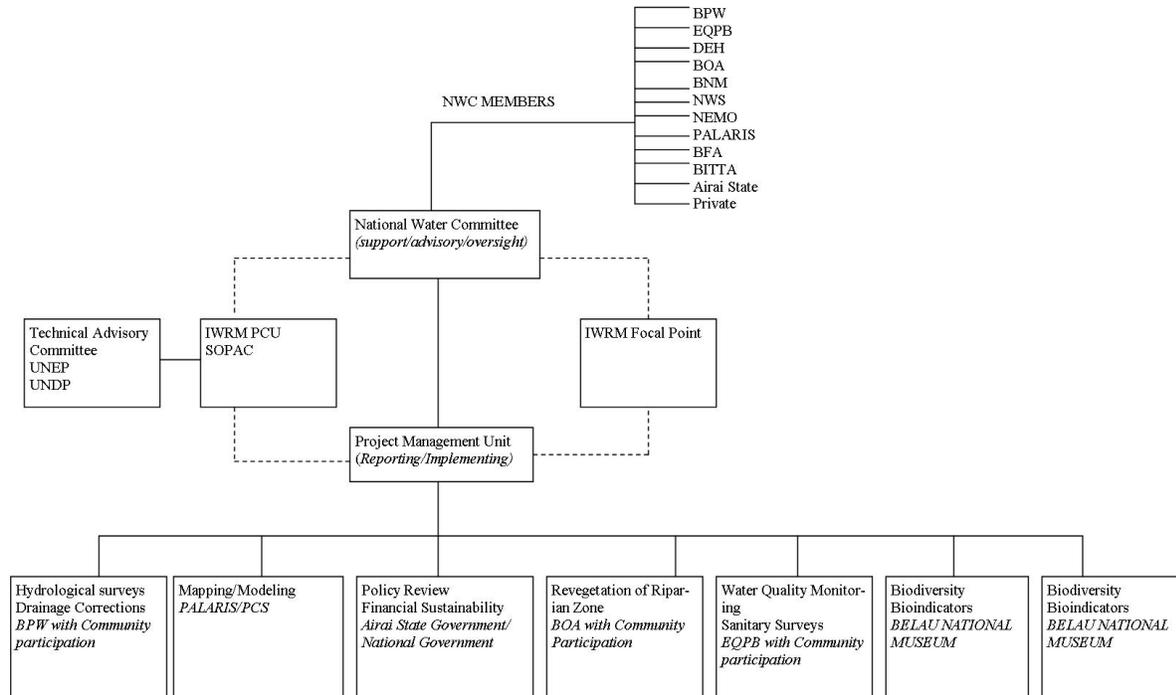
## Ngerikiil Watershed Restoration for the Improvement of Water Quality

1.2 Revegetate riparian to minimize sedimentation levels	1.2.1 Riparian revegetated with native tree species	25% of riparian zone is revegetated with native trees by year 3	Current forest coverage will be assessed before revegetation	Healthy riparian for years to come, increase biodiversity
	1.2.2 Chemical usage for water treatment reduced	5% reduction in chemicals used to treat source water at Ngeruobel WTP by end of project	Current levels of chemical use at Ngeruobel WTP	Decrease in cost of treating water, used as indication of sediment reduction
	1.2.3 Chemical pollutants of river waters monitored	Full chemical screening of water conducted on year 1, 3, & 5 with a reduction of high pollutant levels by 5% at Year 5	Baseline collected at Year 1	Decrease in high level pollutants, as indication of better filtration by healthy riparian
1.3 establish long-term monitoring program	1.3.1 Water quality monitoring program developed/formalized	1 water quality monitoring program developed by year 1	Informal water quality monitoring program in place	Data will assist with management of the catchment
	1.3.2 Monthly water quality monitoring visits carried out .	12 water quality monitoring visits per year per site	Limited monitoring	Data collected used for management of the catchment
	1.3.3 Water quantity monitoring program developed	1 water quantity monitoring program developed by year 3		HYCOS project
<b>Component 2. Drainage mitigation</b>				
2.1 Vegetate drainage ways	2.1 Drainage ways of 'Compact Road' affecting water source vegetated	All drainage ways vegetated by end of project	Minimal vegetation	
2.2. Storm water workshop	2.2 People trained in storm water management	1 workshop completed by year 1 (20 people trained)	No training	Knowledge acquired used to improve road drainage in the Ngerikiil watershed and throughout the rest of Palau
2.3 Chemical analysis of road drainage	2.3 Road run-off analyzed	1 analysis completed by year 1	No baseline	Information will be used to determine road contributions to water quality
<b>Component 3. Improvement of biodiversity/bioindicators</b>				
3.1 Monitoring of ecosystem health through bioindicators	3.1.1 Ongoing aquatic invertebrate monitoring data collected	1 aquatic invertebrate survey completed per quarter per monitoring site	Compare to reference site	0% reduction in biodiversity  10% improvement in biodiversity and species richness by year 5
	3.1.2. Dragonfly surveys conducted	1 dragonfly survey completed per year per site	Dragonfly baseline established in Year 1	Information used to improve management
	3.1.3 Bird population surveys conducted	1bird population survey completed per quarter per site	Bird population Baselines currently assessed	5% increase in native & endemic bird population by year 5
	3.1.4 Monitoring sites conducted	1 vegetation photopoint monitoring per year per site	Vegetation photopoint established by year 1	Used on a yearly basis to determine improvement of revegetation/biodiversity
<b>Component 4. Policy/Awareness</b>				

## Ngerikiil Watershed Restoration for the Improvement of Water Quality

4.1 Establish “Payment for Ecosystem Services”	4.1 Revenue collected from water users by Year	Legislation/policy for PES established by year 4	5No money collected for safeguarding water source	Ngerikiil Watershed Trust Fund Established
4.2 Socio-economic Impact Survey	4.2 Socio-economic survey conducted	Survey conducted by year 3	No survey	Information used to improve weak spots of management/policy/awareness campaigns, and  review of effect of watershed protection on local communities and impact on economic development of the state
4.3 Increased Awareness of watershed protection	4.3.1 Protection of environment to protect watershed	# of community members involved in project and working group	Survey for baseline	Institutionalize approach and develop new policy
	4.3.2 Legislation for watershed protection passed at end of Project period	# of legislation for watershed protection	Increase/strengthening of watershed legislation	Establishment of protection zones
	4.3.3 Water safety Plan	Legislation in place by Year 1		Establishment of water safety plant
<b>Component 5. Documentation</b>				
5.1 reports to SOPAC/GEF	Update GEF through SOPAC on project progress	1 progress report per year		
5.2 Documentation of watershed restoration strategy	Watershed restoration documented	Document on project produced at end of project	Project documented	Lessons learnt shared with Region

### ***I. Project Management Structure***



A Project Manager will be hired under the Palau Environmental Quality Protection Board. The Project manager will be guided and instructed by the National Steering Committee for the Water Safety Program. This Committee will expand to include representatives from relevant government agencies, and representation from the private sector and local communities. The Steering Committee is currently chaired by the Bureau of Public Works. The Steering Committee will evolve into a National Water Committee. The committee will seek advice and guidance from technical experts and stakeholder groups. Consultations with the wider community will bolster the success of the implementation and delivery of this project.

The Steering Committee will report, through the Project Manager, on the status of the demonstration project to SOPAC.

**J. Stakeholders and Beneficiaries**

Several government agencies will be involved in this integrated approach to the development and implementation of the objectives of this demonstration project. They include, but are not limited to:

- Ministry of Resources and Development (Bureau of Public Works-BPW, Bureau of Agriculture-BOA, Palau Automated Lands and Resources Information Systems- PALARIS)
- Airai State Government
- Environmental Quality Protection Board (EQPB)
- Public Health (Division of Environmental Health, DEH)

Other stakeholders will be involved to foster support for the overall process. These include:

- Belau National Museum (BNM)
- Palau Conservation Society (PCS)
- Various community groups

#### ***K. Long-term Sustainability Strategy***

The long-term goal is to have a protected water resource in the Ngerikiil Watershed. In order for this to be sustainable, long term environmental planning must completely integrate the various principles that lead to truly sustainable land development. Sustainability is achieved when a resource is conserved for future generations to enjoy.

#### ***L. Replicability***

The project can be replicated in areas with any watersheds. Successes and lessons learned will be applied to the remaining watersheds in the Republic and within the region for islands with similar topography (i.e. PNG, Samoa, Pohnpei, etc) and other SIDS.

#### ***M. Monitoring and Evaluation Process***

The Program Manager, under the supervision of the National Steering Committee and with direct feedback from the local communities, will prepare annual work plans, Quarterly Operational Reports, and Annual Progress Reports. The Project Manager will provide regular progress reports to the members of the Project Steering

Committee. These reports will enable the Project Steering Committee and the SOPAC to review and resolve any issues constraining implementation.

The Project Steering Committee will meet on a quarterly basis to review project implementation and provide scientific, technical, policy, and strategic guidance. The

minutes of these meetings will be shared with all participating institutions. The EQPB and the Project Steering Committee will monitor the activities of the project by assessing progress at all stages, analyzing situations to determine the causes for any major deviations from the plan and deciding necessary actions to remedy the situations as appropriate.

The day-to-day monitoring will be the responsibility of the Project Manager based on the project's Annual Work Plan and its indicators. The EQPB will inform SOPAC of any delays or difficulties faced during implementation so that the appropriate support or corrective measures can be adopted in a timely and remedial fashion.

Short reports outlining main updates in project progress will be provided on a quarterly basis to SOPAC by the project management team.

#### ***N. Co-Funding***

The Republic of Palau government will provide significant co-funding through an ongoing commitment to staff salaries, support, and maintenance. Co-funding sources are identified in the budget breakdown.

Other co-funding associated with watershed protection and conservation of water resources includes:

*a) Ecosystem-based Management (Packard Foundation through PCS)*

= available funding (\$177,000)

##### *Activities*

- river monitoring (water quality)
- sediment monitoring
- biological indicators (ants)

*b) Food & Agriculture Organization (through EQPB) = \$25,000*

##### *Activities*

- awareness raising of watershed importance

*c) Water Safety Program (WHO/SOPAC through Water Safety Committee) = \$10,000*

- awareness raising of watershed protection
- rainwater catchment maintenance
- water resources use

*d) Hydrological Cycling Observing System - HYCOS (SOPAC through Water Safety Committee) = \$150,000*

- water quantity monitoring

*e) Bureau of Public Works: \$100,000*

- water source protection
- water resources use

*f) Office of the Palau Automated Lands and Resources Information Systems: \$10,000*

- Resource mapping and modeling
- Geographical Information Systems (GIS) assistance to all projects in Palau

*g) Belau Nation Museum: \$150,000*

- Bio-monitoring of Babeldaob Watersheds

*h) Palau Conservation Society: \$125,000*

- “Ridge to Reef Roadshow”
- Community conservation officer

*i) US Department of Agriculture Forestry Services = \$280,000*

- Studies on ecosystem services
- Impacts of sea level rise on mangroves and associated land impacts, looking at connections of coral reefs and watersheds

**Annex A: BUDGET**

Vehicle requested in the budget is for full-time use for access to site, and for equipment and manpower transport. Part of the project area is rugged terrain and a 4-wheel drive vehicle is necessary to ensure access to site. Most 4-wheel drive vehicles for all implementing agencies are old and may be out of commission before end of project.

**A.1. Detailed Budget**

<b>Detailed Five Year Budget for Sustainable Management of Ngerikiil Watershed</b>										
Activities	Budget Line	Description of expenditures	Benefits		USD	US\$	US\$			US\$
			Natl	Reg I	Baseline	GEF	Others			TOTAL
						In-Kind	Funds	Donor		

**Ngerikiil Watershed Restoration for the Improvement of Water Quality**

<b>Project Management Unit (PMU)</b>	Project Manager (to be housed at EQPB)	60 months @ \$2500/month with 30% administrative work & 70% technical/field work		x		55,000		25,000 No letter	Nat'l Govt	80,000
	Office Space	60 months @ 2000/month					120,000		EQPB/BPW	120,000
	Communications	Telephone, fax, email 60 months @500/month		x				30,000	EQPB	30,000
	Utilities	Electricity/water 60 months @ 500/month						30,000	EQPB	30,000
	Office supplies	60 Months @250/month						15,000	EQPB	15,000
	Equipment	Computer, software, etc		x		10,000	5,000		EQPB	15,000
	Meeting costs	4 meetings/year @200/meeting		x		4,000				4,000
	Vehicle	4-wheel drive pick-up truck		x		30,000	7,000			37,000
	<b>Support staff</b>									
	Water Quality Lab (25% of full-time salary)	60 months @ 2400/month (10% support from GEF)	x	x		14,400		129,600	EQPB	144,000
	Administrative support (10% of full-time salary)	60 months @ 500/month	x	x				30,000	EQPB	30,000
	Intake Support staff (10% of full-time salary)	60 months @2000/month (10% support from GEF)	x	x		20,000		100,000	BPW	120,000
	Volunteer stipend	60 months @ 200/month		x		12,000				12,000
<b>Component 1. Improvement surface water quality</b>										

**Ngerikiil Watershed Restoration for the Improvement of Water Quality**

1.1 Survey pollutant sources	1.1.1 Survey site for pollutant sources	monitoring, travel		x		7,000	30,000	25,000	EQPB	62,000
		Inspection of piggeries for proper maintenance practices	x		50,000					
		Monitoring of farms for pesticide use	x		50,000					-
	1.1.2 Mapping pollutant sources	data processing, mapping and modelling for management use		x		32,500		5,000	PALARIS	37,500
	1.1.3 Pollutant sources reduced	corrective actions taken, sources remove when possible		x		20,000				20,000
		Piggery Working Group	x		10,000					-
		Erosion controls through earthmoving permit system	x		1,000,000					-
	1.2.1 Revegetate riparian to minimize sedimentation levels	Purchase of native seedlings from local nurseries and planting		x		50,000				50,000
	1.2.2 Ngeruobel water supply treatment plant	Chemical use for treatment of raw water	x		1,910,000					-
		General plant operations and staffing	x		5,000,000					-
	1.2.3 Full Chemical Screen of rivering	full chemical survey of river water	x	x		45,000		5,000	EQPB	50,000

**Ngerikiil Watershed Restoration for the Improvement of Water Quality**

1.3 Establish long-term monitoring program	1.3.1 Water quality monitoring program developed/formalized		x	x		5,000				5,000
	1.3.2 Monthly water quality monitoring visits carried out	Minimum 1 trip per month for 60 months	x	x		20,000	281,500	140,400	EQPB	441,900
	1.3.3 Water quantity monitoring program developed		x	x		5,000	5,000	298,000	HYCOS	308,000
	Drinking Water supply and marine recreational waters monitoring		x		500,000					-

**Component 2. Drainage Mitigation**

2.1 Vegetate drainage ways	2.1.1 Drainage ways of "Compact Road" affecting water source vegetated			x		15,000				15,000
	2.1.2 Road maintenance of Compact Road		x		2,500,000					-
2.2 Storm water workshop	2.2.1 People trained in storm water management	1 workshop with identified consultant		x		27,500				27,500
2.3 Chemical analysis of road drainage	2.3.1 Road run-off analyzed	full chemical screen		x		10,000				10,000

**Component 3 Improvement of biodiversity/bioindicators**

**Ngerikiil Watershed Restoration for the Improvement of Water Quality**

3.1 Monitoring of ecosystem health through bioindicators	3.1.1 ongoing aquatic invertebrate monitoring data collected	quarterly surveys, travel, data processing, supplies		x		25,000			BNM	175,000
	3.1.2 dragon fly surveys	annual survey, travel, data processing, supplies		x		10,000			BNM	10,000
	3.1.3 bird population surveys	quarterly surveys, travel, data processing, supplies		x		42,500		100,000	BNM	42,500
	3.1.5 Vegetation photopoint monitoring	annual survey, equipment & manual		x		15,000		50,000	BNM	15,000
	3.1.4 Mapping and modelling of ecosystem health			x		15,000			PALARIS	20,000
	Ecosystem Services provided by watersheds	Connections between forests and rivers		x					US Forestry Service	280,000
	Increased nutrient impact on mangroves	Connections between land use practices and mangroves and sea level rise								
<b>Component 4 Policy/Awareness</b>										
4.1 Establish "Payment for Ecosystem Service"	identification of long-term funding	Financial sustainability mechanisms		x		37,500				37,500
4.2 Socio-economic Impact Survey		review of effect of watershed protection on local communities and impact on economic development of the state		x		10,000				10,000

**Ngerikiil Watershed Restoration for the Improvement of Water Quality**

4.3 Increase awareness of watershed protection	4.3.1 Awareness raising materials, community workshops	enhancement of project through community awareness		x		10,000	125,000	35,000	EQPB PCS	170,000
	4.3.2 Legislation for watershed protection	Policy development for national & state levels		x		25,000		50,000	SOPAC	75,000
		Legislative process		x		1,000,000				
	4.3.3 Water Safety Plan			x				10,000	SOPAC	10,000
<b>Component 5. Documentation</b>										
5.1 Reports	Various reports to govt and SOPAC			x		5,000				5,000
5.2 Documentation of watershed restoration strategy				x		5,000				5,000
<b>TOTAL</b>						<b>12,020,000</b>	<b>507,400</b>	<b>835,500</b>	<b>1,263,000</b>	<b>2,518,900</b>

EQPB	PCS	BNM
BPW	PALARIS	
SOPAC	US FORESTRY SERVICE	

Baseline	Alternative	GEF	Co-Financing
<b>12,020,000</b>	<b>14,625,900</b>	<b>507,400</b>	<b>2,098,500</b>

**Annex B Workplan**

Component	ACTIVITY	Output	YEAR 1				YEAR 2				YEAR 3				YEAR 4				YEAR 5				
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
Project Management	Project Manager Contracted		x																				
	Project Steering Committee Meetings			x			x			x			x			x				x			
	Reporting to SOPAC				x																		



**Ngerikiil Watershed Restoration for the Improvement of Water Quality**

Component 3. Improvement of Biological diversity	3.1 Monitoring of Riparian zone through biological indicators	3.1.1 Aquatic invertebrate survey	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
		3.1.2 Dragonfly survey				x					x								x			x	
		3.1.3 Bird population survey	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		3.1.4 Vegetation photopoint				x					x								x			x	
Component 4. Policy/ Awareness	4.1. "Fee for Ecosystem Services" scheme	4.1.1 Policy development											x	x	x	x	x	x	x	x			
		4.1.2 Id long-term funding																x	x	x	x	x	x
	4.2 Socio-economic survey	4.2.1 Socio-economic impact survey																x	x	x			
	4.3 Awareness of watershed protection	4.3.1 Watershed protection campaigns	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		4.3.2 Legislation for watershed protection					x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	<b>X</b>
		4.3.3 Water safety plan	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Component 5. Documentati on	5.1 Report to SOPAC/GEF	Annual Reporting				x																x	
	5.2 Documentation of watershed restoration strategy/Lessons learnt		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	