DEPARTMENT OF ENVIRONMENT AND CONSERVATION

PNG IWRM – DEMONSTRATION PROJECT PROPOSAL

OCTOBER 2007

Contents *Page*

Figures

Acronyms

CBO	Community-based Organization
CMC	Catchment Management Committee
CMP	Catchment Management Plan
DAL	Department of Agriculture and Livestock
DEC	Department of Environment and Conservation
DNPM	Department of National Planning and Monitoring
DoC	Department of Central
DoE	Department of Education
DoH	Department of Health
DoL	Department of Lands and Physical Planning
ENSO	El Nino Southern Oscillation
ICMP	Integrated Catchment Management Plan
NCDC	National Capital District Commission
NDC	National Disaster Centre
NPSC	National Project Steering Committee
NWS	National Weather Service
NRWSS	National Rural Water Supply and Sanitation
PICs	Pacific Island Countries
PNGGS	PNG Geological Survey
SAP	Strategic Action Plan - IWP
SIDs	Small Island Developing States
TPA	Tourism Promotion Authority
UNCCD	United Nations Convention on Combating Desertification
UNFCCC	United Nations Framework Convention on Climate Change
WRM	Water Resources Management
WRMP	Water Resources Management Plan

A. Country: Papua New Guinea

B. Title: Rehabilitation, Management and Monitoring of Laloki River system for economical, social and environmental benefits

C. Executing Body:

The Department of Environment and Conservation will be the national executing agency however, the project will be implemented in close collaboration with the two principal utility providers namely Eda Ranu Limited (water supply) and PNG Power Limited (electricity), relevant government agencies, private sector operators, landowners and other stakeholders within the Laloki River catchment.

D. Cost of Project: **GEF Funding:** USD 500,000

Co-Funding: USD 33,161,885

E. Linkage to IWRM GEF Project Priority Demonstration:

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 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; IWRM will contribute to improving coastal fishstocks and biodiversity. IWRM approaches will also include methods to reduce economic and ecologic dead-zones of oxygen deficient water as a result of human and animal sewage waste

The project will address this in the following ways:

- Establishment of a sound and feasible water resources data collection system.
- Establishment and promotion of an integrated catchment management system to ensure maintenance of ecosystem integrity and sustainable use of water resources.
- Effective water allocation and pollution regulation through a water use and waste disposal policy and licensing.

- Promotion of sustainable land use practices and reduction of land degradation.

- Promotion of eco-tourism and biodiversity conservation in the catchment centered around the Variarata National Park through proper water resources management and allocation.

It will specifically address land base pollution from domestic, agriculture and industries, raw and drinking water quality protection, water resources management, land degradation and vulnerability to climate change through water resources assessment. Although promotion of eco-tourism and biodiversity conservation would not be directly implemented, the project would provide the platform for this activity to commence by allocating enough water for environmental needs.

F. Linkage to National Priorities and Programs

The project will enforce the Fourth National Goal and Directive Principle of Papua New Guinea's National Constitution, which calls for sustainable use of natural resources. This goal is reinforced through the objectives of the various environment management and biodiversity protection legislation that DEC administers including the Environment Act, National Parks Act and Flora and Fauna Protection Act. It will assist in fulfilling the country's obligations under international conventions and conferences such as the regional Waigani Convention on waste disposal, the WSSD, the International Conference on Freshwater, 3rd and 4th World Water Forum Water Actions, RAMSAR Wetlands Convention, Convention on Biological Diversity (CBD), United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Convention on Combating Desertification (UNCCD). The project will also assist in addressing ecologically sustainable development and the protection of water supplies, which are key Millennium Development Goals under the Medium Term Development Strategy for PNG 2005 – 2010.

Several related projects and programs have commenced and are completed while others are ongoing and some are planned to operate during the same time frame as the IWRM project. These include Rouna 4 Intake, Raw Water Main and Booster Pump Station project, Rural Water Supply and Sanitation project, Healthy Islands Program, Second National Communication (Climate Change Situation and Adaptation), Sustainable Land Management, Pacific Islands Adaptation to Climate Change, National Disaster Management Project, Rehabilitation of Ramu River Hydrological Stations and Pacific HYCOS Flood Forecasting. It will be noted that the aspects covered are water supply and sanitation, climate change situation analysis and adaptation under UNFCCC (two projects), sustainable land management under (UNCCD), national disaster management, hydrometric station rehabilitation and flood forecasting. Laloki River will be the pilot site for a number of these projects so there should be scope for resource sharing and synergy towards common ultimate objectives.

G. Name and Post of Government Representative endorsing the Demonstration Activity:

Hon. Benny Allan, MP, Minister for Environment and Conservation

H. Project Objectives and Activities

1.0 Background

The Laloki River catchment located in the Central Province is 440 km^2 in area and is especially critical because it serves as the major source for water supply and electricity for Port Moresby city, the capital of PNG. The principal man-made structure providing for these two utilities is the Sirinumu dam which is situated in the headwaters of the catchment. It was constructed in the early nineteen sixties and commissioned in 1963 initially for hydro-electricity generation and subsequently water supply as well. The dam and associated water supply and hydropower structures have been upgraded over the years to cater for growing water demand and electricity needs within the catchment, the city and parts of the Central Province.

Located near and around the dam, along and down the river are villages, settlements, educational, church and research institutions, commercial farms, a cannery and a prison. The villagers and settlers use the river water directly for laundry and bathing while drinking and cooking water is obtained from other sources including minor tributaries or reticulated water supply systems where boiling before consumption is encouraged. Most of the smallholder poultry and piggery operations, commercial farms, and educational, church and research institutions, the cannery, the prison and National Agriculture Research Institute (NARI) draw water from the river directly or indirectly through groundwater and treat before usage. In the dry season, smallholder farmers, some educational institutions and NARI draw water from the river or groundwater to irrigate crops and rear livestock. In terms of electricity supply, aside from the villages and settlements, power is drawn from the hydro-electricity grid. With its close proximity to the city, more agricultural developments, government institutions and large human settlements are being planned for the catchment. This is in addition to the continuous expansion of the city and its concomitant public utility requirements.

Unlike most of PNG where annual average rainfall ranges from 3000 to 4000mm, the Laloki river catchment has a distinct wet and dry season with a markedly lower annual average rainfall from 600 – 900mm. The wet season lasts from end of November to end of April with a January maxima. On the average the wet season is approximately five months long while the dry season can run for as long as the remaining seven months. With minimal annual rainfall, the Sirinumu Dam provides the supply stability required for domestic consumption, power generation, industrial and manufacturing use, agriculture and irrigation needs within the catchment as well as the environmental flow requirements of the river system. River water quality has deteriorated as a result of anthropogenic discharges especially solid and domestic waste from villages and settlements, wash water from piggeries and poultry operations, treated industrial effluents and silt-laden runoff over land cleared for subsistence and commercial farming. Contamination levels increase over time during the long dry season with declining river flows.

Figure i: National Capital District Town Water Supply Pipeline and feeder into Rouna 1 & 3 Power House

Water supply and power generation become very critical during prolonged dry seasons which have recently been attributed to the ENSO phenomenon. To deal with this scenario, a management strategy referred to as Sirinumu Release Rule was formulated to control the outflow from the reservoir after reaching the 40 Mm^3 level. This mechanism was developed by the two principal water users of the catchment i.e. Eda Ranu and PNG Power in consultation with DEC. This rule sets the threshold for water diversion for power generation during critical low flow situations when water supply takes precedence over power generation. However, this management strategy does not necessarily account for the demands of other water users downstream as well as the requirements for minimal environmental flow and therefore needs to be reviewed.

Due to the high hydraulic gradient between the headwaters and the lower catchment, flooding is common during heavy rainfall events. Increasing land clearance and riverside gardening continues to raise the rate and volume of runoff as well as the extent of flooding and the resulting risk to human lives and property. Consistent flooding downstream is threatening the long-term existence of various infrastructure including the Bomana prison which now has one side of its perimeter fence currently less than 10m from the riverbank and is likely to be washed away by the next major flood. Relocation of the prison will be costly and minor reconfiguration and shifting within the current site as well as bank reinforcement and protection is recommended. However the actual need for and extent of such remedial actions should be based on sound hydrological flood analysis which is yet to be undertaken.

Like most of PNG, the Laloki catchment is rich in biodiversity and this was recognized with the establishment of the Variarata National Park in the early nineteen seventies. This park is home to the world's only poisonous bird, *Pitohui spp.* which possesses a toxin similar to that found in the poison arrow frogs of Central and South America (Sowei et al 2002). Gold and copper mining took place in the area below the park in the late nineteen twenties and recently permission was granted through an Exploration License for further investigation of mineral ores. The exploration work and potential mine development will significantly affect catchment hydrology and biodiversity. The southern portion of the famous Kokoda Trail starts from the upper catchment area and leads northeastwards inland. Hundreds of tourists come

every year to walk the rugged, physically challenging trail and try to relate to the fierce fighting that took place there when the Australian forces drove back the Japanese who had decided to cut across the Owen Stanley Range from Oro Bay on the northern coast to gain control over Port Moresby during the Second World War. These two major attractions in the catchment provide additional opportunities for the promotion of landowner-oriented eco-tourism and maintenance of the area's natural biodiversity.

Land use planning and water utilization in the catchment has so far taken place in an uncoordinated manner. The availability of water in terms of quantity and quality within the catchment is coming under increasing stress as a result of rising population and land uses and growing demand for water and electricity. Effective water resource management in the catchment has been affected by declining operational funding for collection of hydro-meteorological data since 1988 from the national government as well as Eda Ranu and PNG Power. In 1995, funding constraints forced the closure of all the hydrometric stations within the catchment apart from the one located at the downstream Bomana pumping station. In view of the current situation, there is an urgent need to revive hydro-meteorological data collection in the catchment and formulate a catchment management plan for the long-term sustainable use of the available water resources.

The main concerns for the Laloki River catchment are therefore listed below.

- Demand management including water sharing (infrastructure)
- Management of extreme events (droughts and floods),
- Hydrological data collection, management and support,
- Water quality monitoring due to increased point and diffuse waste discharges,
- Land use impacts on catchment yield and water quality,
- Deterioration of river water quality from agricultural and non-source pollution,
- Rural water supply lacking,
- Downstream wetland management and maintenance of ecosystem, and
- Absence of a catchment management plan to safeguard all water uses.

The main priority for the catchment is to establish a participatory mechanism for all stakeholders (landowners, resource users, utility service providers and regulatory agencies) to formulate a comprehensive and enforceable integrated catchment management plan. The catchment management plan will include a land use management component and a flood management component incorporating a flood warning system (direct outcome of PacHyCOS).

Figure ii: Sogeri Market Laloki River Valley Catchment

Three other projects will be implemented in the same catchment and should complement the IWRM project. Two will deal with the flood management aspect of the river system (EU – National Disaster Risk Management project and WMO – Pacific HyCOS project) and the other will address land use management issues (GEF UNCCD – Sustainable Land Management project). Given the manner, in which it has been structured, the EU projects and especially the EU IWRM National Planning Program will assist the IWRM and Pacific HyCOS projects in terms of hydro-meteorological equipment procurement, installation and operation.

2.0 Objectives and Activities

The overall goal of the Laloki River catchment IWRM demonstration project is to promote the sustainable use of the available water resources for economic, social and environmental benefit of the people residing in the catchment and Port Moresby city. To achieve this goal the demonstration project will focus on the components listed below.

- Development and implementation of strategies to improve the management of water resources (both surface and ground) through a water resources management plan, land use plan and water quality criteria for the benefit of all stakeholders.

- Development and implementation of strategies to utilize appropriate methods and technologies for water supply and waste disposal through guidelines, policies for water use and disposal and licensing of all point source discharges.

- Implementation of awareness on the need for integrated water resources management and provision of training on water resources assessment in collaboration with the Pacific HyCOS project (under the GEF Regional Component).

- Formulation of a representative, affordable and feasible water use plan as well as an effective and enforceable catchment management plan as the ultimate objective in partnership with other related projects in the catchment.

Consistent with the above, the main project components are stated below along with their respective main activities. The supportive activities such as administrative, project overheads etc are not necessarily outlined her however they are captured in the proposed budget .

2.1 Improve User - Resource Management Interface through Integrated Catchment Management and Monitoring

2.1.1 Develop a communication strategy and conduct education and awareness on the need for an integrated and sustainable catchment management planning.

2.1.2 Undertake topographic, hydro-geological, vegetation, biodiversity, socio-economic and land use surveys of the catchment.

2.1.3 Undertake a demand analysis of the river system for all existing and planned in-stream and off-stream uses.

2.1.4 Develop and implement an appropriate hydrological model of the catchment for resource allocation and yield management.

2.1.5 Evaluate the impacts of current, planned and alternative water and land uses.

2.1.6 Develop a water use and waste disposal policy for the catchment.

2.1.7 Formulate an Integrated Catchment Management Plan (ICMP).

2.1.8 Implement the ICMP through the Catchment Management Committee (CMC).

2.1.9 Undertake additional and appropriate policy and legislative reviews.

2.1.10 Evaluate lessons learned and compile a replication strategy for other catchments.

2.2 Improve waste management and reduce human-induced contamination of the Laloki River

2.2.1 Review all the land uses including subsistence and commercial agricultural practices in the catchment.

2.2.2 Carry out a contaminant loading assessment of the river.

2.2.3 Identify and implement reliable methods and technologies appropriate for various waste disposal practices.

2.2.4 Review and amend existing water use permits of point source discharges

2.2.5 Organize licensing of all new activities and rollover current water use permits into the new environment regulatory regime.

2.2.6 Work with the UNCCD Sustainable Land Management project to produce a Sustainable Land Use Plan for the catchment.

2.3 Develop Site specific water quality criteria for the Laloki River Catchment

2.3.1 Appraise the existing water quality situation of the Laloki river and surrounds including Sirinumu reservoir, Goldie River and the Waigani swamp.

2.3.2 Develop and implement a water quality monitoring program of the Laloki and Goldie river systems.

2.3.3 Develop site specific water quality criteria for the Laloki River and surrounds.

2.3.4 Enforce the water quality criteria within the catchment with the assistance of the CMC and all stakeholders.

2.4 Establish a representative and viable hydro-meteorological network for the Laloki River catchment (done jointly with the Pacific-HyCOS)

2.4.1 Develop a communication strategy and carry out education and awareness on the importance of the project and significance of the hydro-meteorological network.

2.4.2 Undertake a physiographic evaluation of the catchment and review the old hydrometric stations.

2.4.3 Identify locations for a representative hydro-meteorological network throughout the catchment in close collaboration with villagers and institutions.

2.4.4 Identify and acquire appropriate flow, rainfall, water quality and groundwater measurement equipment taking into account durability, user friendliness and cost.

2.4.5 Establish stations and train local data collectors.

2.4.6 Evaluate station operation and data collection and carry out improvement and training as required.

2.4.7 Ensure continuous reliable operation of stations and provision of data to the main database unit.

A joint training program will also be prepared and implemented between the IWRM and HyCOS projects under the GEF National Planning Programme.

Some additional benefits from this demonstration project to the community would be the promotion of the important area of land of value to future generations, and to educate our future generations about their environment, flora, fauna and their history

3.0 End of project landscape

At the end of the project all stakeholders within the catchment will appreciate the need for routine water resources data collection and an ICMP, there should be a stakeholder supported water resources data collection system, an effective CMC as well as an ICMP to ensure sustainable water resources utilization for the benefit of the residents within the catchment and the city of Port Moresby. Interwoven with and emerging from above, the expected outputs and outcomes of the project are listed below.

- Stakeholder supported hydro-meteorological network
- Catchment hydrological model for planning and impact assessment
- Catchment water use and waste disposal policy
- Improved waste management
- Improved water quality

- Water quality criteria for Laloki River
- Integrated water resources management planning and implementation
- An effective Catchment Management Committee
- Local communities and stakeholders awareness and acceptance of ICMP
- Model for replication in other catchments

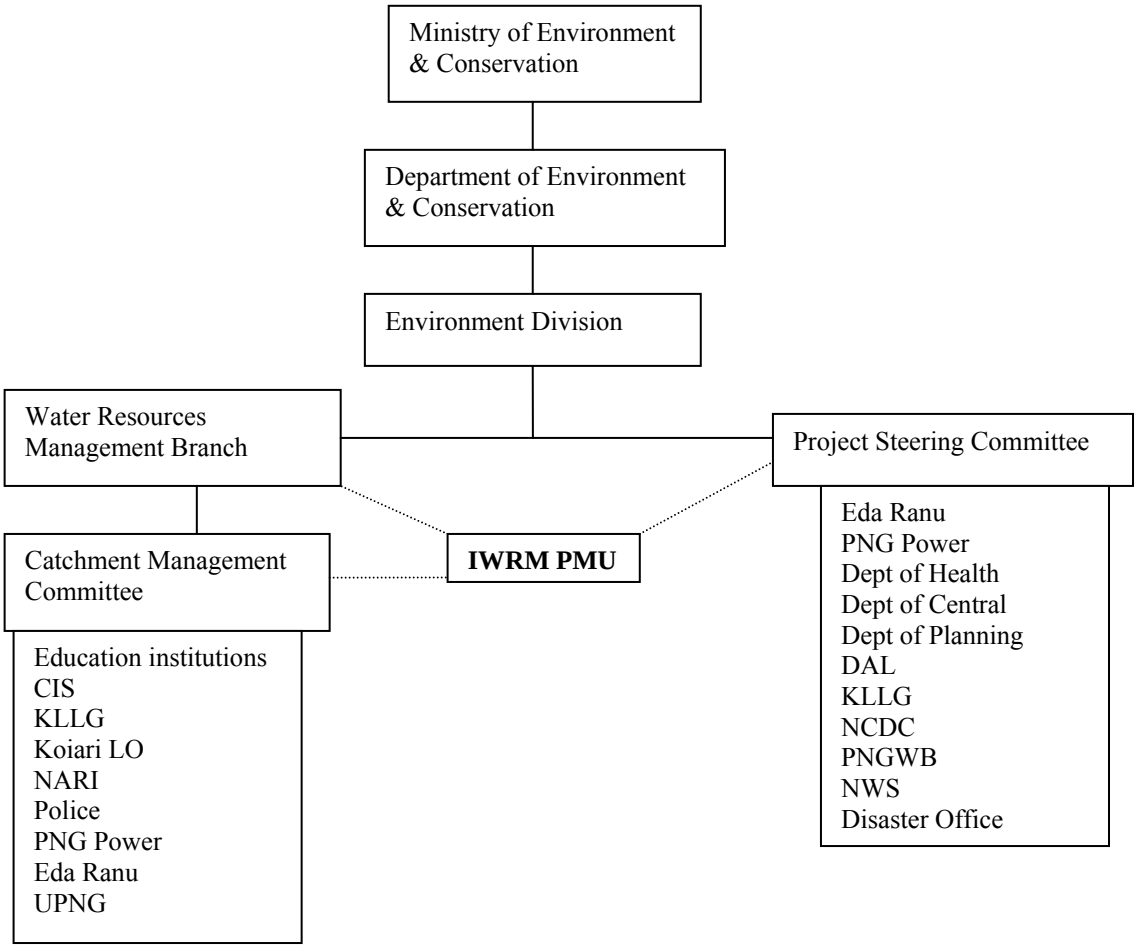
I. Project Management Structure and Accountability

The project will be managed and coordinated by the Water Resources Management Branch of DEC. The Secretary DEC will be the overall Project Manager but routine oversight will be performed by the WRM Branch Manager. The Senior Water Resources Planner will serve as the Project Coordinator and technical support will be provided initially from within the branch, Environment Division, the rest of the department and the other line stakeholders like Eda Ranu, PNG Power, Department of Agriculture and Livestock, Department of Central, Health Department and NGOs.

There will be a National Project Steering Committee chaired by the Secretary DEC or in his absence, the Deputy Secretary for Environment Division. The NPSC will consist of members from line government agencies, private sector and NGOs who by virtue of their activities can and should contribute positively to the promotion of IWRM in PNG. The local landowners, Eda Ranu and PNG Power will be represented. The committee will provide guidance and direction in the implementation of the project and encourage participation from all stakeholders as well as ensure that resources allocated to the project are used as intended.

At the catchment level there will be a catchment management committee chaired initially by the Deputy Secretary Environment, or his delegate. The committee will consist of representatives from all stakeholder communities, institutions and commercial enterprises within the catchment. This committee will assist in the formulation and implementation of the ICMP and play a crucial role in the public education and awareness process.

Figure: iii IWRM Management Structure



J. Stakeholders and Beneficiaries

There is a wide range of stakeholders in the catchment who need to be included as informed and active participants to ensure the successful implementation of the project. They include local landowners, settlers, educational institutions, churches, hotel operators, a correctional facility, a major cannery, a large cattle farm, numerous food crop farmers, poultry and piggery farmers, crucial government departments and agencies, public utility providers and the residents of Port Moresby and the surrounding area.

Apart from DEC, the other main agencies and institutions include:

- Department of National Planning and Monitoring
- PNG Power
- Eda Ranu
- Koiari Local Level Government
- Local landowners and settlers

- Central Provincial Government
- Department of Lands and Physical Planning
- National Weather Service
- PNG Geological Survey
- Department of Agriculture and Livestock
- Department of Health

The main beneficiaries from the project will be those that rely directly on the Laloki River system for water supply, crop and animal husbandry and electricity. These include all the residents and commercial enterprises within the catchment as well as Port Moresby and the nearby area.

K. Long-term Sustainability Strategy

Some of the important elements to ensure the long-term sustainability of the initiatives under the project and IWRM in the catchment include: effective education awareness on the benefits of IWRM, capacity building and empowerment, multi-sectoral and integrated catchment assessment, planning and management, enforceable regulatory measures and an effective self-financing capability. Project coordination will be done from within the Water Resources Branch of DEC so that long term capacity can be built and strengthened to initiate and support the application of the same approach in other parts of the country. Project implementation will be conducted in close professional collaboration with relevant technical expertise within the department and other government and non-government agencies. Both the provincial and local level government will be involved as key players in the implementation of the project in order to secure long-term support and assist in the adoption of similar initiatives in other catchments within the province. A feasible financing mechanism for the continuation of the work of the CMC with the involvement of the two main utility providers should assist in the maintenance and consolidation of the IWRM strategy.

L. Replicability

More catchments within the country are encountering the same pressures of increasing and inappropriate land use and rapid population growth. However planning for these land uses and management of the impacts continues to be undertaken in an uncoordinated and disjointed manner. A dedicated integrated water resources management initiative in a catchment unit has not been conducted to date. This project will attempt to show how improved coordination, networking and collaboration by all stakeholders can result in the routine collection of essential water use and hydro-meteorological data for the sustainable management of water resources and associated ecosystems within a catchment where there is a growing variety of competing water uses and increasing degradation of water quality. The project should also demonstrate how IWRM can be implemented in the context of the local natural resource ownership and utilization systems, socio-economic situation, government structures, and the policy, institutional and legislative framework in the country. Having achieved its intended key outcomes, the project can then be replicated in other catchments in the country or elsewhere in other PICs and SIDs.

M. Monitoring and Evaluation Process

Based on the work plan, a monitoring and evaluation plan will be developed at the start of the project outlining process, stress reduction and environmental indicators as well as monitoring responsibility, method and frequency. Using this plan, project performance will be assessed at regular intervals by DEC, the CMC, the National Steering Committee and SOPAC. Appropriate remedial measures will be undertaken as and when required.

N. Co-funding

On the basis of the 3:1 GEF to co-sponsors funding ratio for the project, requests for support will have to be submitted to the National Government, the Central Provincial Government, the Koiari Development Corporation (a business arm of the Koiari Local Level Government), Eda Ranu and PNG Power. Office accommodation and associated utility costs will be met by DEC. A project funding request will be prepared as part of DEC's annual budgetary submission to the National Government. This submission will request for two-thirds of the total funding. Since the project is located in the Central Province and the environmental as well as socio-economic benefits will also be enjoyed by people residing within the catchment, financial and in kind support will be sought from the Central Provincial Government and the Koiari Development Authority. As major river system users with substantial fixed investments in the catchment the two utility providers will be requested to provide financial and in-kind support as well. In addition, a general invitation will be made to all NGOs, CBOs as well as other related government and non-government programs and projects to participate in the implementation of the project.

O. Potential Co-Funding Projects

Other co-funding support can be drawn from the following non-GEF projects.

i. National Disaster Risk Management Project

1.0	**Title of Project/Activity**	National Disaster Risk Management Project
2.0	**Executing organization**	National Disaster Center
3.0	**Funding source(s)**	European Development Fund (EDF)
4.0	**Start and end dates of project**	2007 - 2010
5.0	**Cost break down (cash and in-kind)**	USD273,548[1]
6.0	**Focus of the project**	• Improved disaster management with particular focus on hazard assessment and risk management.
7.0	**Brief description of key activities and expected outcomes**	• Improved disaster monitoring and reliable warning systems for all types of natural disasters nationwide, i.e., including floods and droughts. • Improved disaster risk management, preparedness, relief and rehabilitation
8.0	**Key project contacts (names, numbers, e-mail addresses etc.).**	(i) NDC - Kaigabu Kamyamanaya (ii) PNGGS - Arnold Lakamanga - (675) 321 5888/ (675) 322 4623 (iii) DEC - Kay Kalim - wrmb@daltron.com.pg /

[1] For all the conversions from PNG Kina to US dollar, the rate of 0.3273 for end of August 2007 was used

		(675) 325 0198
9.0	**Activities that overlap or complement with the GEF IWRM project and their value (in cash or in-kind).**	• Upgrading of existing hydrometric stations through procurement of new equipments. • SOPAC to purchase equipment and fund training. • GoPNG – provide personnel and all other in country logistical support

ii. Rehabilitation of Ramu River Hydrological Stations

1.0	**Title of Project/Activity**	Rehabilitation of Ramu River Hydrological Stations
2.0	**Executing organization**	Department of Environment and Conservation
3.0	**Funding source(s)**	European Development Fund (EDF - through SOPAC)
4.0	**Start and end dates of project**	2007 - 2010
5.0	**Cost break down (cash and in-kind)**	USD65,460
6.0	**Focus of the project**	• To revive the three hydro-meteorological stations within the Ramu River catchment for environment protection and management, sustainable resource development and climatic assessment.
7.0	**Brief description of key activities and expected outcomes**	• Plans to acquire the monitoring instruments are already in place. • Allocation of resources for construction and installation is in progress.
8.0	**Key project contacts (names, numbers, e-mail addresses etc.).**	(i) SOPAC: Michael Bonte - www.sopac.org /(679) 338 1377 (ii) DEC: Maino Virobo - wrmb@daltron.com.pg /(675) 325 0198
9.0	**Activities that overlap or complement with the GEF IWRM project and their value (in cash or in-kind).**	• Water level, flow and rainfall observations over time will be processed and analsyed to forecast trends and the resulting data will be used for sustainable resource development and environment management. • DEC will provide transport plus personnel for station construction, equipment installation as well as routine data collection and analysis. The project will fund instrument acquisition and air fares.

iii. Pacific Hydrological Cycle Observing System Project

1.0	**Title of Project/Activity**	Pacific HyCOS
2.0	**Executing organization**	DEC
3.0	**Funding source(s)**	EU through SOPAC)
4.0	**Start and end dates of project**	2008-2010
5.0	**Cost break down (cash and in-kind)**	USD150,000 (SOPAC to confirm)
6.0	**Focus of the project**	• Revive hydrometric stations of national socio-economic value. • Install remote sensing capabilities to collect and disseminate near real time data for forecasting and warning. • To ensure those operators of major infrastructure such as hydropower and water supply schemes are given adequate advance warning of imminent dangers.
7.0	**Brief description of key activities and expected outcomes**	• Revive hydrometric stations of national significance and economical value. • Install remote sensing capabilities to collect and disseminate near real time data for forecasting and warning. • To ensure those operators of major infrastructure such as hydropower and water supply schemes are given adequate advance warning of imminent dangers.
8.0	**Key project contacts (names, numbers, e-mail addresses etc.).**	(i) Maino Virobo – DEC wrmb@daltron.com.pg Ph: (675) 325 0198 (ii) Lloyd Smith - SOPAC
9.0	**Activities that overlap or complement with the GEF IWRM project and their value (in cash or in-kind).**	• Collection of hydrological data for database • Training officers on water resources assessment and management • Developing water resource use plan or catchment management plan

iv. National Rural Water Supply and Sanitation Project

1.0	**Title of Project/Activity**	National Rural Water Supply and Sanitation Project
2.0	**Executing organization**	Department of Health
3.0	**Funding source(s)**	European Union
4.0	**Start and end dates of project**	2006 - 2010
5.0	**Cost break down (cash and in-kind)**	USD98,270
6.0	**Focus of the project**	Rural Papua New Guinea
7.0	**Brief description of key activities and expected outcomes**	Provide rural water supply infrastructure and sanitation services
8.0	**Key project contacts (names, numbers, e-mail addresses etc.).**	Project Manager Chairman of Steering Committee: Dr. Paul Aia
9.0	**Activities that overlap or complement with the GEF IWRM project and their value (in cash or in-kind).**	Improvement of rural water supply and sanitation

v. Development of Sustainable Agriculture in the Pacific

1.0	**Title of Project/Activity**	Development of Sustainable Agriculture in the Pacific (DSAP)
2.0	**Executing organization**	National Department of Agriculture and Livestock (NDAL)
3.0	**Funding source(s)**	European Union (EU)
4.0	**Start and end dates of project**	2005 – 2007
5.0	**Cost break down (cash and in-kind)**	USD98,400
6.0	**Focus of the project**	• To promote and implement sustainable agriculture that will improve food production and thereby enhancing food security and income generation in the Pacific. • To generate pacific agriculture using practices that are sensitive to the environment and methods that are sustainable and programme that involves local relevant stakeholders
7.0	**Brief description of key activities and expected outcomes**	• Identify farmer's production problems and offer solutions, identify appropriate technologies and apply them to farming communities • Improve participatory skills of NARES and NGOs • Facilitate scaling-up of useful technologies by enhancing national extension capacity and strengthen national capacity to produce extension materials
8.0	**Key project contacts (names, numbers, e-mail addresses etc.).**	i. Mr. Francis Wambon ii. Caroline Piafu Phone: (675) 321 0167 Fax: (675) 321 0166 Email: dsappng@online.net.pg
9.0	**Activities that overlap or complement with the GEF IWRM project and their value (in cash or in-kind).**	• Identification of appropriate agriculture farming practices which are sensitive to the environment. This will include the identification of waste disposal methods and technologies.

vi. FAO Regional Program for Food Security

1.0	**Title of Project/Activity**	Special Programme for Food Security
2.0	**Executing organization**	National Department of Agriculture and Livestock
3.0	**Funding source(s)**	Food and Agriculture Organisation (FAO)
4.0	**Start and end dates of project**	2005 – 2007
5.0	**Cost break down (cash and in-kind)**	USD65,600
6.0	**Focus of the project**	• To assist developing countries eradicate hunger by half by year 2015 through the National Food Security Programme
7.0	**Brief description of key activities and expected outcomes**	• Establish a national multi-discipline team that will formulate an action plan for the National Plan for Food Security • Establish a national inter-ministerial coordination committee chaired by the Prime Minister • Establish and inter-ministerial technical committee chaired by the Minister or Secretary of the Agriculture with representation from stakeholders including donors, private sector and NGOs
8.0	**Key project contacts (names, numbers,**	i. Mr. Brown Konabe

	e-mail addresses etc.).	Phone: (675) 321 5378 / 321 5374 Fax: (675) 321 5347 Email: bkonafoodsec@datec.net.pg
9.0	**Activities that overlap or complement with the GEF IWRM project and their value (in cash or in-kind).**	Developing sustainable agriculture development policies and strategies and improving food security

vii. Agricultural Land Use Studies

1.0	**Title of Project/Activity**	Agricultural Land Use Studies and related
2.0	**Executing organization**	National Department of Agriculture and Livestock
3.0	**Funding source(s)**	Go PNG
4.0	**Start and end dates of project**	2008 - 2009
5.0	**Cost break down (cash and in-kind)**	USD6,232
6.0	**Focus of the project**	• Undertake studies on land use and land resources within the Laloki Catchment area
7.0	**Brief description of key activities and expected outcomes**	• Compilation of the biophysical survey report(s) and their accompanying maps
8.0	**Key project contacts (names, numbers, e-mail addresses etc.).**	i. Mr. Mika Andrew Ph: (675) 321 1046 / 320 2959 Email: mika_andrew@hotmail.com ii. Mr. Stanley Oa (675) 321 1929 / 320 2959 staniramu@hotmail.com or pngris@daltron.com.pg
9.0	**Activities that overlap or complement with the GEF IWRM project and their value (in cash or in-kind).**	Carry out land use survey of the catchment together with the IWRM project

viii. Koiari Water Supply Upgrade

1.0	**Title of Project/Activity**	Koiari Rural Water Supply
2.0	**Executing organization**	Eda Ranu
3.0	**Funding source(s)**	European Union
4.0	**Start and end dates of project**	August 2005 - July 2007
5.0	**Cost break down (cash and in-kind)**	USD112,778
6.0	**Focus of the project**	Provide clean water to the rural community along the Laloki River
7.0	**Brief description of key activities and expected outcomes**	• Head works and pipeline construction, • Water quality assurance, • Reliable clean water availability, • 72kl of untreated water, • Cost per capita of €50 to €150
8.0	**Key project contacts (names, numbers, e-mail addresses etc.).**	Mr. Billy Imar General Manager
9.0	**Activities that overlap or complement with the GEF IWRM project and their value (in cash or in-kind).**	Establish and promote an integrated catchment management system to ensure maintenance of ecosystem integrity and sustainable use of water resources.

ix. Upgrade Water Treatment Plant

1.0	**Title of Project/Activity**	New Water Source and Water Treatment Project
2.0	**Executing organization**	Eda Ranu
3.0	**Funding source(s)**	European Union
4.0	**Start and end dates of project**	2007 - 2010
5.0	**Cost break down (cash and in-kind)**	USD32,278,646
6.0	**Focus of the project**	• Improve water supply capacity of the Port Moresby Water Supply System
7.0	**Brief description of key activities and expected outcomes**	• New intake structure, water treatment plant and pipelines, • Water quality assurance, • Reliable clean water availability, • 20kl of treated water supply and 40kl untreated, • Cost per capita of €50 to €150
8.0	**Key project contacts (names, numbers, e-mail addresses etc.).**	Mr. Billy Imar General Manager
9.0	**Activities that overlap or complement with the GEF IWRM project and their**	Establish and promote an integrated catchment management system to ensure maintenance of ecosystem integrity and

	value (in cash or in-kind).	sustainable use of water resources.

x. Laloki River Water Quality Monitoring

1.0	**Title of Project/Activity**	Raw water quality monitoring, river intake at Bomana and Rouna 2 Head Pond intake Water Treatment Plant
2.0	**Executing organization**	Eda Ranu
3.0	**Funding source(s)**	Eda Ranu Operational Account
4.0	**Start and end dates of project**	January 2000 - December 2007
5.0	**Cost break down (cash and in-kind)**	USD275,736
6.0	**Focus of the project**	Monitoring of water quality of Port Moresby Water Supply System
7.0	**Brief description of key activities and expected outcomes**	• Water quality assurance • Reliable clean water availability • 184ml of treated water • cost per capita of Є0.6
8.0	**Key project contacts (names, numbers, e-mail addresses etc.).**	Mr. Billy Imar General Manager, (675) 312 2122 Email: bimar@edaranu.com.pg
9.0	**Activities that overlap or complement with the GEF IWRM project and their value (in cash or in-kind).**	Establish and promote an integrated catchment management system to ensure maintenance of ecosystem integrity and sustainable use of water resources.

P. References

DEC – Queensland Sunwater: (2006): Project proposal for Laloki Catchment Management Plan: A submission to the PNG Incentive Fund – AusAid Port Moresby.

Sowei J., Koi H., Mamae H. and Sivusia-Joyce B., (2002): Papua New Guinea Environment Monitor 2002, National Research Institute, Port Moresby, PNG. Report compilation sponsored by the World Bank.

Q. Annexes

1.0 Logframe for Laloki River Integrated Catchment Management Demonstration Project:

2.0 Implementation Schedule

3.0 Budget

Annex 1.0: Log frame for Laloki River Integrated Catchment Management Demonstration Project

Goal: To promote the sustainable use of the Laloki River water resources for the economic and social benefit of people residing in the catchment, Port Moresby city and the surrounding area.			
Objectives	**Activities**	**Measurable outputs**	**Responsible agencies/collaborators**
Objective 1.0 *To establish project coordination within DEC, an overseeing National Steering Committee as well as a Catchment-based Management Committee dedicated to project implementation.*	1.1 Determine administrative and management procedures and systems for the project.	Full administrative and management procedures in place 3 months into the commencement of the project.	DEC
	1.2 Design duty statement and appoint the Project Coordinator.	PC's duty statement developed 1 month into commencement of project. Project Coordinator appointed in the 2nd month of year 1.	DEC
	1.3 Hold project awareness workshop for all DEC personnel.	Project awareness workshop held for DEC personnel within the first 6 months. 1 Officer each released from Conservation and Environment Divisions to assist in implementation of the project with WRM staff.	DEC
	1.4 Develop Terms of Reference (TOR) and establish a National Project Steering Committee (NPSC).	TOR developed in the first 6 months. NPSC established after 6 months of year 1.	DEC
	1.5 Develop TOR and establish a Catchment Management Committee (CMC).	TOR developed in the first 6 months. CMC established after 6 months of year 1.	DEC
	1.6 Hold inaugural workshop for all stakeholders	1 workshop held in year 1. 2 Officers released from stakeholders at any one time to participate in the implementation of the project.	DEC
Objective2.0 *To improve User - Resource Management Interface through Integrated Catchment Management and Monitoring*	2.1 Develop a communication strategy and conduct education and awareness on the need for an integrated and sustainable catchment management planning.	One communication strategy developed after year 1. 5 community members participating in awareness and education activities. 5 members actively participating in the project activities.	DEC, DoE, NGOs
	2.2 Undertake topographic, hydro-geological, vegetation, biodiversity, socio-economic and land use surveys of the catchment.	One report each on topographic, hydrogeology, vegetation, biodiversity, socio-economic and land use produced for the catchment after year 2.	DEC, PNGGS, EDA RANU, DoL, DAL, NGOs

	2.3 Undertake a demand analysis of the river system for all in-stream and off-stream uses.	Report on demand analysis produced after year 1.	DEC, Landowners, Eda Ranu, PNG Power, Church and educational institutions and farmers
	2.4 Develop a hydrological model of the catchment.	Catchment hydrological model developed by the end of year 1.	DEC, PNGGS, NWS, Eda Ranu, PNG Power
	2.5 Using the model, evaluate the impacts of current, planned and alternative water and land uses.	Environment impact assessment done on 5 current activities and 2 planned and alternative water and land use activities by end of project life.	DEC, DAL, DoL, PNGGS, NWS, Eda Ranu, PNG Power
	2.6 Formulate an Integrated Catchment Management Plan (CMP).	Integrated Catchment Management Plan developed by end of year 4.	DEC, DAL, DoL, PNGGS, NWS, Eda Ranu, PNG Power
	2.7 Under the ICMP, develop a water use and waste disposal policy for the catchment	Water use and waste disposal policy developed by end of year 4.	DEC, PNG Power, Eda Ranu, DAL, NGOs
	2.8 Examine the implementation of the ICMP through the CMC.	1 review done on the implementation of the ICMP's priority activities by end of project life.	DEC, DAL, DoL, PNGGS, NWS, Eda Ranu, PNG Power
	2.9 Undertake appropriate policy and legislative reviews.	Publication of a sub-policy of Environment (Waters in PNG) Policy by end of year 3. Review and amend Water Quality Criteria Regulation by end of project life.	DEC, DoH, DAL, Eda Ranu, PNG Power
	2.10 Evaluate lessons learned and compile a replication strategy for other catchments.	Lessons learned report published by end of year 5. Replication strategy developed and endorsed by end of year 5.	DEC and all stakeholders
Objective 3.0 *To improve waste management and reduce human-induced contamination of the Laloki River*	3.1 Review all land uses including subsistence and commercial agricultural practices in the catchment.	Register of existing land uses and their agricultural practices completed by end of year 2.	DEC, DAL, DoL, NGOs, catchment stakeholders
	3.2 Carry out a contaminant loading assessment of the river.	Contaminant load report produced by end of year 1. Review all water use permits in the catchment by end of year 2.	DEC, DAL, NGOs, NARI
	3.3 Identify and implement methods and technologies for appropriate waste disposal practices.	Identify 1 appropriate agricultural waste disposal technology for 5 main agricultural practices in the catchment by end of project life.	DEC, DAL, NARI, NGOs
	3.4 Review existing water use permits of point source discharges (sewage and wastewater inclusive).	Report produced on all current point source discharge water use permits by end year 2. 10 permits rolled into the new environmental regime by early year 3.	DEC, Industries

	3.5 Permit all new activities and roll over all current permits into the new environment regulatory regime.	Develop a Register of all new water uses in the catchment by end of project life.	DEC, Industries
	3.6 Work with the UNCCD project to produce a Land Use Plan for the catchment.	Land use plan produced under the UNCCD project by end of year 4.	DEC, DAL, DoL, PNGGS, NGOs, Landowners
Objective 4.0 *To develop Site specific water quality criteria for the Laloki Catchment*	4.1 Appraise the existing water quality situation of the catchment from Sirinumu reservoir to the Waigani swamp and Goldie River.	Report on the appraisal produced by end of year 2.	DEC, UPNG, DAL, DoH, NGOs
	4.2 Develop and implement a water quality monitoring program of the Laloki and Goldie river systems.	Water quality monitoring program designed and implemented in the 2 catchments by early year 3.	DEC, DoH, UPNG, NGOs
	4.3 Develop water quality criteria for the Laloki River.	Specific water quality criteria developed for the catchment by end of project life.	DEC, NISIT, DoH, UPNG, rest of the stakeholders
	4.4 Enforce the water quality criteria within the catchment with the assistance of the CMC.	Number of infringements served on permit holders for non compliance after the project life.	DEC, CMC, DAL, rest of stakeholders
Objective 5.0 *To establish a representative and viable hydro-meteorological network and database for the Laloki River catchment (done jointly with the Pacific-HyCOS)*	5.1 Develop a communication strategy and carry out education and awareness on importance of the project and the significance of the hydro-meteorological network.	Communication strategy developed on hydro-meteorological networking after 3 years. 2 local persons collecting hydro-meteorological data and maintenance of the network at each site under HyCOS.	DEC, DoE, NGOs
	5.2 Undertake a physiographic evaluation of the catchment and review the old hydrometric stations.	Report produced on physiographic status of the catchment and the old hydrometric stations by end of year 2.	DEC, PNGGS, NWS
	5.3 Identify locations for a representative hydro-meteorological network throughout the catchment in close collaboration with villagers and institutions.	MoU finalised and signed for the old sites with Eda Ranu and PNG Power and report produced for any new proposed sites by end of year 2.	DEC, PNGGS, NWS
	5.4 Identify and acquire appropriate flow, rainfall, water quality and groundwater measurement equipment taking into account durability, user-friendliness and cost.	Appropriate equipments purchased before project commences. Catchment flow, rainfall, water quality database established by end of year 3.	DEC, PNGGS, NWS
	5.5 Establish stations and train local data collectors.	2 new stations constructed and 3 old stations renovated by end of year 3. 5 locals trained in data collection by end year 3.	DEC, PNGGS, NWS
	5.6 Evaluate station operation and data collection and carry out improvement and training as required.	Station evaluation report produced by end of year 5. 2 locals trained on station maintenance by end year 4.	DEC, PNGGS, NWS

	5.7 Ensure continuous reliable operation of stations and provision of data to the main database unit.	No data gaps in the catchment database. Data collected from all sites processed.	DEC, PNGGS, NWS

Annex 2.0: Implementation schedule

Activities	Year 1				Year 2				Year 3				Year 4				Year 5				Implementing Agencies and Partners
Determine administrative and management procedures and systems for the project.																					DEC
Design duty statement and assign the Project Coordinator's role to the Senior Water Resources Planner within WRM Branch of the Environment Division, DEC.																					DEC
Hold project awareness workshop for all DEC personnel.																					DEC
Develop Terms of Reference (TOR) and establish a National Project Steering Committee (NPSC).																					DEC
Develop TOR and establish a Catchment Management Committee (CMC).																					DEC
Hold inaugural workshop for all stakeholders																					DEC
Develop a communication strategy and conduct education and awareness on the need for an integrated and sustainable catchment management plan and the importance of the project and the significance of the hydro-meteorological network.																					DEC, DoE, NGOs
Undertake topographic, hydro-geological, vegetation, biodiversity, socio-economic and land use surveys of the catchment.																					DEC, PNGGS, EDA RANU, DoL, DAL, NGOs
Carry out a contaminant loading assessment of the river.																					DEC, DAL, NGOs, NARI
Undertake a demand analysis of the river system for all in-stream and off-stream uses.																					DEC, Eda Ranu, PNG Power
Upgrade the existing town water supply intake structure, water treatment plant and pipeline																					DEC, Eda Ranu
Upgrade Koiari Rural Water Supply																					DEC, Eda Ranu, DoH, DoC
Installation of five priority village water supply																					DEC, Eda Ranu, NRWSS, DoH, NGO
Appraise the existing water quality situation of the catchment from																					DEC, UPNG, DAL, DoH, NGOs

Sirinumu reservoir to the Waigani swamp and Goldie River.																					
Review all land uses including subsistence and commercial agricultural practices in the catchment.																					DEC, DAL, DoL, NGOs, catchment stakeholders
Identify and implement methods and technologies for appropriate waste disposal practices.																					DEC, DAL, NARI, NGOs
Develop a hydrological model of the catchment.																					DEC, PNGGS, NWS, Eda Ranu, PNG Power
Using the model, evaluate the impacts of current, planned and alternative water and land uses.																					DEC, DAL, DoL, PNGGS, NWS, Eda Ranu, PNG Power
Review existing water use permits of point source discharges (sewage and wastewater inclusive).																					DEC, Industries
Develop and implement a water quality monitoring program of the Laloki and Goldie river systems.																					DEC, DoH, UPNG, NGOs
Permit all new activities and roll over all current permits into the new environment regulatory regime.																					DEC, Industries
Work with the UNCCD project to produce a Land Use Plan for the catchment.																					DEC, DAL, DoL, PNGGS, NGOs
Develop water quality criteria for the Laloki River.																					DEC, NISIT, DoH, UPNG, rest of the stakeholders
Enforce the water quality criteria within the catchment with the assistance of the CMC.																					DEC, CMC, DAL, rest of stakeholders
Formulate an Integrated Catchment Management Plan (CMP).																					DEC, DAL, DoL, PNGGS, NWS, Eda Ranu, PNG Power
Under the ICMP, develop a water use and waste disposal policy for the catchment																					DEC, PNG Power, Eda Ranu, DAL, NGOs
Examine the implementation of the ICMP through the CMC.																					DEC, DAL, DoL, PNGGS, NWS, Eda Ranu, PNG Power
Undertake a physiographic evaluation of the catchment and review the old hydrometric stations.																					DEC, PNGGS, NWS
Identify locations for a representative hydro-meteorological network throughout the catchment in close collaboration with villagers and																					DEC, PNGGS, NWS

institutions.																					
Identify and acquire appropriate flow, rainfall, water quality and groundwater measurement equipment taking into account durability, ease of use and cost.																					DEC, PNGGS, NWS
Undertake appropriate policy and legislative reviews.																					DEC, DoH, DAL, Eda Ranu, PNG Power
Establish stations and train local data collectors.																					DEC, PNGGS, NWS
Evaluate station operation and data collection and carry out improvement and training as required.																					DEC, PNGGS, NWS
Ensure continuous reliable operation of stations and provision of data to the main database unit.																					DEC, PNGGS, NWS
Evaluate lessons learned and compile a replication strategy for other catchments.																					DEC and all stakeholders

Annex 3.0 BUDGET LINES

BUDGET LINE	DESCRIPTION OF EXPENDITURES	BASELINE (USD)	USD	USD			US$
			GEF	OTHER			ALTERNATE
				In-Kind[1]	Funds[2]	Donor[3]	
1.0 PERSONNEL							
Project Coordinator	Public Service Salary Grade 16		30,000				30,000
Project Assistant	Public Service Grade 14		20,000				20,000
Government Assistance	2 Officers from each agencies as and when needed (Gr.12average)			30,000		GoPNG	30,000
Sub-Total			**50,000**	**30,000**			**80,000**
2.0 ADMINISTRATION							
Office set up and Rental	Rental @ $3,000 per month for 5 years		3,000	60,000		GoPNG	63,000
Furniture	Tables, chairs and cabinets	3,000	5,000	1,000		GoPNG	9,000
Utilities	Electricity and Water @ $700 per month for 5 years	2,000	5,000	42,000		GoPNG	49,000
Stationary	Office support	3,000	4,000		200	GoPNG	7,200
Travel – Stakeholders	Airfares and DSA	30,000	4,000		2,000	GoPNG	36,000
Workshop costs and DSAs	One-off stakeholder meeting		5,000		1,000	GoPNG	6,000
Sub-Total		**38,000**	**26,000**	**103,000**	**3,200**		**170,200**
3.0 EQUIPMENT							
Office equipment	Binding machine, photocopier	10,000	5,000	500		GoPNG	15,500
Computers	For database and data processing	10,000	6,000				16,000
Appropriate software and license	For hydro-geological modelling (License fee over 3 year term)	25,000	12,000				37,000
Digital cameras (2)	For survey and monitoring		2,000				2,000
Field reconnaissance	In-situ testing and surveying	13,000	16,000	257,500		SOPAC Disaster Risk Management Project	286,500
Water quality sampling and field testing equipment	In-situ water quality testing and sampling, etc	16,000	21,000	16,000		SOPAC Disaster Risk Management Project	53,000

Vehicle	4-Wheel Drive (without vehicle can't implement project)	33,000	20,000				53,000
Sub-Total		**107,000**	**82,000**	**274,000**			**463,000**
4.0 OPERATIONAL OVERHEADS							
Communications	Telephone, fax & internet	5,000	10,000				15,000
Fuel	Fuel	2,000			2,000	GoPNG	4,000
Field allowances	Camping advance	3,000	10,000	500		GoPNG	13,500
Maintenance	Vehicle, office and field equipments	16,000	16,000				32,000
Sub-Total		**26,000**	**36,000**	**500**	**2,000**		**64,500**
5.0 REPORTING AND PUBLIC AWARENESS							
Reports and Guidelines	Reports publications	1,000	9,000				10,000
Public Awareness	Sensitise local community and stakeholders on ongoing water resources assessment and management activities	5,000	10,000		2,000	GoPNG	17,000
Sub-Total		**6,000**	**19,000**		**2,000**		**27,000**
PROJECT ACTIVITIES							
6.0 Baseline Foundation Surveys	Topographic Survey	10,000	10,000				20,000
	Hydro-geological survey	20,000	15,000	5,000		GoPNG	40,000
	Biodiversity (flora & fauna) survey	100,000	6,000	5,000		GoPNG	111,000
	Socio-economic survey	5,000	8,000		2,000	GoPNG	15,000
	Land use survey		3,000				3,000
Sub-Total		**135,000**	**42,000**	**10,000**	**2,000**		**189,000**
7.0 Water Resources Assessment and rehabilitation of Hydro meteorological stations	ID of locations for additional hydrometric network in the catchment		2,000	20,000	3,000	GoPNG	25,000
	Establish stations and collection of data also train local data collectors	3,000	10,000		150,000	Pac HYCOS	163,000
	Data collection and evaluation of the station's operation	4,000	8,000		20,000	Eda Ramu Rehabilitation Project	32,000
Sub-Total		**7,000**	**20,000**	**20,000**	**173,000**		**220,000**
8.0 Land Use and Waste Disposal Management and Monitoring	Review all agricultural and industrial land use practices		16,000		6,232	DAL Land use Project	22,232
	License all new land uses	2,000	5,000				7,000

	Develop a Land use plan		5,000	10,000		DAL	15,000
	Assess river contamination		15,000				15,000
	ID and implementation of appropriate methods and technologies for disposal of various waste types		15,000		98,400	DAL Develop't of Sustainable Agriculture in Pacific	113,400
	Review of all existing water use permits and conversion into new environment permitting system of Environment Act 2000	10,000	6,500				16,500
Sub-Total		**12,000**	**62,500**	**10,000**	**104,632**		**189,132**
9.0 Development of Site Specific Water Quality Criteria	Appraisal of existing water quality situation of the catchment		6,500				6,500
	Development and implementation of a water quality monitoring program	5,000	25,000	10,000	272,680	Eda Ramu	312,680
	Development of site specific water quality criteria for the catchment		47,000				47,000
	Water quality criteria compliance check in the catchment		10,000				10,000
Sub-Total		**5,000**	**88,500**	**10,000**	**272,680**		**376,180**
10.0 Upgrading of Rural and Urban Water Supply systems in the catchment.	Demand analysis of the catchment for infrastructure upgrading		15,000				15,000
	Upgrade the existing intake structure, water treatment plant and pipeline	50,000	10,000		31,920,825	Eda Ramu	31,980,825
	Upgrade Koiari Rural Water Supply		5,000		112,778	Eda Ramu	117,778
	Installation of five priority village water supply		10,000		98,270	Eda Ramu Rural Water Supply and Sanitation Project	108,270
Sub-Total		**50,000**	**40,000**		**32,131,873**		**32,221,873**
11.0 Policy and Legislative review	Review of all relevant policies and legislations and make necessary adjustments	2,000			5,000	EU IWRM Planning Program	7,000
	Development of a water use and waste disposal policy				6,000	EU IWRM Planning Program	6,000
Sub-Total		**2,000**			**11,000**		**13,000**
12.0 Formulation of an Integrated and Sustainable Catchment Management	Development of hydrological model for the catchment		8,000	2,000		GoPNG	10,000

Strategy	Evaluation of the impacts on the catchment of current and planned water and land uses		7,000				7,000
	Development of an Integrated Catchment Management Plan (ICMP)		10,000				10,000
	Implementation of the ICMP with appropriate amendments		5,000				5,000
	Evaluation of lessons learned and development of a replication strategy		4,000				4,000
Sub-Total			**34,000**	**2,000**			**36,000**
TOTAL		**388,000**	**500,000**	**459,500**	**32,702,385**		**34,049,885**