

**SOPAC**

ANNUAL REPORT SUMMARY  
**2005**



South Pacific Applied Geoscience Commission





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## Director's Foreword



Cristelle Pratt  
SOPAC Director

With the critical support from our development partners, our focus and effort has and will continue to be toward implementation of the *SOPAC Strategic Plan 2005-2009*, which was endorsed by our member countries at SOPAC's 33rd Annual Session of its Governing Council.

Our current Strategic Plan provides the organisation with a clear focus for the next five years to strengthen national and regional initiatives and actions towards sustainable development. In this regard we remain mindful of the need to consider the economic, environmental and social dimensions of sustainable development as we identify, design, develop and implement appropriate actions to address those development challenges that we can provide technical support in.

In so far as operationalising our Strategic Plan, I see that the activities of our three technical programme areas of ocean and islands, community lifelines and community risk will strongly support the implementation of the higher level policy directives toward sustainable development, governance, economic growth and regional security

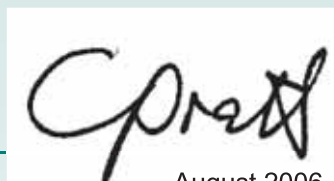
underpinning the *Pacific Plan*; and other activities respond to and support the implementation of regional policy and strategic frameworks for action that may not emerge as key initiatives under the *Kalibobo Roadmap* but remain critical regional priorities.

The Region I believe has worked extremely hard over the last few years to develop sound regional policies on areas that continue to challenge us. Various Pacific regional organisations have also worked over a similar time frame toward reviewing and rationalising their programming support and developing strategic plans to describe this. Our challenge as one of these Pacific regional organisations is to be able to clearly articulate our areas of comparative technical advantage; to engage as a reliable and effective partner in these areas where we have comparative technical advantage; and to deliver quality solutions, services and advice. The cumulative effort of what each organisation provides and delivers must lend itself to making a noticeable and positive difference within our member countries.

In 2005, SOPAC continued to successfully collaborate and cooperate with partners in developing and delivering worthy technical interventions and some of these are described within the body of this summary report under the narratives of our three programme areas. SOPAC'S technical advisory support to Pacific delegations through the lengthy international processes of the Barbados Programme of Action for the Small Island Developing States + 10 and toward the 2<sup>nd</sup> World Conference on Disaster Reduction culminated in two international declarations – the *Mauritius Strategy for the further Implementation of the Programme of Action for the Sustainable Developments of Small Island Developing States* and the *Hyogo Declaration*, respectively. Again the real challenge is how we provide effective support to our members, who have committed to these global declarations, through the design, development and effective implementation of interventions that meet with their national development priorities.

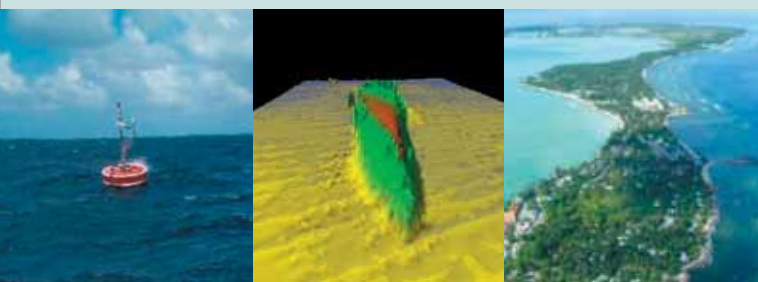
Nationally, SOPAC delivers technical outputs to its member governments and it continues to strive to look at ways in which it can work with and support member governments in taking these outputs and translating them into outcomes on-the-ground, which should in essence be making a positive difference to the lives of their people. This will continue to be a major focus of our work and I look forward to reporting on our progress in this regard in our next annual report summary to you.

In the meantime, I trust that after reading this annual report summary you will agree that we: have demonstrated results; are an organisation that has embraced a strategic programming approach; and perform an extremely important and critical service and advisory role in key development areas that continue to challenge and confront our membership.

A handwritten signature in black ink, appearing to read 'C. Pratt', is enclosed within a white rectangular box. A thin horizontal line is positioned to the left of the box.

August 2006

## KEY WORK PROGRAMMES



### Ocean and Islands

To improve technical knowledge of ocean and island ecosystems for the sustainable management of natural resources.



### Community Lifelines

Improved community access to energy, water and sanitation, and information and communication technologies for sustainable livelihoods.



### Community Risk

To improve disaster risk management practices to build safer and more resilient communities.

## Introduction

### What does SOPAC do ?

SOPAC's work focuses on providing assistance to its member countries in three key programme areas: Ocean and Islands, Community Lifelines and Community Risk.

Ocean and Islands Programme is an integrated programme focused on improving technical knowledge of ocean and island ecosystems for the sustainable management of natural resources through: Resource use solutions; Monitoring physical and chemical change in ecosystems; and, Natural resources governance.

Community Lifelines Programme is a diversified programme that improves and strengthens community access to energy, water and sanitation, information and communications technologies through: Resource assessment, development and management; Asset management; and, Community lifelines governance and advocacy.

Community Risk Programme is a comprehensive programme aimed at building safer communities through improved disaster risk management practices, by: Strengthening resilience to disasters; Mitigating the effects of hazards; and, Mainstreaming disaster risk management.

These three key programme areas are supported by Corporate Services. To effectively provide these support services, SOPAC maintains an information technology unit, provides publication and library services, and offers technical and field services to support work programme delivery.

### Who benefits from SOPAC ?

Member countries are Australia, Cook Islands, Federated States of Micronesia, Fiji Islands, Guam, Kiribati, Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. American Samoa, French Polynesia, New Caledonia and Tokelau are associate members. Any island member country can request assistance from SOPAC.

### Who pays for SOPAC ?

SOPAC is funded by member-country contributions and supported by the following: Australia, the Commonwealth Secretariat, Denmark, the European Union, Fiji Islands, France, Japan, New Zealand, Office of US Foreign Disaster Assistance, Taiwan/ROC, United Kingdom, various UN agencies and, the Global Environment Facility, Asian Development Bank and World Bank. Where donors have provided assistance for specific activities in the Work Programme, either at the regional or country level, this is acknowledged in the Annual Report Summary.



The Ocean and Islands Programme (OIP) undertakes work within three component areas:

- Resource Use Solutions.
- Monitoring Physical and Chemical Change of Ecosystems.
- Natural Resources Governance.

The following narrative highlights activities undertaken which contributed to the ultimate goal of improved scientific knowledge of ocean and islands ecosystems for the sustainable management of natural resources. The full Ocean and Islands Programme report for the reporting period September 2004 to September 2005 was presented to the SOPAC 34<sup>th</sup> Governing Council Annual Meeting and is available from the Secretariat on request.

## Resource Use Solutions

There are presently some forty-five (45) shared maritime boundaries between Forum Island states with only sixteen (16) formally negotiated and three (3) ratified. Twenty-six (26) are yet to be negotiated. Well-negotiated and declared maritime boundaries lay the foundations for regional security and clarify natural resources governance for States within their Exclusive Economic Zones (EEZ). Recent achievements within the Regional Maritime Boundaries initiative, under SOPAC are:

- A fully operational Pacific Islands Regional Maritime Boundaries Information System (PIMBRIS). Adaptation of MarZone and completion of two training workshops were held, with the first for participants from Solomon Islands, Papua New Guinea, Marshall Islands, Tonga, Vanuatu; and the second for participants from Federated States of Micronesia, Cook Islands, Kiribati and Palau, respectively.
- A comprehensive report outlining the status of maritime boundaries data for Tuvalu was completed and quality assured by Geoscience Australia. This is the first technical report to be completed outlining all boundary data with independent validation for any Pacific coastal state. Survey gaps were also assessed for all states with the exception of Papua New Guinea, Federated States of Micronesia, and Palau (underway); and a programme developed to finalise data (including assistance and strategy development, for acquisition of new data where required). A joint SOPAC - Commonwealth Secretariat Workshop for Maritime Boundaries Negotiations was held in Apia immediately after the 34<sup>th</sup> SOPAC Governing Council Session.

The use of marine aggregates for construction is a key issue for many Pacific Island Countries (PICs), given the adverse environmental impacts and unsustainable nature

of extraction. For many PICs aggregate extraction is “mining” and though not considered as such by many, represents a lucrative industry given the demands of the construction industry. The following initiatives targeted at better assessing the scale of marine aggregate extraction in the region, and developing alternate solutions were completed:

- A benefit – cost assessment of marine aggregate use and impacts for Majuro Atoll, Republic of the Marshall Islands was undertaken with reporting expected to be completed in early 2006. This is a follow-up on technical assessments of marine aggregates undertaken in Majuro Lagoon, in order to establish a sound basis and resource economic argument for extraction of alternate, marine aggregate sources.
- Assessments of potential quarry sites for Pohnpei, Federated States of Micronesia were undertaken and included the location of potential on-land quarry sites, the development of guidelines for appropriate extraction and environmental impact assessments for quarry operations for Pohnpei. Stakeholder workshops on impacts of extraction were also held.



*Detailed fieldwork for assessment of terrestrial aggregates in south-western Viti Levu, Fiji.*

Other key activities under the resource use solutions component of the programme included:

- The completion of two marine surveys in the EEZ's of Fiji (December 2004 – January 2005) and the Federated States of Micronesia (June 2005) were completed as part of Phase 2 of the second and final Stage of the eighteen year long Japan-SOPAC Cooperative Deep-sea Minerals Programme. These survey activities completed the field acquisition element of the programme, with reporting expected to be completed by March 2006.
- Transcription of petroleum exploration data held in the SOPAC Petroleum Data Bank located at Geoscience Australia in Canberra. Following the verification and quality checking of the re-mastered 3590 and 9-track tapes all original tapes will be destroyed. In the reporting period five enquiries from exploration companies and institutions were received requesting data products for Fiji and the Solomon.

### Monitoring Physical and Chemical Change in Ecosystems

Long-term physical monitoring of ocean systems is a prerequisite to understanding the drivers for climate change and related impacts. At the time of the 34th Session of the SOPAC Governing Council the PI-GOOS Coordinator had completed one year of implementation of the PI-GOOS Strategic Plan 2005-2007. The placement of the PI-GOOS Coordinator was crucial to reinforcing existing and developing new partnerships throughout

the region and internationally to strengthen the PI-GOOS alliance and the following key activities were implemented:

- Promotion and further development of the SEREAD ocean science education initiative for primary and secondary schools throughout Fiji in 2006 and a more formal strategy for its development and introduction to curriculum throughout the Pacific region between 2006-2009.
- The design and development of the PI-GOOS Web-portal, which has specific links to relevant ocean datasets useful to the member countries; securing an ocean data server to store ocean information at SOPAC, for use by member countries and mirrored at the International Pacific Research Centre in Hawaii.
- The inaugural Physical Oceanography Course funded by the Nippon Foundation via POGO and jointly coordinated between POGO, USP Marine Studies and SOPAC was conducted in July 2005 at USP's Laucala Campus in Fiji, with thirty-three Pacific Islanders participants enrolling in the course.

Other major activities under this component include:

The completion of maintenance and calibration of SEAFRAME sites of all beneficiary States of Phase III of the South Pacific Sea Level and Climate Monitoring Project. Linkages were developed with AusAID and partners in the lead up to the design of a new, fourth phase for the project.



*Deployment of a Sound Ocean Systems Inc water quality monitoring buoy in Manihiki Lagoon funded by bilateral NZAID to the Cooks Islands and installed and monitored by the SOPAC OI programme.*



It is envisaged that Phase IV will commence in January 2006 with management of the project moving from AMSAT to the Bureau of Meteorology, Australia.

The collection of various long-term sustained ocean and meteorological data in real-time from monitoring buoys in the Penryhn and Manihiki Lagoons in the Cook Islands continued throughout the year, with the maintenance and recalibration of monitoring buoys being completed in late 2005.

Other activities in the Cook Islands included reporting on an assessment survey of port areas, harbours and adjacent coastal areas of Rarotonga, to provide development options to Government, as well as on an assessment of the physical impacts of a proposed tourism project to dredge the lagoon in the O'otu area of Aitutaki Lagoon.

Geophysical surveys were completed for the Rewa, Navua and Sigatoka Rivers located on Viti Levu, Fiji. Processed data, GIS, map and information products enabling assessment of impacts of dredging and sedimentation for each of the mentioned rivers, with recommendations for future planning and management decisions was prepared.

#### **Natural Resources Governance:**

Under Article 76 of United Nations Convention on the Law of the Sea, some Pacific coastal States have, until May 2009, the potential to prepare and submit a claim for an extended Continental Shelf beyond 200 M to the United Nations Commission on the Limits of the Continental Shelf. Given the timeline and the technical complexities for submissions, this remains a pressing issue for Federated States of Micronesia, Fiji, Papua New Guinea, Palau, Solomon Islands, Tonga and Vanuatu as the 2009 deadline draws nearer. Potential benefits are real as a successful claim to an extended outer shelf could result in a Pacific Coastal State gaining resource jurisdiction over a greater area of the seafloor and its subsoil, beyond the current 200 M EEZ limit.

In the reporting period, a joint Commonwealth Secretariat, United Nations Office of Legal Affairs/Division for Ocean Affairs and the Law of the Sea, SOPAC and Commonwealth Secretariat technical training course on the Delineation of the Outer Limits of the Continental Shelf Beyond 200 M Limit was held at the Lagoon Resort, Fiji, from 28 February to 5 March 2005. This was the first of two workshops on this subject. The 2nd was convened by the Japan Hydrographic Department, in Tokyo in June 2005.

Linkages were developed with UNEP-GRID ARENDAL (Norway) on ways to progress a regional desktop study. In this process a regional scanning phase was completed. A working group of officials from Pacific coastal States met in February to consider progress of the SOPAC Maritime Boundaries initiative and to develop a strategy to mobilise resources to complete their national desktop assessments. Efforts and advocacy over the past several years has resulted in a larger group of countries (Tonga, Fiji and Papua New Guinea) engaging in the process of achieving desktop studies through bilateral or national means. SOPAC continues to play a key facilitation and technical support role. Discussions commenced with AusAID in order to access technical expertise contained within Geoscience Australia to provide quality assurance of desktop studies as they are completed.



*Levelling survey in Cook Islands.*

Maritime boundaries not a simple drawing of lines

The need to determine EEZ boundaries between zones of neighbouring countries where the potential maritime zones overlap was identified in the 1990s as a significant issue for coastal States to attend to. All SOPAC island member countries are coastal States that have the bulk of their wealth and health generated from the vast expanse of ocean that in some cases outstrips their land areas by ratios as high as 100 to 1. Therefore, properly delineated and defensible maritime boundaries are a sovereignty issue. The absence of agreed maritime boundaries, both binding in international law, and reflected in domestic legislation, has the potential to give rise to disputes with neighbouring countries over the ownership of resources either in the shorter or the longer term.

The United Nations Convention on the Law of the Sea (UNCLOS) sets out the international legal framework within which all activities in the oceans and seas must be carried out. For Pacific coastal states, UNCLOS promises exclusive jurisdiction over the living and non-living resources of the adjacent water column, seabed and subsoil to a minimum of 200 nautical miles from the coast, or to seabed boundaries agreed with neighbouring countries; however, all sovereign rights claims over areas of ocean space must be based upon sound technical data and must satisfy requirements prescribed within the UNCLOS.

Also, under Article 76 of the UNCLOS, coastal states can establish outer limits of the legal continental shelf up to 350 nautical miles from the baselines, and within the provisions of the Convention, claimant states have to submit particulars (inclusive of supportive scientific and technical data) of the outer limits of its continental shelf beyond the 200 nautical mile boundary by 13 May 2009.

While the extended continental shelf issues, with a fixed deadline of 13 May 2009 acts as an incentive for some states to move forward on formalising submissions for territorial seas, the same cannot be said for normal boundary agreements. There are presently about forty-five (45) shared boundaries between Pacific island states with sixteen (16) formally negotiated and only three (3) ratified. Twenty-six (26) are yet to be negotiated.

The following constraints, to a greater or lesser extent, true in most SOPAC member countries, are some of the contributing factors to the poor state of resolution on these boundary issues:

- limited financial resources;
- lack of technical capability and capacity in-country;
- limited man-power resources; and
- the need to coordinate multi-disciplinary boundary delimitation teams in country.

The Pacific Islands Regional Maritime Delimitation Boundaries Project (PIRMBP)

was established, with assistance from the Australian Government to respond to this pressing regional issue. The PIRMBP is a mechanism to ensure regional consistency in terms of the relevant technical data; as well as support capacity building within the country to better define maritime and extended continental shelf boundaries under the provisions of UNCLOS. PICs are given technical assistance to complete the determination of baselines for defining their territorial and archipelagic seas, contiguous zones and EEZs.

Output includes the complete computations of all boundaries including medians, using state-of-the-art maritime boundaries delimitation software. Quality checks of data are undertaken and map outputs produced showing the various computed maritime zones. Comprehensive country reports detailing the procedures and the maritime boundaries information for each country are produced. National counterparts are also trained in data acquisition, assessment, analysis and maritime boundary definition.

A key output of the PIRMBP was establishing the Pacific Islands Regional Maritime Boundaries Information System (PIRMBIS) containing all baseline and maritime boundaries data and information that is 1) updateable; 2) accessible to query; and 3) compliant with UNCLOS. SOPAC and Geoscience Australia established PIRMBIS in 2003, to collate regional coverage of the maritime limits of PICs. PIRMBIS was designed with similar specifications and

feature definitions as the Australian data collation system, AMBIS, managed by Geoscience Australia. Geoscience Australia is the lead organisation providing assistance in this area to SOPAC member countries.

Maritime data and information collated within PIRMBIS for each country (supported by databases held at SOPAC) then form the basis for negotiations between sovereign states, concerning shared boundaries. It is at this pre-negotiation stage, that PICs need to form multi-disciplinary teams to ensure the best outcomes are negotiated.

The Commonwealth Secretariat supported a regional workshop in October 2005 to address this need for multi-disciplinary participation from countries at negotiation – but more nationally focussed training will be needed.

SOPAC’s role in boundary delimitation is mainly one of facilitation to sovereign states within its membership. This facilitation role while being regionally implemented through mechanisms such as the PIRMB and other projects; can also be delivered nationally depending a member-country’s stated specific need and request for assistance.

A snapshot of the status (as at 30 September 2005) of SOPAC member states that are party to UNCLOS, with ratification dates and their potential claim to an extended continental shelf are tabulated below.

List of SOPAC Member States that are Party to UNCLOS, with Ratification Dates and their Potential to Claim an Extended Continental Shelf.			
Pacific coastal State (PICS)	UNCLOS Ratified	Potential for Continental Shelf Extension (CSE)	Revised and (Original) Deadlines for Claim Submission to CLCS
Australia	5 October 1994	YES	13 May 2009 (16 November 2004)
Cook Islands	15 February 1995	NO	
Federated States of Micronesia	29 April 1991	YES	13 May 2009 (16 November 2004)
Fiji	10 December 1982	YES	13 May 2009 (16 November 2004)
Guam			
Kiribati	24 February 2003	YES***	26 March 2013
Marshall Islands	9 August 1991	NO	
Nauru	23 January 1996	NO	
New Zealand	19 July 1996	YES	
Niue*		NO	
Palau	30 September 1996	YES***	13 MaY 2009
Papua New Guinea	14 January 1997	YES	13 May 2009 (14 January 2007)
Samoa	14 August 1995	NO	
Solomon Islands	23 June 1997	YES	13 May 2009 (23 June 2007)
Tonga	2 August 1995	YES	13 May 2009 (2 August 2005)
Tuvalu	9 December 2002	YES***	8 January 2013
Vanuatu	10 August 1999	YES	13 May 2009

\* PICS that have signed UNCLOS only but yet to ratify

\*\* The Decision (SPLOS/72) of the States Parties to the Law of the Sea extends the deadline for submissions to the CLCS until 13 May 2009, for those States who ratified the Convention prior to 13 May 1999. 13 May 1999, being the date of adoption by the CLCS of its Science and Technical Guidelines, for submissions in accordance with article 76, paragraph 8 of the Convention. For those states that ratified after 13th May 1999, the 10 year period start from the day the Convention has entered into force for them (which is on the 30th day following date of ratification or accession, as stated in Article 308 of the Convention).

\*\*\* These countries have the potential to claim for extended Continental Shelf according to the UNEP scanning assessment report. (UNEP Shelf Programme 2005).

# Community Lifelines

The overall goal of the Community Lifelines Programme (CLP) is “improved community access to energy, water and sanitation, and information and communication technologies for sustainable livelihoods.” This is carried out through the following three key component areas of:

- Resources Assessment, Development and Management.
- Asset Management.
- Community Lifelines Governance and Advocacy.

The key issue and challenge for the Community Lifelines Programme is to integrate implementation of our activities under three very distinct utility-focused sectors of energy, water and information and communication technologies. The full Community Lifelines Programme report for the reporting period September 2004 to September 2005 was presented to the SOPAC 34<sup>th</sup> Governing Council Annual Meeting and is available from the Secretariat on request.

Adopted regional policies and guidelines continue to be pivotal in guiding the work of the programme both within the region and in addressing global agendas, for example the multi-year programme of work of the Commission of Sustainable Development (CSD), which focused on water, sanitation and human settlements in 2004-2005 (CSD12 & 13), and the thematic cluster of energy for sustainable development; industrial development; air pollution / atmosphere; and climate change in 2006-2007 (CSD14 & 15). Funding opportunities that were realized under CSD12 & 13 included the development of a framework for programmes and activities to be implemented during the “Water for Life Decade” from 2005 to 2015, in an attempt to meet the Millennium Development Goals (MDG) Targets on Water and Sanitation. Compilation of a regional position paper that will specifically address energy issues for submission into the CSD14 & 15 process commenced during this reporting period.

## Resource Assessment, Development and Management

The gloomy outlook of rising fuel costs in the global market provides the impetus to drive towards identifying alternative sources of energy and renewable energy options in the Pacific region.

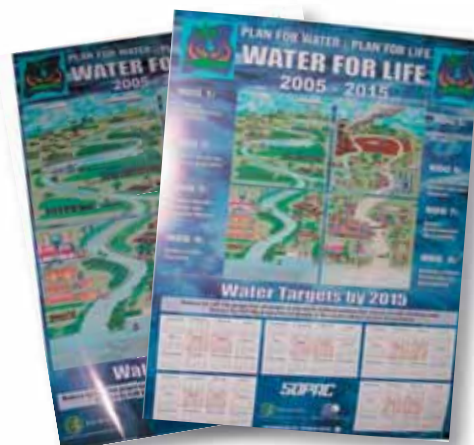
In this regard a biomass resource assessment proposal has been redrafted for submission to the Food and Agriculture Organization (UN). Aside from the energy aspect of biomass being recognised and promoted, the agricultural component and the sustainable development dimensions of the initiative have also been elaborated.

Work in the biofuels sector increased significantly within the period with the following three key activities being undertaken:

- Convening of a national workshop in Fiji and a sub-regional workshop in Vanuatu as a means towards developing a regional strategy and providing future directions with regard to progressing biofuel initiatives in the region, with an emphasis on the use of coconut oil.
- Carrying out a feasibility study on the use of coconut oil as a substitute fuel for electricity generation in Samoa.
- Coordinating the implementation of a UNDP-funded study on biofuels as the key component in a Fiji Resilience Building Project.

The 20-kW demonstration wind turbine installed as part of the Wind Energy Education Programme completed 12 months of operation and the turbine was officially handed over to the University of the South Pacific and forms an integral part of USP’s post-graduate courses in wind energy. Aside from the formal educational value of the wind turbine, the wind turbine has also attracted site visits from other interested parties such as primary and secondary school children. A training of trainers’ workshop was convened in March 2005, with a sub-regional workshop on wind energy being held in November 2005 marking the completion of the project activities.

Site-specific wave energy monitoring continued in Fiji with the data logger being relocated by the Fiji Department of Energy to a new site. A second submerged data logger purchased by SOPAC was deployed in the Cook Islands at a site previously identified to have the highest wave energy potential. Results from the monitoring observed at Fiji and Cook Islands confirm earlier wave energy resources assessments, which is encouraging. Any further development of the region’s wave energy



Water for Life poster and calendar.





*Analysing data from wave gauge, Cook Islands.*

resources will primarily be dependent on the availability of a commercially-proven technology.

Other activities in renewable energy include the convening of a sub-regional workshop on wind energy in the Cook Islands and a solar PV workshop held in Tonga as activities of the 'Sustainable Use of Renewable Energy Project' or SURE Project. SOPAC also assisted the UNESCAP – Bangkok Office in finalising the 'Pacific Renewable Energy Training Initiative (PRETI)' Project proposal. The detailed project proposal was finalised and presented at a donor consultation meeting in November 2005.

The second year of a three-year hydrological training programme funded through NZAID was conducted. The programme was established as a Water Partnership Initiative and implemented with WMO, UNESCO and NIWA as contribution to the implementation of the Pacific Regional Action Plan on Sustainable Water Management.

Following the appointment of a Water Quality Officer as a shared position with the Institute of Applied Sciences of the University of the South Pacific (IAS-USP) the regional programme on water quality monitoring and database development resumed with training provided in Niue. A regional water quality-monitoring proposal was developed as a partnership initiative with WHO and IAS-USP for consideration by NZAID which has subsequently been funded.

Final products from the SIDA-funded Rainwater Harvesting Demonstration Project were disseminated throughout the Pacific region to promote rainwater harvesting as a source for domestic water supply. The products developed by SOPAC, UNEP and the Tonga Community Development Trust, included a set of Guidelines, a Manual and a Demonstration Video on rainwater harvesting. UNEP also invited SOPAC to become a founding member of a Rainwater Harvesting Partnership.

The outcomes of the Catchments and Communities Project implemented in Vanuatu with the assistance of SOPAC, resulted in the selection by UNESCO of one of the Vanuatu catchments as an official 'Hydrology for the Environment, Life and Policy' or HELP Basin. The HELP basins are providing models of good practice in catchment management.

World Water Day 2005 celebrations raised awareness on water and sanitation under the theme 'Water for Life'. This also marked the start of the Water for Life Decade (2005-2015). Activities jointly implemented by SOPAC and Live and Learn Environmental Education, included the provision of assistance in the development of teacher training and water education and awareness materials for schools.

### **Asset Management**

Following the appointment of a Water Engineer, the programme on water demand management included in-country training and capacity building for water utilities in Niue and the Cook Islands in partnership with UNESCO. Efforts were made to develop a regional water demand management proposal as a partnership initiative with Pacific Water Association (PWA) for consideration by NZAID.

A joint SOPAC-WHO proposal on Water Safety Plans was also developed in response to the 'Pacific Drinking Water Quality and Health Framework for Action'. Implementation funds were subsequently approved by AusAID.

In conjunction with the Global Programme for Action (GPA-UNEP), SOPAC, SPREP and IAS –USP commenced the development of a regional training course on wastewater management to be implemented



*Wind turbine, Mangaia, Cook Islands.*



*River gauging in Naboro, Fiji Islands.*

Ocean Institute (IOI), GPA and UNESCO-IHE (Institute of Water Education).

Climate information to water, energy and disaster managers continued to be provided under the NZAID-funded Pacific Island Climate Update (ICU) bulletin in close cooperation with NIWA.

With funding support from the Asian Development Bank, SOPAC established the Pacific Water & Climate Resource Centre. Its primary function being to ensure the wide dissemination of information on successful applications of climate information in the water sector as a follow-up to the Pacific Dialogue on Water and Climate.

### **Community Lifelines Governance and Advocacy**

The Pacific Energy and Gender (PEG) Network, since its establishment in 2003, has been engaged in developing awareness and advocacy activities, with linkages and support from ENERGIA, the Asia Gender and Energy Network, Netherlands Government through the Technical Centre for Agricultural and Rural Co-operation (CTA) being further strengthened during this reporting period. In December 2005 PEG convened a Regional Meeting in Nadi, Fiji that endorsed the PEG Strategic Action Plan and Terms of Reference. PEG was also part of the CSD14 & 15 preparatory meetings concluding with a PEG submission through the Pacific Energy Background paper and the ENERGIA side event during the CSD14 proper.

The Asian Development Bank supported the establishment of a Coordination Unit for the Pacific Partnership Initiative on Sustainable Water Management that seeks to promote and monitor implementation of priority actions of the Pacific Regional Action Plan on Sustainable Water Management through a partnership newsletter, website, action inventory matrix and database. A SOPAC Water and Sanitation Strategy was also developed for the period 2005-2009 building on the outcomes of the regional consultation, the Pacific Regional Action Plan and associated Partnership Initiative.

Contributions to the Pacific preparations for the 4th World Water Forum were submitted to the Japan Water Forum, which assumed a lead role for the Asia-Pacific region. A Pacific position paper outlining the region's progress since the 3<sup>rd</sup> World Water Forum was presented at the 2005 STAR Water Working Group meeting during the SOPAC 34<sup>th</sup> Session and was subsequently submitted to the 4th WWF Secretariat.

Pacific delegations were supported by SOPAC in their attendance at CSD13, which focused on water and sanitation policy development and action implementation. A Pacific brief was provided for the report of the UN Secretary-General to CSD13 on water and sanitation issues and strategic responses in the Pacific Island region.

The Pacific Programme for Water Governance funded by the European Union Water Initiative commenced in Fiji, Kiribati and the Solomon Islands. The programme will see the establishment of a consultation process and subsequent development of critical institutional building blocks such as a National Water Committees and Policies in the mentioned countries.

The review and publication of the Pacific Islands Energy Policy (PIEP), including the preparation of a companion Pacific Islands Energy Strategic Action Plan (PIESAP) was concluded through the CROP Energy Working Group in consultation with Energy Officers / Officials from Pacific Island Countries (PICs). Assistance in the development and review of national energy policies, and strategic action plans continued under the Pacific Islands Energy Policy and Strategic Action Planning (PIEPSAP) programme funded by the Danish Government. PIEPSAP also supported a number of other energy sector initiatives including an extensive consultation that identified wind energy development as a priority in the Cook Islands Energy Action Plan (CIEAP); co-financing of a power utility tariff study, with the US Department of Insular Affairs and the Pohnpei Power Utility; a review of the electricity sector legislation in the Solomon Islands with the aim to develop an innovative framework for accelerated rural electrification; and the establishment of a full scale GIS/MIS system for the Tuvalu Electricity Corporation (TEC).

With respect to ICT advocacy issues the Secretariat actively contributed to the development of a digital strategy for inclusion into the Pacific Plan, as well as providing direct funding and technical support and advisory at the Asia-Pacific conference of the World Summit on the Information Society (WSIS) which was considered an important platform for promoting initiatives and addressing the communication and information needs of the region.





**Coconut oil fuelling station in the Republic of the Marshall Islands**

## **Pacific drives to replace imported diesel**

Pacific island states have decided to break the stranglehold of dependence on imported oil or be broken by it.

Pacific island states are currently dependent on the import of diesel fuel for a significant part of their power generation needs.

Samoa's Electricity Power Corporation (EPC) and Fiji's Electricity Authority are among other Pacific state utilities that have been superactive in the past few years, looking into alternatives for diesel generation and their attention is understandably drawn to biodiesel generation from locally-available plants – like coconut, cane and cassava.

The desire for resilience in local fuel supply is continually fanned by constantly increasing fuel bills. The heavy dependence on international oil companies who can leave if their profits are not high enough has become decidedly unpalatable to cash-strapped Pacific economies.

Specially-formulated and trustworthy advice in 2003 by scientists long associated with the oil industry that are also in free association with SOPAC through its Science, Technology and

Resources Network addressed this very dilemma. The advice basically warned that there was scarcity directly ahead in the industry that had to be prepared for. They pointed out that oil would no longer be cheap, going to the highest bidders in the future; therefore they advised limiting the growth of cities onto agricultural lands, encouraging agricultural activities, maintaining cultural roots and beginning to farm oceans. The fact that all oil comes from a hole in the ground => ground being a constant surface area => more people being born to inhabit this constant surface area and the length of time it takes for an oil field to gestate – logically concludes that scarcity is ahead and that it would be prudent for the Pacific to not pursue an industrial lifestyle as an ideal. In the medium-term these experts also encouraged continuing oil exploration, although it would be for those who can afford it to come to explore, discover and exploit it.

Against that backdrop Samoa and Fiji lead a late charge into the field of renewables, especially biodiesel generation through local plant resources.

In 2005 Fiji's Electricity Authority declared its intentions to be completely renewable by the year 2012. This intention has been labelled "ambitious" by some quarters but scarce investment dollars are already being diverted into researching alternatives and laying down policy and infrastructure for a number of new power generation projects by government and private entities. It is the way of the future and there seems to have been no delay in forging ahead with plans.

Samoa continued in 2005 with experimentation using various coconut oil/diesel blends in one of its diesel generators. SOPAC was involved in a feasibility study for which funding was secured in late 2004. The feasibility study found that local production of coconut oil is currently three times the cost of imported diesel and that supply is unreliable at best, therefore it was not an economic option. However, lively debate in Samoa seems to suggest that

the country's interest in the opinions of economists on the viability of coconut oil, as an alternative to imported diesel is purely academic. The country has chosen coconut oil to replace diesel – research and economics will have to catch up to this decision – and revitalising the copra industry has become top priority in Samoa.

The drive towards renewables by Pacific states is not an option among an array of options – the very survival of Pacific small-scale economies depends upon it. It therefore seems logical that the Pacific will look to what are plentiful (or has the potential to become plentiful) and perpetual indigenous resources for exploitation and expend effort to raise the cash to enable this exploitation. Research and economics have therefore been provided with a context within which solutions are to be found or risk being ignored. If the 2005 Samoan and Fijian activities in renewables are anything to go by, the Pacific will bite the bullet to invest in the research and technology needed to make the change, which they have been driven to make. Therefore building in-country capacity to raise the quality and quantity of locally produced alternative fuels is a logical activity to preoccupy island governments and their energy advisers.

The donor community has been more than forthcoming in its support of the region's efforts at studying and testing renewable alternatives to imported oil. A number of regional projects are in the offing from the European Union and various UN agencies and an even greater number and impetus through bilateral arrangements. In Fiji, Government projects are funded by a combination of soft loans from organizations like the Asian Development Bank or through grant assistance from the European Union and from individual governments like France and Denmark. Samoa's close association with UNDP-Samoa has greatly assisted its efforts in fast-tracking the replacement of imported diesel oil with locally produced coconut oil.

## Community Risk

The Community Risk Programme (CRP) provides a range of capacity building support to SOPAC member countries through the following three, key components areas of:

- Strengthening Resilience to Disasters.
- Mitigating the Effects of Hazards.
- Mainstreaming Disaster Risk Management.

The following narrative highlights activities undertaken in 2005, which supported the successful delivery of the programmed outputs for the year. The full Community Risk Programme report for the reporting period September 2004 to September 2005 was presented to the SOPAC 34<sup>th</sup> Governing Council Annual Meeting and is available from the Secretariat on request.

### Strengthening Resilience to Disasters

The Pacific Islands Regional Progress Report (1994-2004), as part of the review of the Yokohama Strategy and Plan of Action, was completed and published. This document provided an important reference point on the progress made by the region relative to the Yokohama Plan of Action and the lessons learned have helped shape the priorities identified in the draft Pacific Framework for Action 2005-2015 (see Mainstreaming Disaster Risk Management section below). The Pacific was the only region in the world to fully document its progress since 1995 and this was acknowledged at the Second World Conference on Disaster Reduction convened in January 2005 in Kobe, Japan. The

Secretariat also coordinated regional attendance to the Kobe conference and provided both technical and administrative support to the Pacific delegation at the conference. Fifty (50) delegates representing most SOPAC member countries attended the Conference and a number of country statements were issued. A regional debrief, chaired by Dr Langi Kavaliku who led the SOPAC delegation, was held in Suva following the Kobe conference to discuss the outcome and to map out a strategy to finalise the Pacific Regional Framework for Action 2005-2015 on Disaster Risk Reduction and Disaster Management.

The emergency management coordination and communication systems in Niue, Tonga and Tuvalu were strengthened through funds provided by Emergency Management Australia (EMA) for equipment and resources. This included equipment to fully resource the emergency operations centres in Tonga and Niue, the supply of satellite telephones for all nine Tuvalu atolls and installation of Barrett radios in all Vanuatu provinces. This important regional initiative is critical to improving the ability of the NDMO to effectively communicate and coordinate during the response stage of national disasters.

A Tsunami Information Kit was developed in partnership with the Pacific Disaster Center (PDC) to strengthen resilience to tsunami-related hazards in the region. Member countries involved in the development of the kit were Fiji, Papua New Guinea and Vanuatu. The kit



*Cooks original housing after Cyclone Olaf.*





*Coastal erosion in Lae Papua New Guinea.*

caters for different target audiences, namely Government officials, technical agencies, communities, the educational system and the private sector. This tool was developed as an outcome of the 2004 regional tsunami workshop and will greatly assist member countries that are at risk from tsunami hazards.

Technical assistance was provided by the Secretariat to assist national disaster management capacity building in association with World Bank projects in Tonga and Samoa. This included conducting a review of the NDMO staffing arrangements in Tonga and, attending the stakeholder workshops for the development of the national plan and new Legislation in Samoa. In partnership with the Asian Development Bank the Secretariat provided technical advisory for the strengthening of disaster management and mitigation in the Cook Islands. This has resulted in the development of a draft National Disaster Risk Management Plan and supporting Legislation aligned to the Pacific Regional Framework for Action and a revised Cyclone Response Plan. In the Marshall Islands, the Secretariat assisted government in revising the Standard Mitigation Plan to meet the requirements set by FEMA. A revised plan was submitted and approved in 2005.

The Leadership skills of the NDMOs were strengthened through their participation as part of the East West Center Leadership Development Programme in Honolulu. This programme targeted a number of key areas of leadership development and management skills and will greatly assist the process of disaster management coordination and planning at the national level. This programme was part of a broader leadership development programme that also targeted the energy and water managers in an effort to strengthen national synergies towards improved disaster management, planning and decision-making.

To assist the process of building safer and more resilient communities the Secretariat continued to provide institutional and technical assistance to the fire services in member countries through a partnership with the Australasian Fire Authorities Council (AFAC). A major initiative under this partnership was the attendance of representatives from the Cook Islands, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Papua New Guinea, Samoa, Tonga, Tuvalu and Vanuatu to the AFAC annual meeting and conference in Auckland where a decision was made to establish a Pacific Islands Fire Service Association to encourage greater collaboration and cooperation within the region.

The regional training programme continued to strengthen regional and national capacity with disaster management courses conducted in the Marshall Islands, Tonga, Federated States of Micronesia, Cook Islands, Fiji and the Solomon Islands. SOPAC, together with the Asia Disaster Preparedness Centre conducted the first Community Based Disaster Risk Management course in Fiji, which is currently being adapted for national delivery.

### **Mitigating the Effects of Hazards**

The development of the global Environmental Vulnerability Index (EVI) was completed and presented to the International Meeting of Small Islands Developing States at the BP+10 in Mauritius in January 2005. This included a technical review of the global EVI via a second Think Tank meeting, which included partnership and participation of international vulnerability and indicator experts. An EVI website has been established and diagnostic reports for member countries have been produced. The focus now is on the application of the tool or parts thereof in member countries via strengthening the regional capacity in the use of the tool.

Post-disaster technical assistance to the Cook Islands was provided following the impact of a series of cyclones in early 2005. To ensure that the lessons learned are documented a methodology to assess and analyse impacts needs to be developed and personnel trained in its use. Technical teams also need to be mobilised as soon as logistically possible after an event. To improve the timeliness and quality of post-disaster technical assistance in the region the Secretariat assisted with the drafting of a paper for a broader CROP mechanism that will be presented for discussion by the Leaders in October.

A comprehensive GIS baseline database, including census data, has been developed for Lae, Papua New Guinea and it is intended that Planners and Disaster Centre officers at the national level will be trained in using the database, together with a wide range of



*Emergency Operations Centre course, Tonga.*

stakeholders in Lae. The main objective is to allow for disaster risk reduction measures to be implemented in various sectors at the local level, based on the most current scientific and technical data available. These measures will in turn benefit the communities in and around Lae with respect to the hazards that have the potential to turn into disasters because of the high vulnerability of the area.

Hazard-related technical studies are being carried out by the SOPAC-EU Reducing Vulnerability of Pacific ACP States project and include: landslide assessments; active tectonics and earthquake hazard evaluation in Fiji; flood modelling in Samoa; multihazard mapping in Vanuatu and a review of Vanuatu policy and institutional assessment of the proposed Integrated Coastal Management Process and Plan for Mele Bay; sedimentation studies and tsunami hazard assessment in Papua New Guinea; and, coastal hazard assessments in Kiribati and Tuvalu. Geographical Information Systems (GIS) is used extensively to integrate field-collected data, remote sensed data from satellite imagery and aerial photography and existing data such as topography. The data and information collected and produced are ultimately uploaded to the MapServer of the country of study and is made readily available to decision-makers via the Internet. The database and the MapServers are one platform whereby Information and Communication Technologies can facilitate the decision-making process by making relevant, current disaster risk reduction and disaster management information available.

### **Mainstreaming Disaster Risk Management**

To support the outcomes of the Second World Conference on Disaster Reduction and to contribute to the process of building safer and more resilient Pacific island nations and communities to disasters, a draft Pacific Framework for Action 2005-2015 was

developed. This was the culmination of two years of review and consultation with all stakeholders and has provided a strategic roadmap for the member countries to mainstream disaster risk reduction and disaster management over the next decade. The purpose of the framework is to accelerate the mainstreaming of disaster risk reduction (prevention and mitigation) and disaster management (preparedness, response and recovery) by national governments. Mainstreaming could be fast tracked through policies, plans and programmes designed to reduce the short- and long-term social (including health and security); as well as economic and environmental consequences of disasters consequently strengthening sustainable development planning.

In partnership with the University of the South Pacific and supported by funding from Australia the Secretariat contributed to a research project that examined the economic impacts of natural disasters on development. Specifically the research consisted of case studies in Fiji, Niue, Tuvalu and Vanuatu, with the primary objectives being to assess the economic impacts of natural disasters over the past 20 years, develop a framework for assessing future impacts, examine the principle that a greater emphasis on disaster risk management will reduce costs and construct a model for assessing relative effectiveness and the benefit-cost ratio of various disaster risk management measures.



Framework for Action 2005 – 2015.



## The Global Environmental Vulnerability Index (EVI) Completed

The Environmental Vulnerability Index is a tool designed to provide an estimate of the vulnerability of a locality via a series of fifty indicators that were developed by a partnership involving Ireland, Italy, New Zealand, Norway, UNEP and SOPAC.

The tool was developed in collaboration with the Alliance of Small Island Developing States (AOSIS) and the experts and institutions of Small Island Developing States, given that the impetus behind the development of the EVI was the move within the UN system to raise the ranking of certain small island states up the human and economic development ladder. AOSIS resisted the proposed development status change arguing that due consideration should be given to the unique case of some SIDS with their geographic isolation, fragility of environment and smallness; and pushing for greater awareness of the key elements of vulnerability. As part of the Barbados Programme of Action (BPoA), the United Nations responded in 1994 by calling for the development of a composite vulnerability index that included economic, social and ecological components of vulnerabilities in the SIDS countries.

Most of the work prior to the development of the EVI has focused on the impacts of the environment or environmental hazards on economies and society. Relationships between and within societies and economies have also been well researched. The area that has received little attention in the past has been that

of the effects of economy, society and natural phenomena on the persistence of natural environments. This is an important omission because factors that affect the integrity of the natural environment will affect the welfare of human systems, which are fundamentally dependent on them. The EVI is a contribution to addressing this gap by widening an understanding of the issues and impacts of the social and economic forces on the environment.

The second and final Think Tank meeting to assemble a small group of internationally recognised scientists to examine the EVI was held in October 2004. The Think Tank II peer review and commentary pronounced the EVI "sufficiently well-developed to begin national implementation. Within limitations of available data, it successfully captures the nature and scope of environmental vulnerability. It is quantitatively robust and highly relevant to policy at national and international levels." Countries could now trial the index and test it under various national conditions to determine how well it defines their vulnerability and meets their national objectives. With respect to the original United Nations call in 1994, the EVI, according to the experts, captures the environmental vulnerability of SIDS and emphasises their ecological fragility. The EVI meets the BPoA requirements for the environmental area, but needs to be complemented by economic and social vulnerability indices for a complete measure of a country's vulnerability.

Reservations that had been expressed by a handful of countries after the first international presentation of the EVI have been taken into account, for example, a sub-index for Climate Change was designed to identify environmental risks and monitor how rapidly climate change impacts are affecting a country. At national level the EVI can also be used as a tool for setting priorities for environmental remedial action, as the indicators have been designed to capture short-term trends, changes and improvements (5-year scale).

The minimum data requirement for calculating a valid EVI classification score for any country was set at greater than 80%. SOPAC member countries with more than 80% data available are placed below under the category their EVI score falls into.

Finally, the EVI needs an international organization to be responsible for its continuing development and implementation. Overtures to premier global and regional environmental organizations have met with minimal traction, however this should not prevent any country from applying the tool to manage their vulnerability, to protect or build up its resilience, to report on such international processes such as the Millennium Development Goals and the state of their environment.

The home of the EVI on the world-wide web is <http://www.vulnerabilityindex.net>.

Extremely Vulnerable	Highly Vulnerable	Vulnerable	At Risk	Resilient
Cook Islands	Fiji	New Zealand	Australia	[None]
Kiribatti	Marshall Islands	Solomon Islands	Papua New Guinea	
		Vanuatu		



The following activities are highlights of the SOPAC/EU Reducing Vulnerability of Pacific ACP States project for this reporting period and are reflected under each of the key technical programme areas of SOPAC:

## Ocean and Islands Programme

Under Key Result Area 1 of the EU Project: Sustainable development of coastal zones, in particular through identifying alternative sources of aggregates:

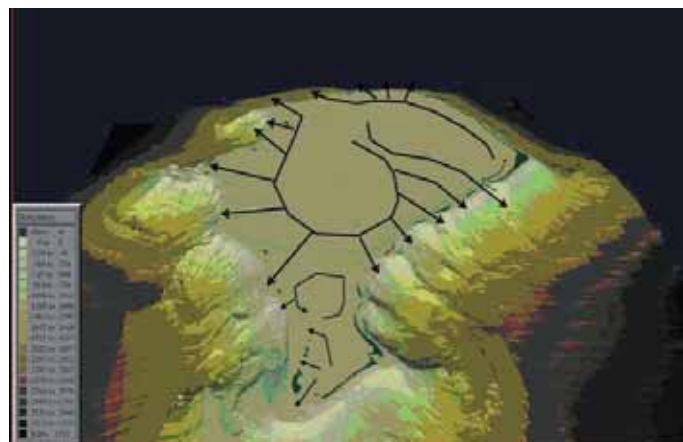
A marine swath mapping survey to acquire data within Tuvalu's EEZ was completed at the end of 2004, with the first multibeam survey of 2005 being completed for Niue in May following mobilisation of a new charter vessel, the 'Summer Spirit', which required equipment installation and subsequent calibration and testing of these. This was followed by a marine survey within the waters of the Solomon Islands over a three month period from June to August, and subsequent surveys being completed in Kiribati (including Banaba) and Nauru. One of the objectives of the marine surveys being to identify offshore, marine aggregate resources that represent economically viable alternatives to illegal mining of beach sand or high-cost bulk importation is vital to ensure sustainable development of coastal zones.

An extensive study to improve the development and management of offshore aggregates in Tongatapu and the development of appropriate guidelines was presented at a stakeholder workshop in Tonga in March.

Project progress in Tuvalu and Kiribati in advancing community, government and donor awareness and acceptance of the establishment of dredging offshore, marine aggregate resources as an acceptable way forward to eliminate beach sand mining has been realized. This will directly contribute to reducing the vulnerability of coastal areas and the communities that live within the coastal zone. The lessons being learned and the 'models' being created from these experiences will directly benefit similar atoll environments within the Project's remit.

Under Key Result Area 4: Island Systems Management (ISM) infrastructure established and in use in each country, key achievements include:

A hydrodynamic model of Funafuti atoll, Tuvalu to better understand nutrient and sediment dispersion characteristics within the lagoon circulation has been developed.



*Water circulation in Funafuti.*

## Community Lifelines Programme

Under Key Result Area 2: Improved planning practices installed for safe and adequate water supplies and sanitation systems, the following achievements were realised:

Capacity building in the regional water sector was aided for the third successive year by delivery of a series of lectures on hydrogeology and sustainable water resources to final year students reading for their Bachelor of Science degree at the USP.

A reconnaissance hydrogeological field survey and advice was facilitated in January to assist the Momi Bay tourism development in their search for alternative water resources to satisfy the site engineering, hotel and landscaping water supply demands.

Two multi-parameter, HydroLab "DataSonde" water quality monitoring sondes were purchased and have the capability to provide long-term, sustained monitoring. They will be deployed within the region in marine, brackish or freshwater environments for water quality monitoring purposes.

Significant GPS survey assistance was provided to map the water supply assets and infrastructure within the Sigatoka catchment with the Fiji Public Works Department. In addition further hydrogeological investigation and monitoring of Niue's groundwater resources was completed.

Under Key Result Area 4: ISM infrastructure established and in use in each country, the following activities were achieved:

The eighth MapServer was installed and officially presented to the Government of Samoa through the National Representative to SOPAC in early 2005. It is physically located in the Department of Meteorology but is also available online – see <http://map.meteorology.gov.ws>. The ninth and final Mapserver to be installed under the EDF8 was installed in the Solomon Islands at the end of 2005. Targetted training courses to build local capacity in RS/GIS and Mapserver applications were completed in-country in Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands and Tuvalu during the reporting period.

### **Community Risk Programme**

Under Key Result Area 3: Implement comprehensive hazard and risk management tools within the framework of an Integrated Holistic Approach for Sustainable Development (Island Systems Management), highlights are as follows:

Under one of several long-term Fellowships offered under the project, a second successful field season in active tectonics and earthquake hazard evaluation of the Suva to Navua Project area was completed by Mr Tariq Rahiman, who is currently completing a PhD at the University of Canterbury. Important new geo-scientific findings relating to potential mega-landslides, rock fall dams, lake sediments and flooding risks within the Navua catchment have been identified.

Continued technical support for post-cyclone support and assessment in Niue (wave modelling and hazard zonation mapping) and the provision of post-damage assessment assistance to the Cook Islands (GPS surveys of damage assessment) were provided. An expert field-team from UPNG have successfully completed a tsunami hazard assessment of the northwest coast – Vanimo-Indonesia border.

#### *Cross-cutting issues*

Initial multi-stakeholder consultations have been successfully completed in all six EDF9 States, with a second round of multi-stakeholder consultations completed in Palau in mid-2005.

Three new In-Country Interns were successfully identified and appointed within the EDF8 States of Vanuatu, Tuvalu and Samoa and in August, all Country Interns of the Project benefited from interaction with other MapServer users from across the Pacific region through attendance at the PacINET meeting convened in Tarawa, Kiribati.

Project Fellowship funding support has benefited over ten individuals with their graduate or post-graduate studies, specific training or conference opportunities and on-the-job training and work attachments at the Secretariat. A two-week hydrodynamic modelling course was also undertaken at SOPAC in March with the Danish Hydraulic Institute presenting the MIKE21 modelling software.

Following appointment of the two person EDF8 Mid-Term Review Team project staff were involved in extensive liaison and preparations to receive, assist and support the MTR team. In-country visits by the MTR Team and discussions with Project stakeholders in all eight EDF8 states began in mid-June and were completed by mid-August. The draft MTR report was presented to participating SOPAC member country representatives in the margins of the 34<sup>th</sup> SOPAC Governing Council Session held in Apia, Samoa in September 2005.

Twelve new Project reports and one new Project Information Brochures (No. 7 – Aggregates) were issued during the year, with project personnel continuing to forge significant synergies with many different non-government organisations, non-state actors and private organisations throughout the region.

Support in the delivery of tertiary courses in the USP science degree programme courses was provided by a number of project specialists.

Five National Information Centres were identified and established, with MapServers were installed and deployed using open-source GIS systems. These provide publicly accessible, interactive spatial and tabular datasets via the Internet to a wide range of stakeholders such as land managers, resource managers and service utilities who can control various layers within the GIS. This activity is a fundamental component of the SOPAC/EU Reducing Vulnerability of Pacific ACP States project.

## The Story of an Ancient Lake in Viti Levu (Fiji)

Major discovery in Fiji's Geology with widespread applications for palaeo-climate studies and risk assessment of extreme events.

During field work within the framework of the SOPAC/EU Project 'Reducing Vulnerability of Pacific ACP states' and a PhD thesis from the University of Canterbury on seismic hazards of southeastern Viti Levu, a new layer of Quaternary Lake Deposits in the Geology of the Navua catchment in southeastern Viti Levu has been discovered: These finely interbedded, partly organic lake deposits (Figure 1) are silent witnesses of a huge landslide at the Namosi Gorge, which occurred several tens of thousands of years ago and caused the damming of a 100-150 sq km lake and the separation of the Navua and Waidina river systems (Figure 2).

The Namosi Gorge is a peculiar geomorphological feature in central southeastern Viti Levu (Figure 3). It presently forms a wind gap between the Navua and Waidina river catchments and is known commonly as the Namosi Gap. It has been speculated in previous studies that a palaeo Navua-Waidina river once flowed through the Namosi Gorge. Disruption of flow of this palaeo river is thought to have occurred at the Namosi Gorge, which led to the diversion and southward flow of the Navua river at Namuamua and which left the Namosi Gorge dry. Small, unconnected occurrences of lacustrine sediments were first noted in the area by Band (1966) and Rodda (1976).

The basement rocks in the area are poorly stratified volcanoclastics of the Namosi Andesite. The Namosi Gorge itself is filled for nearly all of its length by landslide debris, which formed a dam of an estimated 100 m height. The debris is littered with tree logs and individual boulders reaching the size of a house (Figure 4). Aerial photos reveal a number of distinct and very large landslide head scarps along ridges at the northern flank of the Namosi Gorge, which are the most likely source areas of the deposits in the valley floor. West of the gorge, exposures along the Wainikoroluva riverbank reveal the basement rocks overlain by the landslide deposit. This deposit is composed entirely of coarse and angular andesitic material locally derived from the adjacent surrounding ridges. This deposit is overlain by a 20 m thick layer of lake sediments, which in turn is overlain by fluvial sediment. These fluvial sediments are approximately 50 m above present river level. The occurrence of lake sediments has been confirmed for seven kilometres west of the Namosi Gorge and also identified in the upper Navua River area (Figure 2).

The geological history of the area as interpreted from the currently mapped geomorphology and stratigraphy is

consistent with an exceptional landsliding event in the Namosi Gorge, which blocked the paleo drainage west of the Namosi Gorge for a number of thousands of years. The inferred landslide dam embankment is a cross ridge on the valley floor of the Namosi Gorge. This cross-valley ridge forms the highest point along the Namosi Gorge valley (about 200 m). The lake sediments and overlying fluvial gravels form a distinct terrace level at 120 to 140 m across the Navua river catchment. The terrace can be clearly seen on aerial photos of the upper Navua catchment and is suggestive of a drowned topography, with isolated peaks of the Late Miocene Navua Mudstone surrounded by the flat terrace ground composed of the younger gravels and underlying lake sediments.

This discovery is one of the most important in Fiji's geology over the last few decades. The lake sediments cover parts of three 1:50 000 geological maps sheets and it provides a significant potential data bank of the poorly known Quaternary geological history of Fiji. But beside revealing parts of the geologic history and the development of the Navua catchment there are several more widespread implications.

Firstly, continuous series of laminated Quaternary lake sediments, which are rare in the humid tropics, are very useful for several avenues of palaeo-climatologic and palaeo-environmental research. This deposit has the potential to provide an invaluable record of Quaternary climate changes in the region, which in turn will help to understand current climatic changes.

Secondly, the amount of aggregation under natural, pre-human conditions establishes a valuable benchmark for comparison with current increased erosion and aggregation rates due to human activities like deforestation, land use changes and road construction.

Thirdly, the Namosi Gap occurs within a zone of seismicity passing through southeast Viti Levu. The large 1953 Suva earthquake caused numerous rock falls and landsliding in the upper Waidina area and one temporary landslide dam in the upper Navua river. The paleo Navua-Waidina river disruption may have similarly been caused by a seismo-tectonic event. There is a well-known Fijian legend from the Namosi/Navua area which talks about an earthquake and a flash flood, which would have happened after breaching of a temporary landslide dam. Studies of the processes that lead to the disruption of the proto Navua-Waidina river may add to the poorly understood seismo-tectonic history of south eastern Viti Levu and hence increase our knowledge of recurrence intervals of large earthquakes.

Fourthly, the size and associated processes of this extreme landslide event, which created the third largest catchment in Viti Levu, provides us with a premise for

reconsidering the risk for downstream communities. The Navua delta with its growing township is known for its agriculture potential and is part of a resettlement programme of the Ministry of Agriculture. Landslide damned lake outburst floods are known worldwide for their destructive potential and long outrun distances. The narrow Navua Gorge is prone to blockage by major landsliding from the extremely steep side slopes. According to the traditional Flood Legend and a reported event from the 1830s, such an event might have happened twice already in the relatively recent (historic) past.

Tariq Rahiman & Michael Bonte-Grapentinein



Figure 1.

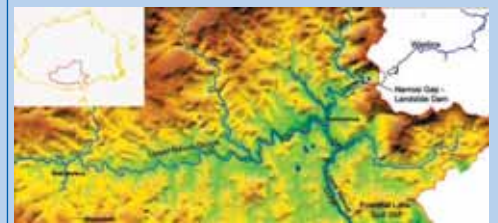


Figure 2.



Figure 3.



Figure 4.

### References:

- Anonymous & Rodda, P. 1995, *A legend from Fiji: the flood*, Fiji Mineral Resources Department Note BP1/112: 5 pp.
- Band, R.B. 1966, *Geomorphological aspects of the Namosi Gap*, Fiji Mineral Resources Department Note BP30/39: 2 pp.
- Rodda, P. 1976, *Geology of northern and central Viti Levu*, Fiji Mineral Resources Division Bulletin 3: 160.
- Terry, J.P., Ollier, C. & Pain, C.F. 2002, *Geomorphological evolution of the Navua River, Fiji*, *Physical Geography* 23, No. 5: 418-426.

## Appendix 1: SUMMARY OF 2005 FUNDING BY PROGRAMME

SOURCE OF FUNDS	GRAND TOTAL	TOTAL OCEAN & ISLANDS PROGRAMME	TOTAL COMMUNITY LIFELINES PROGRAMME	TOTAL COMMUNITY RISK PROGRAMME	TOTAL CORPORATE SERVICES	TOTAL DIRECTORATE
A: DONOR FUNDING						
ACIAR	5,000		5,000			
ADB	8,000		8,000			
Australia Marine Science & Technology	95,641	95,641				
Australia-Annual Grant	2,417,051	964,749	744,646	707,656		
Australia-AYA	120,250		120,250			
CFTC	46,339	46,339				
Cook Islands (Bilateral)	31,663	31,663				
CTA	60,000		60,000			
Danish/EU	628,203		628,203			
EMA	144,561			144,561		
EU	164,440		164,440			
European Union EDF 8	3,902,889	1,300,681	1,701,574	731,192	169,442	
European Union EDF 9	1,854,043	500,000	848,936	446,809	58,298	
Fiji	0					
FSM	12,039	12,039				
GEF	50,000		50,000			
ISDR	10,000			10,000		
Japan Water Forum	50,000		50,000			
Kiribati (Bilateral)	37,947			37,947		
New Zealand-Annual Grant	1,041,279	207,602	607,941	225,736		
New Zealand-Special Grant	581,503		435,137	146,366		
OFDA	108,643			108,643		
Taiwan (ROC)	180,597	48,061	132,536			
UNDESA	468,877		318,877			
UNESCO-IOC	73,940	73,940				
United Kingdom (ODI)	113,600	113,600				
UNOPS/UNDP	105,000		105,000	105,000		
Various	43,240				43,240	
World Bank	7,500					
TOTAL DONOR FUNDING	12,362,245	3,394,316	5,980,540	2,716,409	270,980	0
<u>B: TOTAL REGULAR BUDGET</u> (principally membership contributions)	2,202,651	36,400	106,404	0	1,419,450	640,397
TOTAL 2004 REVISED BUDGET	14,564,896	3,430,716	6,086,944	2,716,409	1,690,430	640,397
TOTAL 2005 APPROVED BUDGET	13,336,978	3,491,217	4,989,217	2,368,744	1,775,784	712,016



## Appendix 2: REPORTS & PUBLICATIONS UPDATE (as at 30 September 2005)

### CORPORATE PUBLICATIONS

Proceedings of the Thirty-third Session, hosted by the Government of Papua New Guinea at the Coral Coast, Fiji Islands, 17-24 September 2004.

Annual Report Summary 2004.

SOPAC Business Plan 2005 (SOPAC Miscellaneous Report 580).

### TECHNICAL REPORTS

- 371 McKenzie, E. 2004. A cost-benefit analysis of projects implemented to assist the black pearl industry in Manihiki Lagoon, Cook Islands. (74 pages)
- 372 Mosley, L., Carpenter, C., 2005. Niue coastal water quality and groundwater resources assessment. (Restricted to Niue until end of April 2005) (35 pages)
- 373 Mosley, L., Sharp, D., 2005. The Hydrogen-Sulphide paper-strip test -- a simple test for monitoring drinking water quality in the Pacific Islands. (24 pages)
- 374 Mosley, L., Singh, S. & Sharp, D., 2005. The effect of a cyclone on drinking water quality and how best to protect public health when similar disasters occur. RESTRICTED. (See SOPAC Miscellaneous Report 543 for published version)
- 375 Pratt, C.R., Kaly, U. & Mitchell, J., 2005. Pacific Training Manual: How to use the Environmental Vulnerability Index (EVI). (77 pages)
- 376 Kaly, U.L., Pratt, C.R. & Mitchell, J., 2005. Environmental Vulnerability Index (EVI) : Description of Indicators, 18 October 2004. (See Joint Contribution 177 for UNEP published version, dated 20 December 2004) (40 pages)
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- 43 Booth, S., 2005, Project Progress: January to August 2005. (Special Intermediate Report produced for the SOPAC 34th Annual Session, Apia, Samoa) (38 pages)
- 44 Prescott, N., 2005. Tonga -- Proceedings of the Tonga National Workshop on the use of the Offshore Aggregates Dredging Guidelines and Action Plan, Nuku'alofa, Tonga, 14-15 March 2005 & (The Draft Code of Practice for Regulating Agency and for Dredging Companies) (53 pages)
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### Appendix 3: SECRETARIAT STAFF LIST (as at September 2005)

POSITION	NAME	COUNTRY OF ORIGIN	DATE JOINED SOPAC	CONTRACT START	CONTRACT END
DIRECTORATE					
Director	Cristelle Pratt	New Zealand	May 2000	Feb 2004	Feb 2007
Deputy Director (Outgoing)	Russell Howorth	New Zealand	Oct 1986	Mar 2002	Sept 2005
Deputy Director	Bhaskar Rao	Fiji	May 2004	Sept 2005	Sept 2008
Executive Assistant	Litia Waradi	Fiji	Apr 1989	Jan 2004	Dec 2006
Executive Planning Officer	Kakala Vave	Fiji	May 2003	May 2005	May 2006
OCEAN & ISLANDS PROGRAMME					
Manager Ocean & Islands	Bhaskar Rao	Fiji	May 2004	May 2004	Aug 2005
Senior Adviser – Physical Oceanography	Jens Kruger	United Kingdom	Sept 2004	Sept 2004	Sept 2007
Senior Adviser – Resource Economist	Vacant				
Senior Adviser – Marine Geophysics	Robert Smith	Australia	May 1988	July 2004	July 2007
Senior Adviser – Aggregates	Akuila Tawake	Fiji	Oct 2003	Oct 2003	Oct 2006
Senior Adviser – Geoscience Training	Russell Maharaj	Trinidad & Tobago	Nov 2001	May 2004	May 2005
Senior Adviser – Marine Geoscience	Vacant				
Adviser – Technical (Electronics)	Simon Young	Fiji	Jan 1993	Jan 2005	Jan 2008
PI-GOOS Coordinator	Sarah Grimes	Australia	Aug 2004	Aug 2005	Aug 2006
Adviser Sustainable Development	Netatua Prescott	Tonga	Aug 2004	Aug 2004	Aug 2007
Adviser Aggregates & Coastal Process	Arthur Webb	United Kingdom	Jul 2004	Jul 2004	Jul 2007
Project Officer 1 – Technical (Marine)	Kalisi Fa'anunu	Tonga	Apr 2005	Apr 2005	Apr 2006
Project Officer 2 – Technical (Surveying)	Andrick Lal	Fiji	Sept 2001	Sept 2004	Sept 2007
Project Officer 3 – Technical (Geoscience)	Sekove Motuiwaca	Fiji	Apr 1980	Jan 2004	Dec 2006
Project Officer 4 – Technical (Electronics)	Peni Musunamasi	Fiji	Jun 1989	Jan 2004	Dec 2006
Project Officer 5 – Technical (Mechanics)	Setareki Ratu	Fiji	Oct 1986	Jan 2004	Dec 2006
Adviser – Resource Economics	Emily McKenzie	United Kingdom	Oct 2003	May 2003	Oct 2005
Programme Assistant – Ocean & Islands	Frances Dobui	Fiji	Oct 2003	Oct 2003	Oct 2006
Project Officer 6 – Maritime Boundaries	Emily Artack	Fiji	May 2004	Jan 2005	Dec 2007
Project Officer 7 – Ocean & Islands Programme	Arti Naidu	Fiji	May 2002	May 2004	Feb 2006
EU Attachment	Naomi Biribo-Atauea	Kiribati	Jul 2004	Jul 2004	Dec 2006
COMMUNITY LIFELINES PROGRAMME					
Manager Community Lifelines	Paul Fairbairn	New Zealand	Jan 1998	Sept 2003	Sept 2006
Senior Adviser – ICT/CLP	Vacant				
Senior Adviser EU – Team Leader – Water	Stephen Booth	United Kingdom	Feb 2003	Feb 2003	Feb 2006
Resource Specialist	Vacant				
Senior Adviser EU – GIS and Remote Sensing	Wolf Forstreuter	Germany	Jan 1999	Jan 2003	Jan 2006
Senior Adviser EU – ICT Specialist	Franck Martin	France	Sept 1993	Jan 2003	Jan 2006
Senior Adviser – Water	Marc Overmars	Netherlands	Apr 2000	Jan 2005	Dec 2005
Adviser – PIEPSAP Project	Anare Matakiviti	Fiji	Feb 2000	Sept 2004	Sept 2007
Adviser – Water Resources, Supply & Sanitation	Vacant				
UN Associate Expert	Jan Cloin	Netherlands	Nov 2003	Nov 2003	Nov 2006
Project Manager – PIEPSAP Project	Gerhard Zieroth	Germany	Aug 2004	Aug 2004	Aug 2007
Water Engineer	Sarah Davies	Australia	June 2004	June 2004	June 2006
Adviser – Energy	Rupeni Mario	Fiji	Oct 1998	Apr 2005	Apr 2008
Adviser – ICT	Siaosi Sovaleini	Tonga	Oct 2005	Oct 2005	Oct 2006
Project Officer 9 – ICT Network and Security	Graeme Frost	Fiji	Mar 1992	Jan 2004	Dec 2006
Programme Assistant – Community Lifelines	Arieta Navatoga-Sokota	Fiji	Oct 2003	Oct 2003	Oct 2006
Assistant Project Officer 1 – Water & Sanitation	Vacant				
Project Officer – PRAP Facilitator	Rhonda Bower	Fiji	Nov 1998	Jan 2004	Dec 2004
Project Officer 11 – WASH Officer	Kamal Khatri	Fiji	Feb 2005	Feb 2005	Feb 2006
Project Officer 12 – Water Sanitation	Alena Lawedrau-Moroca	Fiji	May 2003	May 2005	May 2006
Project Officer – Energy	Emeline Veikoso	Tonga	Apr 2005	Apr 2005	Apr 2006
Assistant Project Officer 13 – PIEPSAP	Yogita Bhikabhai	Fiji	Jan 2002	Sept 2004	Sept 2007



# STAFF LIST ... continued

POSITION	NAME	COUNTRY OF ORIGIN	DATE JOINED SOPAC	CONTRACT START	CONTRACT END
COMMUNITY LIFELINES PROGRAMME ... continued					
Assistant Project Officer 14 – Water Quality	Sarabjeet Singh	Fiji	June 2004	June 2004	Feb 2005
USP/SOPAC Water Quality Officer	Tasleem Hasan	Fiji	Mar 2005	Mar 2005	Mar 2006
Temp. Attachment Water Resources	Linda Yuen	Fiji	June 2005	Oct 2005	July 2006
Project Officer Water Partnerships	Sanjeshni Naidu	Fiji	Aug 2005	Aug 2005	Aug 2006
Project Officer 15 – GIS/RS ICT	Elizabeth Lomani-Whippy	Fiji	Feb 2004	Feb 2005	Feb 2006
Project Officer 16 – GIS/RS ICT	Joy Papao	Solomon Islands	June 2004	June 2005	June 2006
EU Intern – Fiji	Vilisi Tokalauvere	Fiji	Feb 2004	Feb 2005	Feb 2006
ICT Attachment	Daryl Woo	Fiji	Oct 2003	Oct 2003	Mar 2006
COMMUNITY RISK PROGRAMME					
Manager Community Risk	Alan Mearns	Australia	June 2000	June 2003	June 2006
Senior Adviser – Risk	Michael Bonte	Germany	June 2003	June 2003	June 2006
Disaster Mitigation Adviser	Atu Kaloumaira	Fiji	Dec 2000	Dec 2003	Dec 2006
Programme Director – PDRMP	Kathryn Hawley	United States of America	Aug 2004	Aug 2004	Aug 2007
Adviser – Hazards Assessment	Litea Biukoto	Fiji	Apr 2003	Jul 2004	July 2007
UN Associate Expert	Noud Leenders	Netherlands	Nov 2003	Nov 2003	Nov 2006
Project Officer 17 – PDRMP	Monika Swamy	Fiji	Aug 2004	Aug 2004	Aug 2007
Project Officer 18 – PENTAG	Tukatara Tangi	Cook Islands	Sept 2004	Sept 2004	Sept 2007
Research and Planning Officer	Kata Duaibe	Fiji	Apr 2004	Apr 2004	Apr 2005
Programme Assistant – CRP (Outgoing)	Paulina Ravouvou	Fiji	Aug 2004	Aug 2004	Apr 2005
Programme Assistant – Community Risk	Asenaca Rokomanalagi	Fiji	Apr 2005	Apr 2005	Apr 2006
Assistant Project Officer 19	Jonathan Mitchell	Fiji	Dec 2002	Feb 2003	June 2006
CORPORATE SERVICES					
Manager Corporate Services	Mohinish Kumar	Fiji	Mar 1998	Sept 2003	Sept 2006
Adviser – Technical Editor	Mereseini (Lala) Bukarau	Fiji	Nov 1985	Sept 2003	Sept 2006
Accountant	Makereta Kaurasi	Fiji	Apr 1998	Apr 2004	Apr 2007
Conference & Travel Officer	Laisa Baravilala-Baoa	Fiji	Jul 1987	May 2003	May 2006
Administration Officer	Karen Datta	Australia	July 2001	July 2004	July 2007
Project Officer 20 – Library	Dorene Naidu	Fiji	Sept 2004	Sept 2004	Sept 2007
Finance Services Officer – I	James Ram	Fiji	May 2000	Jan 2003	Dec 2005
Assistant Administration Officer – SOPAC/EU Project	Subha Ram	Fiji	Sept 2004	Jan 2003	Jan 2006
Adviser – ICT/CS Technical	Sakaio Manoa	Fiji	Jan 2004	Aug 2005	Aug 2008
Project Officer II – Publish./Graphic Arts	Reuben Vulawalu	Fiji	Apr 2001	Mar 2004	Mar 2007
Receptionist/Clerk	Unaisi Bainiloga	Fiji	Feb 1987	Jan 2004	Dec 2006
Driver/Clerk	Enele Gaunavou	Fiji	Jul 1988	Jan 2004	Dec 2006
Assistant Project Officer 22 – Web Developer	Vacant				
Assistant Project Officer 23 – ICT Training	Avinash Prasad	Fiji	June 1999	Jan 2004	Dec 2006
Office Assistant/Cleaner	Salestino Niu Daurewa	Fiji	Sept 1987	Jan 2004	Dec 2006
Assistant Finance Officer III	Emi Nofaga	Fiji	Aug 2002	Mar 2005	Mar 2006
Security Officer	Cama Temo	Fiji	Sep 2002	Jan 2005	Dec 2005
Security Officer	Waitisoni Tuberi	Fiji	Sep 2002	Jan 2005	Dec 2005
Assistant Project Officer IV – Publications/ Library	Elenoa Rokodi	Fiji	Feb 2003	Feb 2005	Feb 2006
Carpenter	Nand Kumar	Fiji	June 1998	Jan 2005	Dec 2005
Assistant Carpenter	Ajay Chand	Fiji	Dec 2000	Jan 2005	Dec 2005
Gardner	Are Waione	Fiji	Mar 1996	Jan 2005	Dec 2005

#### Appendix 4: LIST OF ACRONYMS

ADB	– Asian Development Bank
ACP	– African-Caribbean-Pacific
AMSAT	– Australia Marine Science and Technology Limited
CHARM	– Comprehensive Hazard and Risk Management
CLP	– Community Lifelines Programme (SOPAC)
CoCoGen	– Coconut Oil for Power Generation
CRP	– Community Risk Programme (SOPAC)
CROP	– Council of Regional Organisations of the Pacific
CSD	– Commission on Sustainable Development
CTA	– Technical Centre for Agricultural and Rural Co-operation
DSM	– Demand Side Management
eCS	– extended Continental Shelf
EDF	– European Development Fund
EEZ	– Exclusive Economic Zone
EIA	– Environment Impact Assessment
EMA	– Emergency Management Australia
EPC	– Electric Power Corporation
EU	– European Union
EVI	– Environmental Vulnerability Index
FAO	– Food and Agriculture Organisation (UN)
FEA	– Fiji Electricity Authority
FSchM	– Fiji School of Medicine
FSM	– Federated States of Micronesia
GEF	– Global Environment Facility
GIS	– Geographic Information System
GPS	– Global Positioning System
GWP	– Global Water Partnership
HYCOS	– (Pacific) Hydrological Cyclone Observing System
IAS	– Institute of Applied Sciences (USP)
ICT	– Information & Communications Technology
IOC	– Intergovernmental Oceanographic Commission
ISM	– Island Systems Management
IWRM	– Integrated Water Resources Management
JAMSTEC	– Japan Agency for Marine-Earth Science and Technology Centre
MDG	– Millennium Development Goals
MIS	– Management Information Systems
NDMO	– National Disaster Management Office
NGO	– Non-Government Organisation
NIWA	– National Institute for Water and Atmospheric Research (New Zealand)
NSA	– Non-State Actors
NZAID	– New Zealand Agency for International Development
OIP	– Ocean and Islands Programme (SOPAC)
PDC	– Pacific Disaster Center
PIEP	– Pacific Islands Energy Policy
PIESAP	– Pacific Islands Energy Strategic Action Plan
PIEPSAP	– Pacific Islands Energy Policies and Strategic Action Planning
PIFS	– Pacific Islands Forum Secretariat
PI-GOOS	– Pacific Islands – Global Ocean Observing System
PIC	– Pacific Islands Countries
PIPP	– Pacific Islands Information and Communication Technologies Policy and Strategic Plan
PNG	– Papua New Guinea
POGO	– Partnership for Observation for the Global Ocean
PRETI	– Pacific Energy Training Initiative
PWA	– Pacific Water Association
PWD	– Public Works Department
RAP	– Pacific Regional Action Plan on Sustainable Water Management
RS	– Remote Sensing
SEAFRAME	– Sea Level Fine Resolution Acoustic Measuring Equipment
SERREAD	– Scientific Educational Resources and Experience Associated with the Deployment of Argo profiling floats in the South Pacific Ocean
SIDS	– Small Island Developing States
SOPAC	– South Pacific Applied Geoscience Commission
STAR	– Science, Technology and Resources Network
TEC	– Tuvalu Electricity Corporation
UK	– United Kingdom
UN	– United Nations
UNCLCS	– United Nations Commission on the Limits of the Continental Shelf
UNCLOS	– United Nations on the Law of the Sea
UNDP	– United Nations Development Programme
UNEP	– United Nations Environment Programme
UPNG	– University of Papua New Guinea
USP	– University of the South Pacific
WHO	– World Health Organisation
WSIS	– World Summit on the Information Society
WUE	– Water Use Efficiency
WWF	– World Water Forum



