



Annual Report Summary 1998



SOPAC

South
Pacific
Applied
Geoscience
Commission

Table of Contents

Foreword by the Director	1
Introduction to SOPAC	
What is SOPAC?	2
What does SOPAC do?	2
Who benefits from SOPAC?	3
Who pays for SOPAC?	3
General Regional Assistance	
Resource Development Program	4
Environmental Science Program	8
National Capacity Development Program	13
Member Country Projects	
Cook Islands	17
Federated States of Micronesia	17
Fiji	18
Guam	22
Kiribati	22
Marshall Islands	23
New Caledonia	24
Niue	24
Papua New Guinea	25
Samoa	25
Solomon Islands	26
Tonga	28
Tuvalu	29
Vanuatu	30
Management and Corporate Services	31
Finance and Administration	32
Technical Work Program Management	33
Appendices	
Appendix 1: Reports and Publications 1998	35
Appendix 2: Secretariat Staff List	39
Appendix 3: 1998 Revised Budget and 1999 Approved Budget	41
Appendix 4: Some Abbreviations used in this Report	42

Foreword by the Director



Alf Simpson

This summary report follows the format of recent years but the reporting period has now been changed to cover the period between Annual Sessions. In this instance approximately October '97 to September '98. This will enable the Secretariat to compile this summary report from my report to Council rather than have to compile a separate, but similar, document for the calendar year.

At the outset I should highlight Nauru becoming a member state at the 27th Annual Session of the Governing Council. This brings to eighteen the number of full or associate members of Council.

In January Philipp Muller, who is well known throughout the region to most, stepped down as Director, to be replaced by myself. I was joined shortly after by Russell Howorth as Program Manager, and Mohinish Kumar as Finance and Administration Controller and a new management team was established.

From the beginning our major task was to generate a new image for the organisation both within our ranks and with the public at large. We proceeded as energetically as we were able, to implement the directions of the '97 Council meeting in regard to the future role and direction of the organisation, and secure the necessary donor partnership support.

The Energy Unit established itself well from the beginning of the year and discussions continued on the establishment of a Disaster Management Unit at the Secretariat. Generally, all the reshaped Work Program Units adjusted well to the new way of doing business. A major concern was to see support for the Water Resources Unit disappear as donor support was not forthcoming. This was despite the importance placed on the sector by members at the SOPAC Council meeting, and on the international agenda freshwater resources being the key theme for the year of the United Nations Seventh Commission for Sustainable Development.

I am pleased to report that success in efforts during 1998 in attracting new support is reflected in an approved 1999 budget of FJD\$8.5 million, compared with FJD\$5.5 million in 1998. This new support came from new donors and partners, as well as from our traditional supporters. For this I must record sincere appreciation on behalf of the Pacific small island developing states we are in business to serve.

A special project was launched mid-year which I believe worthy of mention: the Environmental Vulnerability Project. With the special assistance of New Zealand we embarked on the task, found too hard in the international arena, of trying to find an acceptable method of measuring vulnerability of states other than by economic measures. Small island states have expressed their "special" case in numerous international fora since Barbados in 1994, but to date have been unsuccessful in determining an acceptable methodology. Just how vulnerable we are was brought home with devastating effect by a tsunami in July, on the north coast of Papua New Guinea. This must surely strengthen our resolve to make the Pacific a safer place for its peoples.

Much other excellent work was carried out during the reporting period and mention of it follows in this report. I commend it to you, and express my gratitude for the support of our member countries and the dedication of all the Secretariat staff for their service. I would like to mention one staff member in particular who departed during the year after many, many years of dedicated service beginning back in 1983. To Phil Woodward, our former Chief Cartographer, Marilyn and family, we wish you well back in Canberra.

With these few remarks I close. I hope that you will find the Annual Report Summary for 1998 informative and easy reading, and go away with the feeling that SOPAC along with the partnerships it is building, really is in the business of making a difference for the people in its Pacific small island member states.

A handwritten signature in dark ink, appearing to be 'Alf Simpson'.

Alf Simpson
Director

August 1999

Introduction to SOPAC

What is SOPAC?

SOPAC is the South Pacific Applied Geoscience Commission. It is an intergovernmental, regional organisation dedicated to providing geological services to promote sustainable development in the countries it serves. SOPAC's work is carried out through its Secretariat, based in Suva. The work program is reviewed annually by the Governing Council assisted by: Secretariat representatives (SOPAC), a Technical Advisory Group (TAG), and a Science, Technology and Resources Network (STAR). SOPAC is funded by member-country contributions with support from donors.

What does SOPAC do?

SOPAC's work focuses on providing assistance to its member countries in 3 key areas: mineral and energy resource identification, promotion, and development; environmental geoscience; and human resource development in the geoscience field. To effectively provide these services SOPAC maintains an information technology unit, provides publication and library services, and offers technical and field services for specific project work.



The Director in Paris signing the UNESCO/SOPAC Memorandum of Understanding with Frederico Mayor, Director-General of UNESCO



Some of the 'leaders of tomorrow' wait at the Fiji Mineral Resources Department to hear lectures and view demonstrations about the hidden resource, groundwater, on World Water Day.

Who benefits from SOPAC?

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

Benefits accrue to member countries directly through the provision of basic geological knowledge, and indirectly through improvements in land and ocean use, leading to improved health through improved water and sanitation provision, wealth generation through the development of mineral resources, and more sustainable development, by taking into account the geo-environmental impacts of developments.

Who pays for SOPAC?

SOPAC is funded by member-country contributions and supported by the following donors: **Australia, Fiji Islands, Canada, France, Israel, Japan, Korea, New Zealand, People's Republic of China, ROC-Taiwan, the United Kingdom, the United States, the Commonwealth Secretariat, the European Union, and the UN family.** Where donors have provided assistance for specific activities in the work program, either at the regional or country level, this is acknowledged in this Annual Report Summary.

General Regional Assistance

Not all of the services provided by SOPAC are required by all countries. The resource-rich Melanesian countries generally request SOPAC's assistance to promote or develop their mineral or petroleum potential. The smaller Micronesian and Polynesian countries, which are commonly more isolated with fewer exploitable resources, have other needs, more often related to the assessment of causes of coastal erosion, groundwater and sanitation improvements.

Those activities in the 1997-1998 reporting period which have provided assistance to the region as a whole, or to groups of countries are included in this section on regional assistance.

Resource Development Program

The resource development program covers a broad spectrum of activities including assisting countries in the search for viable mineral deposits including aggregates and hydrocarbons both onshore and offshore, assisting countries in the development of adequate quantities of safe drinking water and sanitation facilities, and investigating alternative sources of energy.

SOPAC also received financial support from New Zealand as Chair of the United Nations Commission for Sustainable Development CSD-7 for a "special project" related to the development of an environmental vulnerability index. This will pursue the development of an ecological/environmental vulnerability index consistent with the Barbados Plan of Action, and the needs enunciated by the Alliance of Small Island States (AOSIS).



The Environmental Vulnerability Index (EVI) Team, left to right: Ursula Kaly, Helena McLeod, Reginald Pal, Craig Pratt, Susanne Schmall and Lino Briguglio.



Mineral Resources

SOPAC's role is to identify and promote the onshore and offshore mineral potential (including aggregates and hydrocarbons) of its member countries and the region in general.

The South Pacific Islands contain several of the largest epithermal and porphyry gold systems in the world, many of which occur near or on the coast. Erosion removed large quantities of gold to rivers and nearshore environments, therefore, it is reasonable to postulate that large gold placers associated with these onshore deposits might occur as typical beach and offshore placers in the region.

The larger SOPAC member countries: **Papua New Guinea, Solomon Islands, Vanuatu and Fiji Islands** contain several of the world's largest epithermal and porphyry systems. Although some deposits are well known, there are numerous lesser-known occurrences that have equal or better potential. Collection of base information through preliminary investigations and data compilation is essential to promote lesser-known deposits so as to attract potential investors.

A three-day international conference on Pacific exploration technology was held in Nadi, 23-25 September 1998 (PET '98). The conference sought to bring to international attention the importance of mineral exploration to the Pacific, existing new developments and new challenges that face the region. SOPAC co-hosted the conference with the Society of Economic Geologists and the Fiji Mineral Resources Department (SOPAC Miscellaneous reports 305 & 306).

A watching brief on offshore cruises in the region was maintained with the view to encouraging the collection of seismic records and, if possible, the collection of seafloor samples over potential hydrocarbon structures identified on old seismic records. And SOPAC continued to maintain and expand the deep-sea mineral databases (especially for manganese nodules, cobalt-rich crusts, metalliferous sediments and hydrothermal minerals) and compile and publish regional maps as required.

The Databank Manager, Peter Butler, continued to publicise the extensive data collection held at the SOPAC Petroleum Databank in Canberra at the 1998 Australian Petroleum Production Exploration Association (APPEA) conference in Canberra. Work on updating the petroleum data catalogues for **Solomon Islands, Vanuatu, Fiji Islands and Tonga** continued.

Water Resources

The water resources and sanitation activities aim to improve the health of those in member countries, by improving the available quantity and quality of potable water resources.

Assistance with the development and application of national databases for the long-term storage of water resources (and related) information was ongoing. This project is designed to enhance in-country capabilities for providing technical support and backup services.

Dissemination of water sector information through the WRU/SOPAC virtual library and Water and Sanitation Newsletter continued.

Training activities included: input into the hydrology, hydrogeology and sanitation components of the Certificate in Earth Science and Marine Geology course (SOPAC Training Report 78); ongoing onsite training in the use of water sector equipment and investigation methods to water staff in various member countries during field activities; preparing materials and demonstrations to mark World Water Day (SOPAC Projects #10); and organising the ACTEW Leakage Control workshop along with the ADB Data Book workshop at the 1998 Pacific Water Association annual general meeting with most member countries represented (SOPAC Miscellaneous Report 291).



World Water Day lectures and demonstrations. The theme in 1998 was "Groundwater – the Hidden Resource."

As the agency given the mandate to coordinate water and sanitation activities in the Pacific region, SOPAC participated in planning for appropriate activities with SPREP (solid waste management), SPC (health & sanitation), WHO, UNDP, UNESCO, UNICEF, UNEP, ESCAP and the Water Supply & Sanitation Collaborative Council.

As the Interim Secretariat for the Pacific Water and Wastewater Association (PWA), SOPAC Secretariat hosted the PWA Steering Committee meeting with participants from **Fiji Islands, Vanuatu, Samoa and American Samoa** (SOPAC Miscellaneous Report 268); the first PWA newsletter was produced; documentation was prepared to register PWA in the Fiji Islands; and the 1998 PWA Annual General Meeting was organised and held in Suva. The PWA AGM was attended by representatives of water utilities from most member countries including **Palau, American Samoa** plus private sector interests from Australia, Fiji Islands, New Zealand (SOPAC Miscellaneous Report 291).

Also, a drought index using monthly rainfall data was designed to aid in alerting member countries to possible drought situations and research into the efficiency of collecting rainfall from roof catchments is ongoing at the SOPAC premises. The study was to assist in the design of roof catchment systems. Severe drought conditions in some island nations also prompted an appraisal of desalination applications in Pacific island nations as an option (SOPAC Technical Report 260).

Energy

This is the Energy Unit's first year as part of the SOPAC Secretariat, since it transferred from the Forum Secretariat.

During 1998, a joint "SPC-SOPAC Regional Energy Program" workshop was convened in Nadi, Fiji Islands, to design of a 5-year regional energy program (SOPAC Joint Contribution 123).

Phase II of the Regional Wood Stoves Program commenced implementation by the Foundation for the Peoples of the South Pacific (FSP). Participating countries are **Tuvalu, Kiribati, Tonga, Papua New Guinea and Vanuatu**.

Publication and distribution of the final report for the 2-year wind power resource assessment project were completed. This study focused particularly on the **Cook Islands, Fiji Islands, Tonga, Niue and Vanuatu**. Individual discussions have commenced with each of these countries with respect to continuing the monitoring and for the future evaluation of their wind data.

Assistance was provided to those countries that have not yet adopted their draft national energy policy statements and to those member countries that required assistance with the preparation of a rural electrification policy and implementation guidelines.

Assistance was ongoing with the collection of petroleum demand and supply data from the oil companies; and to the member countries in the management and input of data collected.

A proposed structure for a regional information database for the Pacific Islands was developed to provide as wide as possible a range of technologies and experience within both the renewable and non-renewable energy sectors.

Ongoing advisory and coordination activities included evaluating opportunities for providing technical assistance in developing rural electrification policy; providing technical information to member countries on a variety of energy technologies; and commenting on member-country proposals for bilateral assistance.

In its regional coordination capacity, SOPAC was represented by Energy Unit staff at the following meetings:

APEC – Energy Project, Energy Efficiency and Conservation Expert Group, 12th Meeting, Tokyo, Japan, 16-18 February 1998.

APEC – Conference on Energy Demand and Supply Outlook in the Asia Pacific Region, Tokyo, Japan, 19-20 February 1998.

APEC – Energy Data and Outlook Expert Group, 9th Meeting, Seoul, Korea, 23-25 February 1998.

EU-UNDP Experts Meeting to Review Draft Report on Sustainable Energy as a Tool for Development for ACP Countries, 18th June 1998, Vienna.

IEEJ – Institute of Energy Economics Japan - Seminar on Energy Supply and Demand Outlook, June 1998.

UNESCO Youth Forum, "Youth Leadership in a World of Change", Brisbane, Australia 11-16 May 1998.

Environmental Science Program

Coastal

SOPAC is equipped to carry out detailed, continuous bathymetric and seismic reflection profiling, as well as sediment sampling, current measurements and temperature-density-salinity dissolved oxygen profiles. Requests from member countries for specific investigations have all been related to commercial or research projects crucial to national industry.

A joint project between SOPAC and Victoria University of Wellington is ongoing in **Fiji Islands** (Viti Levu), **Marshall Islands** (Majuro), **Kiribati** (Tarawa) and **Tuvalu** (Funafuti) to study the biological components of carbonate sediments. The study involves determination of the sediment composition and the processes controlling sediment accumulation. As part of an attempt to quantify sediment production and also to investigate the effects of habitat modification; the distribution, abundances, life cycles and growth rates of the foraminiferal and ostracod microfauna in the sediments are being investigated. The University of the South Pacific has been collaborating with the **Fiji Islands** aspect of this project.

The MIKE21 computer modelling software was acquired with the assistance of UNDP and the Government of Denmark. Basic training for staff and member-country representatives in the use of the software was completed. The four modules in the current



The transducer for the Secretariat's shallow-water swath mapper affixed to the Yautalei.



*Coastal erosion on Majuro,
Marshall Islands.*

version of MIKE21 are: (i) the hydraulics and oceanography module which allows for the modelling of the hydrodynamics of lagoons, ports and harbours; (ii) the environmental module to model water quality and simulate environmental impacts of outfalls, heavy metals, coliform and other pollutants; (iii) the wave module for storm surge and wave impact assessment on shoreline and marine structures, and (iv) the sediment transport module. French students provided under French funds have assisted throughout the year in data analysis and coastal modelling in support of coastal projects in various island countries using MIKE21.

Another computer package, Interactive Graphical Ocean Data System (IGODS), was acquired in conjunction with the Fiji Mineral Resources Department, to manage the growing quantities of physical oceanographic data collected with a CTD probe (conductivity, temperature and depth). A training workshop was conducted in July for staff from both agencies. Features of the software are its ability to graphically display data from multiple surveys, produce a variety of graphical outputs of depth profiles, XY plots, two and three dimensional finite element transects and 3D volume visualisation animations.

SOPAC continued its collaboration with SPREP with regard to the Pacific Island Climate Change Assistance Project (PICCAP). SOPAC attended three PICCAP meetings: in Apia, on regional coordination; in Nadi, briefing on the Kyoto Protocol; and a **Fiji Islands** in-country seminar.

SOPAC was represented at the First Regional Conference on Coastal Erosion Management in Hawaii and other Pacific Islands hosted by SEAGRANT. Representatives from the **Federated States of Micronesia** and the **Marshall Islands** also attended this meeting.

distribution on a MapInfo GIS database. The second stage will be to analyse and project the risk to life and property arising from the various hazards using the MapInfo database and scenario computer-modelling techniques. The first step in risk assessment was completed this year with the development of a building/assets survey questionnaire linked to a GPS capability (refer surveys of community assets, below).

Earthquake microzoning studies

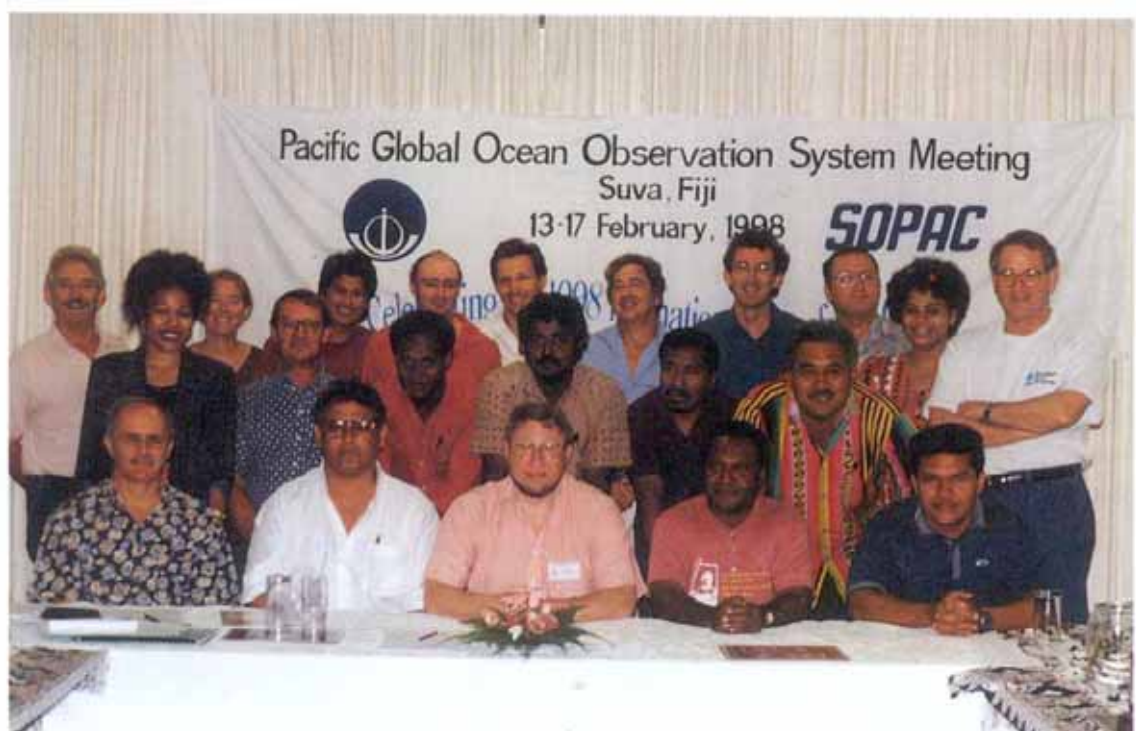
For **Fiji Islands**, **Solomon Islands**, **Tonga** and **Vanuatu**, studies were continued to determine the characteristic earthquake ground-response and geotechnical parameters for Suva, Honiara, Nuku'alofa and Port Vila. These studies will help in the development of a microzonation of the cities to enable adequate design of infrastructure against earthquake resonance effects across a range of foundation conditions. Seed funds provided under a project with the Geophysical Institute of Israel and USAID have resulted in the initiation and continuation of these four studies. A MapInfo database relating to a wide range of hazards was partially completed.

Surveys of community assets (New Zealand Aid funded)

Surveys were carried out with the assistance of local teams (**Fiji Islands** 5 members; **Solomon Islands** 6 members; **Vanuatu** 6 members; and **Tonga** 6 members) trained in the use of GPS and electronic questionnaire surveying. The databases record the susceptibility of each building to a wide variety of hazards, and will be used interactively with GIS hazard maps to quantitatively assess risk to life and property.

The trial survey of Suva was completed in March with over 4000 buildings being individually assessed. The Honiara survey was about 70% completed in March-April with some 2000 buildings being individually assessed. Port Vila was about 80% completed in June with some 2500 buildings individually assessed; and in Nuku'alofa about 80% was completed in July with some 2000 buildings being individually assessed. Data from the four cities have been registered into MapInfo databases.

Participants at the Pacific GOOS workshop in February. The workshop launched the Year of the Ocean in the Pacific.



SOPAC cooperated with the Japan Marine Science and Technology Center (JAMSTEC) in the launch of the Triangle Trans-Ocean Buoy Network (TRITON) plan in the tropical Pacific warm pool region to better understand basin scale heat transport with emphasis on El Niño/Southern Oscillation (ENSO), that influences global climate change. The Program involves measuring the surface fluxes, water temperature, and salinity down to 750 m and full meteorological factors vital to study the water mass formation process and long range climate variation on a decadal scale.

SOPAC continued its association with the joint IOC/IHO GEBCO series as a reviewer for the Southwest Pacific, and with the Committee on Digital Bathymetry especially for Sheet 5.12 which covers the SOPAC region. SOPAC has agreed to assist with the gridding exercise of Sheet 5.12 which is being co-ordinated through NGDC. SOPAC was represented at the 1998 GEBCO and the Southwest Pacific Hydrographic Commission (SWPHC) meetings.

The SOPAC-initiated Shallow-Water Digital Bathymetric Database continued to be maintained and updated as new data became available. Data continues to be provided to relevant users.

Monitoring of research cruises in the region continued, with member countries being kept informed of planned cruises and provided with data and results produced from completed cruises. The Secretariat continued to coordinate the opportunities for participation by member countries in these cruises. Data continued to be requested on behalf of member countries and added to the Secretariat databases.

The Secretariat continued to pursue collaboration with UNESCO/IOC, and held the regional workshop on a Pacific Regional Global Ocean Observing System in February 1998. The Secretariat, also in collaboration with UNESCO/IOC and the Government of France, organised a regional workshop on marine habitats which was hosted by New Caledonia in November 1997.

The Secretariat continued its efforts, to attain maximum mapping coverage of member countries EEZ through the promotion of seabed mapping projects and research cruises. Assistance was provided to IFREMER (New Caledonia), and other island nations in preparation for SOPACMAPS II that will carry out seabed mapping in the EEZ areas that would include waters of **Fiji Islands, Niue, Tonga and New Zealand**. The proposal to France was for the use of the IFREMER research vessel *l'Atlante* to map possible areas for EEZ extension claims, and fisheries resource assessment.

The Secretariat attempted to keep member countries apprised of their rights and obligations under the UNCLOS, particularly on matters relating to the International Seabed Authority (ISA), Marine Scientific Research (MSR), boundary delimitation and



Lauretta Ah Sam, meets the Director at the presentation to SOPAC of her award-winning painting on the Year of the Ocean (see front cover of this report).

other provisions such as those under Article 76. Towards this end, the Director pursued his membership of the Legal and Technical Commission at ISA which is currently drafting a mining code for polymetallic seabed mineral resources. At the same time, SOPAC continued to benefit from observer status at the ISA.

National Capacity Development Program

Human Resources Development (HRD)

The final year of the 3-year Certificate Course was completed in the first half of the year. Of the 19 students who completed the course, 18 passed final examinations.

Seventeen (17) SOPAC Fellowships were awarded between 30 June 1997 to 30 June 1998. The attachments were for periods between two weeks to a month. Countries benefiting include **Fiji Islands** (4), **Marshall Islands** (1), **Papua New Guinea** (1), **Samoa** (3), **Solomon Islands** (5), **Tonga** (1), and **Vanuatu** (2).

Regional workshops organised during the reporting period by HRD Unit to support activities of other units included:

- "Marine Benthic Habitats and their Living Resources: Monitoring, Management and Application to Pacific Island Countries" from 10-16 November 1997 in Noumèa, **New Caledonia** (Joint SOPAC Report 116).
- "Pacific Regional Global Observing Systems from 13-17 February 1998 in Suva jointly coordinated by SOPAC and IOC. The workshop was attended by 8 participants from seven member countries, and included a participant from **Palau** (Joint Contribution 119);

Also several in-country workshops and seminars were organised during the reporting period under various other units of the Secretariat.

Assistance provided to the University of the South Pacific, included four Secretariat staff members contributing the majority of lectures and laboratory classes for the SC301 Applied Geology Course; and other lectures were also provided to the Ocean Resources Management Course and to the new Coastal Zone Management Course.

Evaluation of distance education programs in the geosciences began, with a view to identifying the most effective method of applying these to member countries.

Information Technology

SOPAC continued to support member countries in the development, installation and maintenance of appropriate Information Technology (IT) systems. These systems are essential for improving the effectiveness of the relevant government departments by providing access to timely and accurate information.

Within the Secretariat a new server was installed to address the requirement for increased storage capacity and performance. There are now three servers that are allocated the functions of file and print serving; Internet web access; Exchange server and Proxy server; and Intranet web services. The deployment of Proxy server and reconfiguration of the Fiji Mineral Resources Department, **Fiji Islands**, network interconnection has enhanced security for both organisations. A more robust tape

backup system, HP DDS-3 and ArcServe 6.5 has been installed. Microsoft Exchange Server 5.0 implemented and users migrated from Microsoft Mail Server and that server shut down. Microsoft Exchange Server upgraded to 5.5 and synchronisation of regional organisation users mailing addresses commenced.

Enhancement to the Web site with a home page created for the Water Resources Unit continued with the deployment of a robust intranet.

The Computer Operator attended a one-week Exchange Server course and one-week NT Administration course. The network cabling was repaired and upgraded to accommodate the Hazards Assessment Unit and the arrival and integration of the Energy Unit. A new PABX was installed and new cabling installed for the Fiji Islands Internet Group gateway. All Secretariat staff were upgraded to Office 97 and Outlook 97 and optionally Outlook 98. Internet Explorer 4.0 was deployed as the preferred web browser.

The Disaster Management Unit (formerly UNDHA) became a SOPAC work program activity and the unit, although not located at the Secretariat, was connected to full Internet services via FIG and a full postoffice (Exchange server) installed. Upgrade work was also effected through additional memory and hard drive for server plus installation of Exchange Server 5.5 to allow intercommunications between this Unit located remotely from SOPAC Headquarters. Databases developed for the Unit had a backup system upgraded and security enhanced.

SOPAC continued to produce a large amount of data in digital form. GIS technology provides opportunities to organise and secure it. Digitisation and quality check are also an essential component of data production. The objectives are to produce digital datasets that can serve all member countries and are distributed from the Regional Data Centre. All member countries were provided with a CDs containing SOPAC Data 97 and SOPAC Data 98 at the Annual Session.

SOPAC has continued to support all member countries in the use of GIS and Remote Sensing technology, particularly, by way of development of databases and training of in-country technicians involved in the development of GIS-related work. A GIS and Remote Sensing Newsletter was also published and distributed throughout all member countries.

SOPAC's commitment to supporting all member countries in the use of GIS Remote Sensing technology requires retrieval and development of small utilities to meet the need of the professional in the Secretariat as well as the professional in the country. The development of these tools is an ongoing task and these are provided to member countries either during in-country visits or during fellowship attachments. The objective is to provide on demand, solutions to enhance the capability of the

Earth Science and Marine Geology students do current meter gauging in Savura Dam, Fiji Islands.



software platform adopted by SOPAC. GIS utilities and FAQ continue to be downloaded as well as being created in-house for subsequent distribution to member countries when any dataset is provided.

The Fiji Internet/Intranet Group (FIG) where SOPAC is the gateway partner continued to operate at an international link speed of 19.2 kbps. The number of partners was 11 including the Disaster Management Unit, European Union, Fiji Institute of Technology, Forum Secretariat, Fiji School of Medicine, Fiji Trade and Investment Board, French Embassy, Mineral Resources Department, SOPAC, SPC, UNDP as well as FAO Aquaculture, Federated States of Micronesia Embassy, FSP Suva and Marshall Islands Embassy.

SOPAC continued to maintain mailing lists that include GIS-PACNet (GIS Pacific), IT-PACNet (Information Technology Pacific), PET98, STAR and FIG-Net (Fiji Internet Group). Assistance was also provided in the growth area of Virtual Libraries that are being developed in other organisations and other member countries where Internet is available.

SOPAC demonstrated GIS and Remote Sensing applications for Integrated Coastal Zone Management whilst participating in a SPREP-organised Regional Marine Biodiversity Workshop in Nadi (SOPAC Miscellaneous Report 288).

An MIS database was installed at SPREP with training provided. The MIS database will assist SPREP and its member countries with an improved project management system (SOPAC Miscellaneous Report 285).

Disaster Management

The Secretariat in conjunction with the Regional Disaster Management Subcommittee together with Australia, New Zealand and UNDP worked through the year to establish the Disaster Management Unit (DMU) at SOPAC to absorb the former UNDHA-South Pacific Program Office following the Forum decision to give SOPAC the mandate for regional coordination of disaster management activities.

Publications and Library

A total of about 75 internally-produced reports (refer List of Publications appended) passed through the SOPAC publishing system of which about a third were formal technical reports containing new, analysed and processed data from recent SOPAC field surveys.

Technical summaries and promotional material published included the 1997 Annual Report Summary, two issues of SOPAC projects and three issues of SOPAC News. Also, a set of activity profiles that summarise the technical capacity of the various units of the Secretariat and includes some major achievements in recent years. A draft new SOPAC Strategic Plan, the vision to take the organisation into the new millennium was also produced.

Miscellaneous promotional material were designed and produced, including a corporate Christmas and New Year greeting card.

The **Fiji Islands** GIS & Remote Sensing Newsletter was also reactivated as the *Fiji Islands and South Pacific GIS & Remote Sensing Newsletter* and is now a major collaborative effort with the University of the South Pacific. Three issues were produced.

In SOPAC's capacity as the Pacific Coordinator of the International Year of the Ocean, special press statements were prepared. Staff also took part in the evaluation meeting, organised by SPREP, of the 1997 International Year of the Coral Reef in April with a view to borrowing the same model and collaborating closely with those with a proven track record in carrying out public awareness campaigns. SOPAC chose to view 1998 as only the start of the serious business of promoting good stewardship of the Pacific Ocean. With 'Oceans and Seas' one of the four major themes in CSD7 in 1999, the signs of greater commitment from the Pacific community were encouraging.

The Publications Unit, in conjunction with the Water Resources and Human Resources Development units, coordinated activities for World Water Day in March. An Open-day for the students and the public was organised in collaboration with Fiji's Mineral Resources Department and a special-issue of SOPAC Projects was released to celebrate the 1998 theme: "Groundwater – the Invisible Resource."

Work with the network, Pacific Woman & Her Environment: A Better Life for Communities through Science and Technology (ECOWOMAN), continued with publishing and database development together with maintenance services given to the South Pacific Action Committee of Human Ecology and Environment (SPACHEE). ECOWOMAN focal points in **Kiribati**, **Samoa** and **Tuvalu** were asked to also collect feedback on the use of the newly-released Sanitation Guidelines Booklet (SOPAC Miscellaneous Report 250), and its companion report on composting toilets (SOPAC Miscellaneous Report 249).

Library Services continued to be maintained by interlibrary loan, reference and reader services, for Secretariat staff and on request from member countries. Library Services are on-going, and the same services were maintained during 1997/1998 by the Publications Assistant/Librarian.

Maintaining the SOPAC Bibliographic Database is an ongoing service, and through the Pacific Islands Marine Resources Information System (PIMRIS), the Publications Assistant/Librarian continued to assist the region with marine resources information, particularly in the geosciences.

Statistics for the year showed a 100% increase in the requests for reports and publication via the Internet and the same was recorded for the number of reports downloaded off the Secretariat website.

Map publication and drafting services continued to be provided throughout the reporting period to all SOPAC programs. Digitising the SOPAC collection of EEZ maps (20) was finally completed.



Beach profiling with Phil Woodward, the Chief Cartographer, in Majuro.

Member Country Projects

Cook Islands

A watching brief on the technology, market and the price of cobalt, nickel and copper was maintained for the Cook Islands. Some trillion tonnes of manganese nodules rich in cobalt occur in the Cook Island's EEZ. Current technology and the unattractive price for the metals preclude developing deep-sea mining of manganese nodules in Cook Island waters at this time.

A one-week MapInfo workshop was conducted in for 18 participants from government sectors and private enterprise. Government sectors represented included Ministry of Marine Resources, Power Utility, Water Utility, Lands and Survey and National Disaster Management Office. The workshop provided training in converting AutoCAD data into MapInfo format and in developing a water pipe network system; a fish catch and effort system; and a pearl shell lease system. A copy of the MapInfo/MapBasic 4.5 data and Iomega Zip drives and cartridges were provided to the Ministry of Marine Resources and the National Disaster Management Office. A GIS user group was initiated – that would meet on a regular basis to exchange developments and be a forum for technology transfer (SOPAC Miscellaneous Report 293).

Also, a joint SOPAC/ESCAP national workshop on water pricing and demand management and conservation in the Cook Islands was held in June (SOPAC Miscellaneous Report 292).

Following the restoration of the Ministry of Marine Resources network, a MDaemon post-office software was installed on the Win95 desktop used as the server and all appropriate staff provided with an Internet e-mail address and mailbox. MDaemon was provided through co-operation with the Maritime Surveillance Centre. A user manual, report and recommendations for upgrade were also provided (SOPAC Miscellaneous Report 293).

A booklet on the manganese nodules of the Cook Islands by Stuart Kingan, was published. The Ministry of Marine Resources office was provided with two sets of the SOPAC holdings of MMAJ/JICA reports on the deepsea cruises for manganese nodules in Cook Island waters. One complete set of all SOPAC Library holdings on the Cook Islands was also compiled, catalogued and shipped to Rarotonga, to replace material that was damaged in a cyclone. With the reinstatement of the bibliographic assistance to member countries, the new Librarian was able to also provide a fully-operational upgraded electronic database to carry on the task of electronic cataloguing at the Ministry of Marine Resources. A desktop computer was donated by SOPAC for use by the Librarian and training in the use of CDS-ISIS provided.

Federated States of Micronesia

Two field suveys to assess the impact of nearshore dredging operations in the coastal zone of Pohnpei Island were completed. These two field surveys complemented the biological impact assessment completed in late 1997 by University of Hawaii SEAGRANT and the College of Micronesia in Pohnpei personnel, a social and environmental study in February 1998, and a physical assessment of eleven dredge sites in May 1998. Representatives from Pohnpei State Environmental Protection Agency (EPA) and the College of Micronesia assisted with the compilation of a report

summarising the findings of the three studies. Dredging guidelines for Pohnpei State were developed from the recommendations contained in SOPAC Technical Report 257.

Also surveyed was a proposed sand mining site in Madolenihmw, Pohnpei. Recommendations were made to Pohnpei EPA that further work be considered before a decision to permit dredging is issued (SOPAC Technical Report 257).

A report of the Japan/SOPAC Deep-sea minerals cruise completed in 1997 on the Hakurei Maru No. 2 was completed and submitted to Government. The survey was conducted over an area of 1 900 000 km² to assess seabed mineral resources of the EEZ. The survey identified seamounts with manganese crust potential and possible areas of hydrothermal sulphide occurrences (SOPAC Joint Contribution 120).

A follow-up Hakurei Maru No.2 cruise was conducted in June-July 1998, in the waters of both Federated States of Micronesia and the Marshall Islands. Work included the collection of bathymetric data and cobalt crusts. Bathymetric maps of the seamounts were made using GPS and multi beam echo sounder (MBES). Cobalt-rich manganese crusts were collected by dredging and large gravity coring. When mineralisation occurred, a deep-towed camera was also used to observe the occurrence and continuity of the crust deposits. A possible hydrothermal area was investigated for sulphide occurrences.

Assistance was provided to Pohnpei and Kosrae in solving existing rural water supply problems. Several spring sources were investigated for potential development on Kosrae (SOPAC Miscellaneous Report 276).

A resurvey of beach profiles on Kosrae was completed in April 1998 (SOPAC Preliminary Report 92); and a study of coastal erosion problems of the outer islands Pohnpei, Chuuk and Yap States was completed during a 3-week cruise from 20 July to 12 August. This outer island survey was a cooperative effort between SOPAC, SEAGRANT and the College of Micronesia (SOPAC Technical Report 268).

In cooperation with the implementation of the Ocean Observing Buoy Network by the Japan Marine Science and Technology Center (JAMSTEC), an array of four buoys were deployed along longitude 155°E in waters of the **Federated States of Micronesia**. Unfortunately these had to be recovered when corrosion destroyed the tether in Buoy 1 in June.

GIS equipment for the Pohnpei State Environmental Protection Agency was procured under Australian funding and installed in late 1998 (SOPAC Miscellaneous Report 248). The FSM Embassy in Suva was assisted with the upgrade of their information systems and establishing e-mail Internet services via dial up.

Fiji Islands

Assistance was provided for the promotional brochure "Fiji Islands-Geophysical Data Release". The brochure consisted of a package of information ranging from geophysical data to geology and mineralisation of the Fiji Islands. The aeromagnetic survey, funded bilaterally by the Australian Government generated huge interest in mineral exploration in the Fiji Islands. The information derived from the aeromagnetic study will also assist various departments of government and the wider community to develop strategies for national resource development and environmental management.

Concern had been raised by landowners about the effect of mining at Mt Kasi on the Yanawai River and coastal environment. Reported fish kills in the river are alleged to have been the result of pollution from the mine. To date, there is little baseline

information to support these allegations. SOPAC and the Mineral Resources Department carried out a survey to determine water quality, current circulation patterns, bathymetry, and sub-bottom structure at the mouth of the Yanawai River. A report is being prepared by staff of the Fiji Mineral Resources Department (MRD).

SOPAC made presentations at the "Best Practice Environmental Management in the Fijian Mineral Industry Workshop," held 11-14 May 1998. The workshop, organised by MRD, AusAID and Coffey MPW Pty Ltd, was part of the institutional strengthening exercise for MRD. SOPAC also assisted with the publication of the proceedings of the workshop.

The Fiji Islands Government is currently developing policy that deals with compensating landowners and lessees for the impacts of mineral development. Compensation is a very delicate issue and the absence of a fair and transparent system is known to foster friction between the major stakeholders in a mining project. SOPAC provided a report outlining the economic theory underpinning such compensation and submitted suggestions for practical assessment of environmental and social costs to be paid as compensation. Tuvatu is being used as a case study for developing the policy. Assistance was provided in various areas of policy development including that of short- and long-term fiscal reforms to the mining sector (SOPAC Miscellaneous reports 307 & 308).



Luna Wong (MRD) and Jackson Lum (Secretariat) during a geophysical survey in Tavua.

A brochure titled 'Fiji Gold' was developed for the Mineral Resources Department with the aim of increasing awareness of the importance of the mining sector to the Fiji Islands and as an educational resource for the layperson.

A cooperative study by SOPAC and Victoria University was implemented to investigate the source(s) of the manganese oxide (MnO) content of carbonate sands in the Nukubuco area off the coast of Suva. The high MnO content degrades the quality of the final portland cement product. An aerial photo survey of

Nukubuco and Suva reefs incorporating GPS control was implemented in support of the study. The aerial photography was a joint undertaking by Fiji Islands Industries, University of the South Pacific, Victoria University and SOPAC (SOPAC Technical Report 250).

A workshop on numerical modelling of water distribution networks was organised for the water supply section of the Public Works Department, in May 1998. The workshop was especially requested for the purpose of upgrading the knowledge of Fiji's water engineers in hydraulic engineering (SOPAC Miscellaneous Report 287).

A German student was also attached to the Secretariat to conduct a study on the benefits of water demand management in the Fiji Islands.

A small energy pilot project on "Appliance Labelling" was initiated with the view to replicability in other member countries. A memorandum of understanding was signed and preparatory planning including liaison with retailers has commenced.

A project was also initiated to measure and compare the actual in-service efficiency of imported and locally-constructed solar hot water systems against the manufacturer's specifications. This activity was implemented following the preparation of

an economic template, which provides a cost comparison based on per cubic metre of hot water available from either solar, LPG or electrical water heaters in domestic service.

In preparation for Phase II of the Regional Wood Stoves Program, a one-week training workshop was held in Suva on building, repair, maintenance of institutional wood stoves, and to develop training skills and a methodology for the regional program delivery. The workshop was implemented by the Foundation for the Peoples of the South Pacific.

A "Grid Connected PV" project was completed by BP Solar (Australia). Funding for the project was provided by the Australian Government through the Department of Environment, Sports and Territories (DEST). The project was implemented to assist in the establishment of a methodology for Activities-Implemented Jointly (AIJ) projects. The project was to demonstrate grid-connected PV and to measure the actual yield from a 10 kW array of PV panels that could be fed directly into an existing electricity distribution grid and assist with greenhouse gas mitigation.

Training in software installation, data logging, data recovery and interpretation was conducted for the Fiji Islands Department of Energy (DOE) and the University of the South Pacific (USP) for monitoring solar hot water system efficiency (SOPAC Miscellaneous Report 294).

Digitisation of Natadola Beach 1:1000 topographic maps for GIS and digital terrain model compilation, incorporating offshore bathymetric data and C¹⁴ dating of shell samples were completed. A preliminary hydrodynamic study of Natadola Bay was also initiated during MIKE21 training workshop.

Seismic reflection investigations were completed for the site of a proposed new sewer outfall for Public Works Department in Laucala Bay (SOPAC Technical Report 267). Also in Laucala Bay, a preliminary hydrodynamics model was completed along with an advection-dispersion model of the existing sewer outfall simulated over a 60-hour period. This model is to be updated and expanded to incorporate Suva Harbour and Draunibota Bay. Calibration data for the model was collected during the third quarter of 1998 in a joint program between ORSTOM, USP and SOPAC.

Support and assistance to the Fiji Islands were also provided to continue a coastal monitoring program of oceanographic conditions off the southeastern coast of Viti Levu taking monthly measurements at some 22 stations. The purpose of the measurements is to determine the seasonal variation in the surface mixed layer and to postulate the potential impacts of submarine outfalls planned in the area.

A request to prepare costings for a route survey for a landing point in Suva, Fiji Islands, for a fibre optic cable 'The Southern Cross Cable Project', was completed. Submissions were made to NIWA for a desk study and to SSI Washington for the nearshore route survey.

A siltation and bathymetric survey of the Monasavu reservoir was completed for the Fiji Electricity Authority. Findings of the study reveal that the principal source of sedimentation is landslips. In some areas bathymetric changes in the order of 10 metres of accumulation have occurred since the last survey in 1993 (SOPAC Technical Report 270).

The ECOTROPE Program funded by ORSTOM and the French Ministry of Foreign Affairs is a collaborative program investigating coastal environmental issues in Suva Harbour, Fiji Islands. A cruise using the ORSTOM vessel RV *Alis* in mid-1998 was the first joint ORSTOM-USP-SOPAC cruise and a second cruise was carried out later in the year.

SOPAC continued to manage and operate the Fiji Mineral Resources Department survey boat, Yautalei. Upgrades to the vessel during the year included installation of a GPS, a 200-kHz echosounder, radar, and some vessel rewiring. Fully operational, the Yautalei, is principally used for (i) field surveys in the Fiji Islands and (ii) equipment testing prior to shipping for surveys in other island member countries.

A continuing dialogue has been maintained with MRD and the intra-Governmental Suva Earthquake Risk Management Project. Results have been obtained for the independent series of microtremor measurements commissioned by MRD for quantifying the zonation of earthquake-shaking.

The project "Seismic Zonation of Suva Central City and Simulation of Tsunami Risk in the Harbour" funded by the French Pacific Fund began with the production of a GIS database of geotechnical information on Suva well underway. This project dovetails neatly into the *Pacific Cities* project, and has provided the means for two more local staff to be employed specifically on seismic hazard assessment in Suva. Meetings were held with members of A2EP, the collaborating institution in Noumea,

to discuss problems and exchange data.

Information Technology services to agencies within the Fiji Islands included: ad hoc data conversion and CD-ROM writing for the Mineral Resources Department; advising the Ministry of Foreign Affairs on upgrading their information system; assisting Management Services Division of the Department of Forestry on an ongoing basis on maintenance and upgrade of their forest-monitoring

information system; and an upgrade to enable web connectivity for the French Embassy was prepared (SOPAC Miscellaneous Report 272).

Assistance was also provided to the Fiji Institute of Technology in upgrading their network and security and to the Regional Resources Rights Team, in upgrading their backup and security.

A review was undertaken of the Fiji Islands UNDP-funded Aid Management Reform Project and report presented (SOPAC Miscellaneous Report 280). The objective of this project was to increase efficiencies in the national aid processes and provide stakeholders with information on aid projects through access to an information system developed for and managed by the Aid Unit, Ministry of Finance and Economic Development. Ministry of Foreign Affairs and Central Planning Office participated in the project. Upgrade proposals and software upgrades for the UNDP Suva office were also implemented (SOPAC Miscellaneous Report 267).



Fiji Electricity Authority staff with GPS equipment during GIS training.

A GIS-based information system was developed under the EU-funded Pacific Regional Energy Program Power Utilities for the Fiji Electricity Authority. MapInfo/MapBasic 4.5 data software was also provided to the Fiji Electricity Authority.

A GIS for Power Utilities Workshop conducted at Fiji Electricity Authority Engineering Division, Lautoka, for 4 days was attended by participants from the Fiji Islands (Fiji Electricity Authority), Solomon Islands (Solomon Island Electricity Authority), and Tonga (Tonga Electric Power Board and Tonga Water Authority). The objective of the workshop was to demonstrate the improved management capabilities through use of GIS and in particular the use of remotely-sensed data for rectified image backdrops for enhancing visual representation of assets in relation to geographic features. (SOPAC Miscellaneous Report 281).

A report was prepared for the proposed interconnection of major institutions in Suva via fibre optic cable. The organisation would include international and regional organisations (EU, SOPAC, SPC, TCSP, UNDP) and teaching institutions (FIT, FNTC, FSM, USP) (SOPAC Miscellaneous Report 271).

SOPAC displays were made available for the Environment Week celebrations in Levuka. Also during Environment Week, SOPAC was chief guest at the judging of a schools art competition organised by the Pacific Concerns Resource Centre. SOPAC purchased one of the winning entries depicting 1998 as the Year of the Ocean. This artwork appears as the cover of this report and was used by the Secretariat to further promote the Year of the Ocean.

Guam

Guam tends to receive direct technical support from the United States, and the University of Guam, and therefore submits no requests for country-specific assistance from SOPAC. Guam has contacts with the other small Pacific Island Countries through its membership of SOPAC, and receives the benefits of the other programs that operate in the region.



Coastal erosion in Majuro Atoll, Marshall Islands is well documented in SOPAC Technical Report 254.

Kiribati

A watching brief on the economic potential of the Malden gypsum deposit was maintained. During the year consumption of the by-product gypsum increased in North America and Western Europe due to the need for plaster and plaster board. However, the increase in consumption has not changed the price of gypsum significantly to warrant the development of gypsum on Malden Island.

A review and commentary on a report examining the economic feasibility and environmental impact assessment for the extraction of sand in offshore Tarawa was completed. The study was based on work completed for marine aggregate resources in Tarawa Lagoon, in 1995.

Dr David Cronan of Imperial College, London, collated data from the SOPAC Library to assess and update information on manganese nodules in the Kiribati EEZ.

SOPAC continued to await a suitable time to visit Ocean Island to assist in a water resources assessment of the island. Finding suitable transportation between Tarawa and Ocean Island has been a major problem.

Support was lent to research by the WHO on the use of composted human excreta from composting toilets as a fertiliser, on Kiritimati (Christmas Island).

A project to provide a PV installation for a rural boarding school was completed and demand management and conservation work funded by the Taiwan Government was also carried out.

A resurvey of existing beach profiles on Tarawa was completed in April 1998 (SOPAC Preliminary Report 94).

Work continued during the year in collaboration with Kiribati officials on the translation of "Coasts of Pacific Islands" to prepare it for publication in i-Kiribati.

Marshall Islands

Aggregate-related studies saw the review and compilation of work completed to date into a GIS base map for Majuro Atoll. Work included correcting a base map for Majuro Atoll from MARIS database to accept and plot GPS recorded data, including lagoon bathymetry, currents, conductivity, temperature data for the lagoon together with alternative sand and aggregate resource locations. Data remaining to be added to the database includes coastal geology and lagoon sediment facies. All data has been placed on CD-ROM and distributed. An in-country visit to install and update the data base was aborted due to air travel difficulties and data files required were transmitted through e-mail.

Due to severe drought conditions on Majuro a technical appraisal of freshwater options including desalination was prepared in response to a request from Marshall Islands Government (SOPAC Technical Report 258). An appraisal of desalination options in other island nations was also prepared in conjunction with the above study (SOPAC Technical Report 260).

Also a preliminary hydrodynamic model for Majuro Lagoon circulation was completed using the computer modelling software MIKE21. Existing beach profiles on Majuro were resurveyed in April 1998 (SOPAC Preliminary Report 93), and a report on the coastal morphology from Rita to Laura was completed (SOPAC Technical Report 254).

A critical evaluation was carried out by SOPAC on the Marshall's Alternative Energy Company (SOPAC Technical Report 274).

Advice was provided to the Marshall Islands Embassy in Suva on equipment and software upgrade of their information systems, to enable e-mail and full Internet services via dial-up.

New Caledonia

Planning and costing for a shallow-water seismic survey over a 3-4 week period in 1999 for sand resource assessment within the southern lagoon was completed and submitted to the relevant agencies.

Niue

A mineral policy was developed for the country. Recently there have been indications that some raised atolls may have mineral potential such as gold and copper beneath the limestone cover. In Niue, a prospecting license was issued to a mining company to prospect for minerals some years ago. The policy provides a guide to investors and a policy stance for government outlining requirements of exploration, mining and quarrying companies seeking to invest in Niue. The policy includes the areas of environment, fiscal policy and exploration and mining (SOPAC Technical Report 276).

Technical assistance was provided via a consultancy to prepare a feasibility study for the development of wind power. The consultant evaluated the potential of wind resources in Niue and prepared a submission for proposal to donor organisations and banks for funding.

The second phase of a solar water pumping project for areas where there is no grid connection possible was redesigned and implementation is expected to be completed by the end of 1998. Fellowship training for water sector staff was also arranged during the reporting period.

Work to place the existing hard copy of the Niue Coastal Geomorphology Map into GIS format was deferred to the 1999 Work Program following the departure of the resident cartographer; consequently a Workshop scheduled for Niue to integrate coastal data with GIS was also deferred.



Niue coastline. The Niue mineral policy includes guidelines to minimise and protect against damage to the environment.

Papua New Guinea

In late July, the Sissano Lagoon area of the north coast of Papua New Guinea was devastated by a large tsunami in which over 2000 coastal community dwellers lost their lives. SOPAC, on request from the Papua New Guinea government, coordinated the efforts of scientific teams that carried out work following the tragedy. SOPAC was also successful in securing agreement with JAMSTEC to carry out two cruises in early 1999, in the area offshore of the Sissano Lagoon to map the seabed in order to better determine and understand the cause of the tsunami.



Aitape Village, Papua New Guinea, after the tsunami of 17 July 1998. The concrete foundations are all that was left of the church and the building next to it.

Also, Papua New Guinea, planning for a workshop on offshore mineral exploration licensing was initiated for participants possessing scientific (living and non-living) industrial, exploration, production, legal-seabed regulation and political expertise. The Metal Mining Agency of Japan (MMAJ) agreed to partially fund the workshop, and other donors were being sought. Participants from other countries were expected.

In addition, assistance for policy development was provided to Papua New Guinea, on their offshore mining policy and legislation.

Seven participants attended two in-country seminars titled 'Geological Seminars using Computer-Aided Learning Modules' and 'Basic Hydrology and Hydrogeology'.

Information and the MapInfo/MapBasic 4.5 software was provided to the Department of Mining and Petroleum.

Samoa

A preliminary water resources survey of the island of Savai'i was undertaken in conjunction with the Apia Observatory and the Water Authority plus JICA (SOPAC Preliminary Report 97). Also a water resources assessment of the island of Manono was undertaken (SOPAC Technical Report 255). A proposal to investigate the use of groundwater to supplement the Asau area water supply was also prepared.

Funding assistance was given to Samoa to allow the completion of the original EU-funded Pacific Regional Energy Program (PREP), Schools Education Program. This involved the training of teachers and the printing of the booklets prepared during the initial phase of the program.

Existing beach profiles in Apia and Mulinu'u Peninsula were resurveyed in March 1998 (SOPAC Preliminary Report 91).

A coastal geomorphological mapping program for Savai'i was initiated for an area of coastline extending from Salelologa to Puapua in the third quarter of 1998. This work was carried out with technical assistance from the Korea Institute of Geology, Mining and Materials and financial support from the Government of the Republic of Korea (SOPAC Technical Report 281).

Pre-survey planning for a geophysical survey on the northern and southern side of Savai'i, as a follow-up to the 1989 SOPAC-NIWA (formerly NZOI) survey was completed. Also preparation of costings for soundings of Apia Harbour to assist with a rehabilitation extension of the main wharf, through JICA Assistance, was completed.

A study was commenced to evaluate the volcanic processes that have occurred on Savai'i, and to prepare a volcanic hazards map for the island.

Lameko Talia became the principal focus for the continuation of the *Pacific Cities* project in Samoa. He participated in the Second Seismic Microzoning Workshop in Suva, and was nominated to collaborate in the latest initiatives on *Pacific Cities* in Apia.

General IT training was provided for Samoan nationals during fellowship attachments at the Secretariat. Also specialised IT training on networking and web design was provided.

An Internet gateway was specified and installed at the Posts and Telecommunications Department (PTD) to allow multiple Internet Service Providers (ISP) to be established. Training was provided to PTD staff as well as ISP staff. This was undertaken during a one-week consultancy (SOPAC Miscellaneous Report 286).

Work on network restoration at the Department of Meteorology together with network expansion and addition of networked equipment was accomplished. A User Manual, a report and recommendations were also provided. A donation was made of a SOPAC desktop computer for the Library unit with a library database installed. An updated User Manual was provided during a second visit (SOPAC Miscellaneous Report 282).

Dial-up Internet with a single e-mail account was restored at the Division of Meteorology in Apia. Following co-operation with the ISP the process for regular uploads of weather satellite images to the web server was developed and tested (SOPAC Miscellaneous Report 282).

Assistance was given in June to re-establish the Library at the Apia Observatory and put in place an effective bibliographic catalogue system. The main ministry library was included in this system. The Observatory Librarian was also attached to the SOPAC Library for one week in May to acquire the basic skills required in maintaining the Department of Meteorology Library.

Solomon Islands

UNDP funded a mineral resources sector review carried out in June, as a follow-up to increased interest in mineral exploration activity in the Solomon Islands and the development of Gold Ridge Mine. The review identified areas in the capacity of the Ministry of Energy, Mines and Mineral Resources that needed enhancing and strengthening to enable the formulation of policies and strategies for the sustainable development of land, mineral and other natural resources and promote investment in the mineral sector (SOPAC Technical Report 256).

A Mineral Master Plan for the country was discussed with the Prime Minister's Office, Central Planning Office and the Ministry of Energy, Water and Minerals. All three offices have recommended that funding be sought for a Mineral Master Plan.

MapInfo training was organised for a senior geologist. MapInfo was introduced as a computer tool to address the problems in the management of the mining tenement system in the Solomon Islands for the future. The current system was slow, tedious and extremely inefficient.

A visit was made to review and discuss existing data collection systems, carry out on-site staff training and collect data on mining and waste disposal activities that may affect groundwater quality. Subsequently arrangements were made to allow four Solomon Island nationals to participate in a Fiji Islands-based workshop on Environmental Management in the Mining Industry (SOPAC Miscellaneous Report 275).

A study on the upgrade of the Auki water supply on the island of Malaita was completed (SOPAC Technical Report 261) and demand management and conservation work funded by the Taiwan Government was also carried out (SOPAC Miscellaneous Report 284). Fellowship training for water sector staff was also arranged during the reporting period. An in-country seminar on hydraulic design and modelling of water supply systems in the Solomon Islands was held in May (SOPAC Miscellaneous Report 284).

Ongoing assistance with the collection of petroleum demand and supply data from the oil companies and its management and input into databases saw the truncation of their database so as to simplify and make the required input.

An AIJ project on "Energy Efficiency for Air Conditioners" was completed and the Consultant SRC International (Australia) prepared the final report. Funding for the project was provided by the Australian Government through the Department of Environment, Sports and Territories (DEST). The project identified a number of energy efficiency saving opportunities and quantified that in the Government sector a 30% saving in electricity consumption could be achieved through the introduction of timers. The pay back period for the investment in timers was 3 months. Greenhouse gas mitigation (CO_2) was estimated at 46 tonnes per annum for the two buildings monitored in the program. Other opportunities abound in the Government sector for additional savings in electricity consumption and CO_2 mitigation.

A UNDP-funded project to assess the contamination risk and likely environmental impacts from WWII sunken vessels in Iron Bottom sound was initiated (SOPAC Preliminary Report 103).



Water conservation in the Solomon Islands: SOPAC and Solomon Island Water Authority staff carrying out step tests, to reduce water losses in Honiara, June 1998.

A Solomon Island national, Kenneth Bulehite, was attached to SOPAC during the Danish Hydraulics Institute MIKE21 training sessions in November-December 1997, and has continued to assist in-country on all aspects of the *Pacific Cities* project, including the organisation of a survey team for the recent buildings assets survey of Honiara. Kenneth was attached to SOPAC from 31st May to 15th June 1998 to work on the Honiara MapInfo GIS database; and existing borehole information relevant to the Honiara risk assessment study was entered into the database.

A GIS-based information system was developed under the Pacific Regional Energy Program for Power Utilities for the Solomon Islands Electricity Authority and a two-week fellowship attachment for one staff from the Geology Division was provided for GIS training in preparation for developing a mineral resources information system.

Tonga

Following completion of the KIGAM-supported study in 1997 to identify possible sources of good aggregates in Vava'u within the tidal zone located north of Holeva Island, two areas were identified, one with 205 000 m² for an average thickness of sediment of 1.2 m, and a second, some 98 500 m² with an average thickness of sediment of 0.6. The report however does not examine the likely environmental impacts of extending sand mining operation into these two areas (SOPAC Technical Report 277).

A water resources survey on 'Eua was carried out with Water Board staff in conjunction with a demand management project (SOPAC Trip Report 251). SOPAC also assisted in the final stage of UNESCO-funded groundwater pollution study on Lifuka Island.

Demand management and conservation work funded by the Taiwan Government was carried out (SOPAC Technical Report 264); and fellowship training was arranged during the reporting period for water sector staff.

A draft technical report was prepared to assist in the development of a rural electrification policy. The report elaborated, in particular, on a suitable mechanism to assist in meeting future energy needs of the more remote islands, in particular, for the expansion of solar photovoltaic programs (SOPAC Technical Report). Guidelines for the establishment of a solar utility were prepared, to include the management, financial and maintenance aspects necessary for the sustainable development of a solar utility. In-country support from SOPAC in the establishment of the solar utility and the introduction of the concept to the rural communities commenced.

Funding assistance was provided to Tonga to allow the completion of the original Pacific Regional Energy Program (PREP), Schools Education Program. This involved the training of teachers and the printing of the booklets prepared during the initial phase of the program.

A project to measure and compare the actual in-service efficiency of imported and locally-constructed solar hot water systems against the manufacturer's specifications was established. This activity was implemented following the preparation of an economic template, which provides a cost comparison based on per cubic metre of hot water available from either solar, LPG or electrical water heaters in domestic service.

A demonstration rechargeable batteries project continued in Nuku'alofa. Following evaluation it will be determined if the concept is suitable for use in other outer islands where the use of dry cell batteries is high.

Tonga national Kelepi Mafi undertook a training attachment in Suva for four weeks in October 1997. Physical base maps of the city were digitised and a database of digitised aerial photographs and power distribution information added was courtesy of the Tonga Power Board. Kelepi also participated in the Second Seismic Microzoning Workshop in Suva and organised the survey team for the 1998 buildings assets survey of Nuku'alofa.

Scholarship student Sisi Tonga'onevai was allowed an extension to his scholarship and commenced his fourth year at USP in February 1998. Semester 1 results indicated that he failed a core course a second time and would not be able to graduate in 1998, therefore the scholarship was terminated.

Information technology equipment upgrade information was provided to the Tonga Electric Power Board.

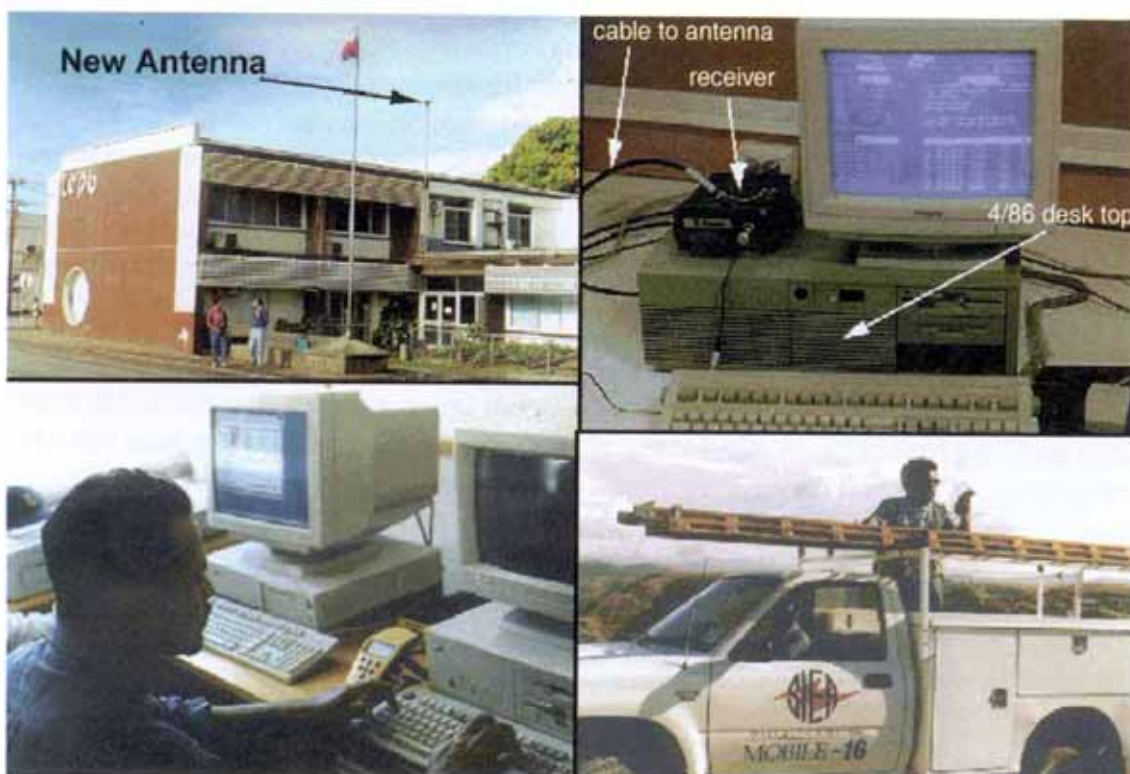
A GIS-based information system was developed under the Pacific Regional Energy Program for Power Utilities for the Tonga Electric Power Board. MapInfo/MapBasic 4.5 software was also provided to the Tonga Electric Power Board. For the Ministry of Lands, Surveys and Natural Resources, an evaluation copy of the MapInfo 4.5 GIS standards was provided.

Tuvalu

A visit was made to Tuvalu to collect data and review existing water and sanitation documents and inspect existing facilities (SOPAC Trip Report 254). The Funafuti Solid Waste Management Plan was also distributed and discussed with all relevant parties (SOPAC Joint Report 118). A follow up workshop is required to implement the Plan.

Demand management and conservation work funded by the Taiwan Government was also carried out (SOPAC Technical Report 269).

A GIS-based information system was developed under the Pacific Regional Energy Program for Power Utilities for the Tonga Electric Power Board.



A resurvey of existing beach profiles on Funafuti was carried out in May 1998 (SOPAC Preliminary Report 95).

A critical evaluation and reporting was undertaken by SOPAC on the Tuvalu Solar Electric Cooperative Society (TSECS). Follow-up assistance on the implementation of the recommendations was also offered (SOPAC Technical Report 266). A small grid-connected Solar PV was installed for the Tuvalu Solar Electric Cooperative Society (TSECS).

A report was prepared for providing LAN/WAN connectivity that would involve a desk study and a two-week visit to Funafuti. Tuvalu requests remained pending to implement a functional Internet Service Provider national telecommunications authority (see SOPAC Miscellaneous Report 283). This would include IT and Internet services management training for Tuvalu nationals, and was awaiting funding before proceeding.

Vanuatu

Fellowship training at the Secretariat was provided to a Vanuatu national for mining tenement management.

An AusAID bilaterally-funded hydrological baseline study to provide information on possible effects of mining on water resources was initiated (SOPAC Preliminary Report 96).

A preparatory stream gauging and topographical survey of an area to pilot a micro hydropower battery charging project was carried out. This is part of a rural electrification project to provide lighting to village households. Following confirmation of the available stream flow the design will be completed and construction commenced.

A hydrodynamic model of Port Vila and Mele Bay was completed with support from France by provision of funding for a French student to be attached to the Secretariat. Tidal data from the National Tidal Facility was used to calibrate the model (SOPAC Technical Report 263).

Ni-Vanuatu Morris Stephen assisted in the preparation of a preliminary earthquake site-response map and carried out microtremor measurements for quantifying the zonation of site response. The program of microtremor measurements was subsequently augmented by Morris and Marc Regnier of ORSTOM in early 1998. Morris Stephen also worked on the Port Vila MapInfo GIS database, and participated in the Second Seismic Microzoning Workshop in Suva. He was attached to SOPAC from 31st May to 15th June 1998 to work on the Port Vila MapInfo GIS database, and took part in the organisation of a survey team for the recent buildings assets survey of Port Vila.

Scholarship student Toney Tevi (Vanuatu) was allowed an extension to his scholarships and commenced his fourth year at USP in February 1998. Arrangements were also made for him to be on attachment at the Secretariat during his free time outside of lectures. At the end of the 1st Semester he passed his remaining unit and graduated.

Management and Corporate Services

The 1998 Annual Work Program and Budget as approved by Council at its last Session was progressively implemented during the year within the constraints of resources both financial and staffing.

All anticipated funding became available, but the Secretariat had to cope with the problem of the budget being in Fiji dollars following the 20 % devaluation in January.

Staffing resources were maintained at 42 full-time staff for most of the year, though the Cartographer position became vacant. The opportunity has arisen to utilise consultants and temporary staff to assist with Work Program implementation.

A new Work Program and Budget structure was implemented progressively over the year. By 30th June 1998 all necessary changes had been effected. The reporting to the 27th Session reflected the efforts made to ensure a smooth transition.

The Secretariat continued its efforts to liaise with member countries on requirements and effectiveness of the Work Program and ensure that member countries' interests were fully served through interaction, participation and collaboration.

Management visited ten member countries. Correspondence was sent out, mid-year, to all national representatives seeking confirmation of contact points for the different sectors that the Work Program now embraces. Attempts were made to improve the effectiveness of the Secretariat by encouraging National Representatives to ensure inputs are driven by national policies and results reach in-country clients.

The Project Profile Database was revamped during the year as the development of the Draft 1999 Work Program and Budget took place. It now exists as the Task Profile Database, which the Secretariat feels more clearly sets out the definition, implementation, monitoring and evaluation aspects of its work.

Operations of the Secretariat were reviewed by the new management team and several changes made in order to ensure an effective and efficient Technical Secretariat, that is maintained with appropriate scientific, technical, administration and support staff.



Members of the Diplomatic Corp in Suva, Fiji Islands, enjoy lunch at the first SOPAC Secretariat Open Day hosted by the new Director.

Several new and substantial funding proposals were developed during the year in order to secure funding and support to enable SOPAC to achieve its goals and objectives.

Management represented SOPAC at relevant regional and international meetings. Management was also represented at meetings of multi-lateral agencies, to demonstrate SOPAC's capacity to more effectively implement certain global programs in the SOPAC region.

In regard to the triennial review of SOPAC staff remuneration, SOPAC monitored developments within the Forum Officials Committee (FOC), particularly the FOC Remuneration Subcommittee established to advise on options for a transparent methodology for determining remuneration of the Forum Secretariat and other SPOCC agencies.

Management continued to develop effective policy options, consistent with the Governing Council's directives and SOPAC Constitution, for consideration by Council at the 27th Session. This particularly applied to the new Energy and Disaster Management Units.

Work continued on planning, coordination and monitoring of aid programs and projects, in order to seek ways to increase the political profile of SOPAC's programs with donors.

Finance and Administration

The work of the Finance and Administration Unit throughout the year focused on ensuring the following services were provided: professional financial services; advice to management on financial matters; timely management, financial and audit reports; assistance in the preparation of Work Program and Budget; professional personnel services; administration, office and property support services; designing, implementing and maintaining operational systems; and development and maintenance of project databases.

Timely preparation and reporting to donors and support agencies included the following:

Australia

Six-monthly and annual financial reports on Australia's annual grant to SOPAC and any of its special/extra funding, including financial reports and related papers for the annual SOPAC/Australia high-level consultations (HLC).

New Zealand

Six-monthly and annual financial reports on New Zealand's annual and any special funding to SOPAC, including financial reports and related papers for the annual SOPAC/New Zealand HLC.

UNDP

Financial reporting including follow up of reimbursement of funds.

Canada

Quarterly financial reports and budget forecasts including follow up of reim-

bursement of funds. Annual audited financial reports and end-of-project (final) report for all concluding projects.

France

Annual financial and variance reports for each project including forecast of funding/budget for the future year.

CFTC

Annual financial reports for each project including variance reports.

EU

Monthly financial report for the Work Program budgets including follow up of reimbursements with RAO, EU Office and the Reserve Bank. Coordinate funding audit of the past year's Work Program and technical assistance, follow up audit report and management letter and provide explanations for any audit queries.

Other Funding

Reports and financial statements for small "one-off" donor funding were provided during the year.

Technical Work Program Management

The work of the technical work program management throughout the year focussed on the following: overall coordination and management of the Resource Development, Environmental Science and National Capacity Development Programs; maintaining ongoing liaison with national representatives to ensure that country work requests are built into the technical work program, and completed tasks are reported on in full, including briefing sessions held in-country where ever possible. Appropriate public relations were also attended to; maintaining ongoing liaison with external support agencies especially within the umbrella of STAR to ensure the latest

in science and technology appropriately contributed to the Work Program; and preparation of submissions and project proposals for consideration by donors whilst keeping in close collaboration with other SPOCC agencies and the "Regional Strategy" being developed by the Forum Secretariat for the region.

Joe Chung, left, of the new Disaster Management Unit (formerly UNDHA/SPPO), Russell Howorth and HE Kodaro Gallen, Ambassador of the Federated States of Micronesia to Fiji, at the Secretariat.



Appendix I: Completed Reports and Publications (as at August 1998)

TECHNICAL REPORTS

1. Smith, R. 1998. Resource evaluation of dredge areas lease 5 and lease 6, Nukubuco reef, Laucala Bay, Suva, Fiji Islands. *SOPAC Technical Report 250*.
2. Xue, C. 1997. Coastal sedimentation erosion and management of Majuro Atoll, Republic of the Marshall Islands. *SOPAC Technical Report 254*.
3. Scholzel, H., Ricci, G. 1997. Assessment of water resources Manono Island, Samoa. *SOPAC Technical Report 255*.
4. Rizer, J.P., Lum, J. 1998. Mineral resources sector review, Solomon Islands. *SOPAC Technical Report 256*.
5. Scholzel, H. (compl.) 1998. Water supply for Majuro, Republic of Marshall Islands - a technical appraisal for feasible options. *SOPAC Technical Report 258*.
6. Ricci, G., Scott, D. 1998. Groundwater potential assessment of Rarotonga coastal plain. *SOPAC Technical Report 259*.
7. Scholzel, H. (compl.) 1998. Desalination - a technical appraisal for its application in Pacific Island Countries. *SOPAC Technical Report 260*.
8. Scholzel, H. 1998. A technical appraisal of the Auki Water Supply System, Malaita Island, Solomon Islands. *SOPAC Technical Report 261*.
9. Shorten, G. 1998. Report to the South Pacific Forum on the International Conference on the Radiological Situation at the Atolls of Mururoa and Fangataufa. *SOPAC Technical Report 262*.

PRELIMINARY REPORTS

1. Woodward, P., Talia, L. 1998. Re-survey of Mulinu'u Peninsula beach profiles, Samoa: 14-19 March 1998. *SOPAC Preliminary Report 91*.
2. Woodward, P. 1998. Re-survey of Kosrae beach profiles, Federated States of Micronesia, 18-21 April 1998. *SOPAC Preliminary Report 92*.
3. Woodward, P. 1998. Re-survey of DUD and Laura beach profiles Majuro Atoll, Republic of Marshall Islands, 23-24 April 1998. *SOPAC Preliminary Report 93*.
4. Woodward, P. 1998. Re-survey of Bikenibeu beach profiles, Tarawa, Kiribati, 30 April 1998. *SOPAC Preliminary Report 94*.
5. Woodward, P. 1998. Re-survey of Fongafale beach profiles, Funafuti, Tuvalu, 5-6 May 1998. *SOPAC Preliminary Report 95*.
6. Scholzel, H., Scott, D. 1998. Vanuatu hydrological baseline studies. Stage 1: Technical assistance to the Department of Geology, Mines and Water Resources. *SOPAC Preliminary Report 96*.
7. Burke, E., Scott, D. 1998. Preliminary Water Resources Investigations Savai'i, Samoa, 10-17 March 1998. *SOPAC Preliminary Report 97*.

MISCELLANEOUS REPORT

1. Hautefeuille, B. 1997. Internet via PEACESAT test. *SOPAC Miscellaneous Report 264*.
2. Allinson, L. 1997. Internet access and pricing in Fiji (initiatives for small island states). *SOPAC Miscellaneous Report 266*.
3. Martin, F., Allinson, L. 1997. Report on the information system, Regional Office, UNDP, Suva, Fiji. *SOPAC Miscellaneous Report 267*.
4. Burke, E. 1997. Pacific Power Association Steering Committee held at SOPAC Secretariat, Suva, Fiji, 21 November 1997. *SOPAC Miscellaneous Report 268*; PWA Committee Report 1.
5. Martin, F. 1997. Coastal marine simulation for PICs. *SOPAC Miscellaneous Report 269*.
6. Martin, F. 1998. VSAT Internet service for the Pacific. *SOPAC Miscellaneous Report 270*.
7. Martin, F. 1997. Routed Information Technology Highway Media (RITHM) for Suva. *SOPAC Miscellaneous Report 271*.
8. Martin, F. 1997. Recommendations for upgrade of the Information System, French Embassy, Suva, Fiji. *SOPAC Miscellaneous Report 272*.
9. Martin, F., Allinson, L. 1997. Report on the information system: Regional Right Resources Team: Suva, Fiji. *SOPAC Miscellaneous Report 273*.
10. Burke, E., Simpson, A. 1997. Water Supply and Sanitation Collaborative Council: 4th Global Forum: water and sanitation for all, Manila, Phillipines, 3-7 November 1997. *SOPAC Miscellaneous Report 274*.
11. Scott, D. 1997. Water and sanitation sector development assistance visit to the Solomon Islands, 25 November - 9 December 1997. *SOPAC Miscellaneous Report 275*.
12. Scholzel, H. 1998. Water and sanitation technical assistance to the Federated States of Micronesia (FSM), Kosrae State, 1-9 December 1997. *SOPAC Miscellaneous Report 276*.
13. Forbes, D.L., Solomon, S.M. 1997. Approaches to vulnerability assessment on Pacific Island coasts: examples from Southeast Viti Levu (Fiji) and south Tarawa (Kiribati). *SOPAC Miscellaneous Report 277*.
14. Martin, F., Duperray, O. 1998. SOPACMAPS Project - short report. *SOPAC Miscellaneous Report 278*.
15. Howorth, R. 1998. Rarotonga Tourism Vulnerability Pilot Study. *SOPAC Miscellaneous Report 279*.
16. Allinson, L. 1998. Aid management reform project review: UNDP Regional Office, Suva. *SOPAC Miscellaneous Report 280*.
17. SOPAC Secretariat 1998. Resource materials from Pacific Regional Energy Program: Power Utility GIS Workshop: 14 - 17 April 1998. *SOPAC Miscellaneous Report 281*.
18. Allinson, L. [1998]. Meteorology information system report and recommendations, Ministry of Agriculture, Forestry, Fisheries and Meteorology, Samoa. *SOPAC Miscellaneous Report 282*.
19. Hautefeuille, B. 1997. Government of Tuvalu: wide area and local area computer network specifications. *SOPAC Miscellaneous Report 283*.
20. Burke, E., Scholzel, H. 1998. Demand management and conservation project field investigations, Solomon Islands Water Authority, 19-30 May 1998. *SOPAC Miscellaneous Report 284*.
21. Martin, F. 1998. SPREP administration and project management database. *SOPAC Miscellaneous Report 285*.

22. Martin, F. 1998. Internet gateway - Telecom Samoa. *SOPAC Miscellaneous Report 286*.
23. Scholzel, H. 1998. SOPAC/ACTEW Workshop on numerical modelling of water distribution networks, Suva, Republic of Fiji, 15-17 May 1998. *SOPAC Miscellaneous Report 287*
24. Allinson, L. 1998. Development, implementation and management of cost effective and sustainable GIS and RS infrastructure for regional applications. *SOPAC Miscellaneous Report 288*.
25. Howorth, R. 1998. Islanders, Oceans, and Coastal Environment Problems: An Approach Towards The Third Millenium. *SOPAC Miscellaneous Report 290*.
26. Burke, E. 1998. Pacific Water Association 1998 Annual General Meeting held at the Southern Cross Hotel, Suva, Fiji, 31 March - 4 April 1998. *SOPAC Miscellaneous Report 291* (PWA AGM Report 1).
27. Burke, E. 1998. ESCAP/SOPAC Pricing and Demand Management and Conservation Workshop. Rarotonga, Cook Islands, 24-26 June 1998. *SOPAC Miscellaneous Report 292*.
28. Allinson, L. 1998. GIS Workshop and assistance to MMR, NDMO, Water Department and other Government organisations. Cook Islands. 18 March – 9 April 1998. *SOPAC Miscellaneous Report 293*.
29. Fairbairn, P. 1998. Mini Workshop on Solar Hot Water Monitoring Project – program installation and set up Pc208w/CR500 Data Down Loading Manual. *SOPAC Miscellaneous Report 294*.

TRAINING REPORTS

1. Butcher, A., Elaise, A. 1998. ESMG 97 report: Report on courses for the Certificate in Earth Science & Marine Geology Training Program. *SOPAC Training Report 74*.
2. Prasad, Sunita 1998. Library attachment at SOPAC Secretariat, by Toluiva Tuifao, Samoa: 4-8 May 1998. *SOPAC Training Report 76*.
3. Isaac Lekelalu. 1998. Guadalcanal plains groundwater availability guide. *SOPAC Training Report 77*.

TRIP REPORTS

1. Forbes, D. 1997. Coastal vulnerability, climate change, and coastal response to sea-level rise in the southwest Pacific: research, reporting, and networking activities in Fiji and New Caledonia, August 1997. *SOPAC Trip Report 250*.
2. Burke, E. 1998. Water resource investigation in 'Eua, Tonga: trip report: Demand Management Project: 31 January - 8 February 1998. *SOPAC Trip Report 251*.
3. Scholzel, H. 1997. Water and sanitation project technical assistance to the Federated States of Micronesia (FSM) 20 November - 9 December 1997. *SOPAC Trip Report 252*.
4. Burke, E. 1998. Field investigation in Funafuti, Tuvalu: demand management project: 16-20 February 1998. *SOPAC Trip Report 254*.
5. Burke, E. 1998. Water pricing and demand management and conservations workshop plus associated field work, Rarotonga, Cook Islands 24 June – 2 July 1998. *SOPAC Trip Report 260*.

JOINT CONTRIBUTIONS

1. Intergovernmental Oceanographic Commission (IOC), SOPAC 1997. Marine benthic habitats and their living resources: monitoring and application to Pacific Island countries: final report from the conference held in Noumea, New Caledonia: 10-14 November 1997. (*SOPAC Joint Contribution 110*).
2. SOPAC, Majuro Atoll Local Government, UNDP 1997. Kabbe ko ilo aelon in Pacific in. (*SOPAC Joint Contribution 117*).
3. SPREP, SOPAC 1998. Tuvalu solid waste management plan. Opus International Consultants Limited, [s.l.]: 32 p. (*SOPAC Joint Contribution 118*).
4. UNESCO, Intergovernmental Oceanographic Commission. 1998. IOC-SOPAC Workshop report on Pacific Regional Global Ocean Observing Systems. Suva, Fiji, 13-17 February 1998. (*SOPAC Joint Contribution 119*).
5. Japan International Cooperation Agency (JICA), Metal Mining Agency of Japan (MMAJ) 1998. Report on the cooperative study project on the deepsea mineral resources in selected offshore areas of the SOPAC region (volume 3) sea area of the Federated States of Micronesia. (*SOPAC Joint Contribution 120*).
6. Forum Secretariat. 1996. Southern Pacific Wind and Solar Monitoring Project. First Annual Report 1995. (*SOPAC Joint Contribution 121*).
7. Forum Secretariat. 1996. Southern Pacific Wind and Solar Monitoring Project. First Annual Report 1995. Volume A. Cook Islands. *SOPAC Joint Contribution 121a*.
8. Forum Secretariat. 1996. Southern Pacific Wind and Solar Monitoring Project. First Annual Report 1995. Volume B. Fiji. *SOPAC Joint Contribution 121b*.
9. Forum Secretariat. 1996. Southern Pacific Wind and Solar Monitoring Project. First Annual Report 1995. Volume C. Niue. *SOPAC Joint Contribution 121c*.
10. Forum Secretariat. 1996. Southern Pacific Wind and Solar Monitoring Project. First Annual Report 1995. Volume D. Tonga. *SOPAC Joint Contribution 121d*.
11. Forum Secretariat. 1996. Southern Pacific Wind and Solar Monitoring Project. First Annual Report 1995. Volume A. Cook Islands. *SOPAC Joint Contribution 121e*.
12. Forum Secretariat. 1997. Southern Pacific Wind and Solar Monitoring Project. Final Report. *SOPAC Joint Contribution 122*.
13. Forum Secretariat. 1997. Southern Pacific Wind and Solar Monitoring Project. Final Report. Volume A. Cook Islands. *SOPAC Joint Contribution 122a*.
14. Forum Secretariat. 1997. Southern Pacific Wind and Solar Monitoring Project. Final Report. Volume B. Fiji. *SOPAC Joint Contribution 122b*.
15. Forum Secretariat. 1997. Southern Pacific Wind and Solar Monitoring Project. Final Report. Volume C. Niue. *SOPAC Joint Contribution 122c*.
16. Forum Secretariat. 1997. Southern Pacific Wind and Solar Monitoring Project. Final Report. Volume D. Tonga. *SOPAC Joint Contribution 122d*.
17. Forum Secretariat. 1997. Southern Pacific Wind and Solar Monitoring Project. Final Report. Volume E. Vanuatu. *SOPAC Joint Contribution 122e*.

Routinely the following were also published and distributed:

- Proceedings of the 26th Annual Session
- Annual Report Summary 1997
- 3 issues of *SOPAC News*
- 2 issues of *SOPAC Projects*
- 3 issues of *South Pacific and Fiji GIS/RS News*

Appendix 2: Secretariat Staff List (as at 31 July 1998)

SOPAC-paid employees are listed with the date they joined SOPAC, and the start and finish date of their current contract.

In-kind staff provided by donors and support organisations are listed with the date they joined SOPAC in *italics*.

SECTIONS	NAME	COUNTRY OF ORIGIN	DATE JOINED	CONTRACT START	CONTRACT END
RESOURCE DEVELOPMENT PROGRAM					
1 Personal/Offshore Assistant	Laisa Baravilala-Baou	Fiji	July 1987	Permanent	
Mineral Resources Unit					
2 Marine Geologist	Jackson Lum	Fiji	Nov 1992	Nov 1995	Nov 1998
3 Offshore Geologist	Kazuhiro Kojima	Japan	Sep 1998		
4 Resource Economist	Helena McLeod	UK	Oct 1997	Oct 1997	Oct 1999
5 Senior Geology Technician	Sekove Motuiwaca	Fiji	Apr 1980	Permanent	
Water Resources Unit					
6 Environmental Engineer	vacant				
7 Hydrogeologist	David Scott	New Zealand	Jul 1997		
8 Hydraulic Engineer	Harald Schoelzel	Germany	Mar 1997		
9 Hydrogeologist	Giovanni Ricci	Italy	Oct 1996		
10 Workshop Assistant	Setareki Ratu	Fiji	Oct 1986	Permanent	
Energy Unit					
11 Energy Coordinator	Paul Fairbairn	New Zealand	Jan 1998	Jan 1998	Jan 2000
12 Energy Advisor	Solomone Fifita	Tonga	Jan 1998	Jan 1998	Jan 2001
ENVIRONMENTAL SCIENCE PROGRAM					
13 Program Assistant	Sisilia Gravelle	Fiji	Sep 1998	Permanent	
Coastal Unit					
14 Marine Geophysicist	Robert Smith	Australia	Oct 1998	Jul 1998	Jun 2001
15 Coastal Geologist	Russell Maharaj	Trinidad & Tobago	Jun 1998		
16 Coastal Geologist	Chao Xiong He	China	July 1998		
17 Senior Electronics Technician	Simon Young	Fiji	Jan 1993	Jan 1996	Jan 1999
18 Electronics Technician	Peni Musunamasi	Fiji	Jun 1989	Permanent	
Hazard Assessment Unit					
19 Coastal Engineering Geologist	Graham Shorten	Australia	Oct 1995		
20 Technical Support Assistant	Graeme Frost	Fiji	Mar 1992	Permanent	
Ocean Unit					
21 Offshore Coordinator	vacant				
NATIONAL CAPACITY DEVELOPMENT PROGRAM					
22 Vive Vuruya	Program Assistant				
Human Resource Development Unit					
23 Training Coordinator	Andrew Butcher	United Kingdom	Feb 1997		
Disaster Management Unit					
24 Technical Advisor	Joseph Chung	Fiji	Jul 1998		
25 Associate Expert	Angelika Planitz	Germany	Jul 1998		
26 Disaster Mitigation Advisor	Atu Kaloumalra	Fiji	Jul 1998		
27 Disaster Management Training Advisor	Joeli Rokovada	Fiji	Jul 1998		
28 Unit Assistant	Marie Yee	Fiji	Jul 1998		
Information Technology Unit					
29 Information Technology Manager	Les Allinson	Australia	Nov 1992	Nov 1998	Nov 2001
30 Database Development Officer	Franck Martin	France	Sep 1993	Apr 1997	Apr 1999
31 Computer Geologist	Olivier Duperray	France	Jan 1998		
32 Computer Operator	Anna Elaise	Fiji	Jul 1990	Permanent	

SECTIONS	NAME	COUNTRY OF ORIGIN	DATE JOINED	CONTRACT START	CONTRACT END
Publications and Library Unit					
33 Publications Coordinator	Lala Bukarau	Fiji	Nov 1985	Oct 1996	Sep 1999
34 Library/Program Assistant	Sunita Prasad	Fiji	May 1989	Permanent	
CORPORATE SERVICES PROGRAM					
35 Program Assistant	Annette Warbrooke	Fiji	Oct 1990	Permanent	
36 Executive Assistant	Litia Waradi	Fiji	Apr 1989	Permanent	
Management Unit					
37 Director	Alfred Simpson	Fiji	Feb 1995	Feb 1998	Feb 2001
38 Deputy Director	vacant				
39 Program Manager	Russell Howorth	New Zealand	Nov 1986	Mar 1998	Mar 1999
40 Finance & Administration Controller	Mohinish Kumar	Fiji	Mar 1995	Mar 1998	Mar 2001
Finance Unit					
41 Accountant	Makereta Kaurasi	Fiji	Apr 1998	Apr 1998	Apr 2001
42 Assistant Accountant	Atesh Narayan	Fiji	Jan 1993	Permanent	
Administration Unit					
43 Administrative Assistant	Nazmeen Whippy	Fiji	Jul 1986	Permanent	
44 Receptionist/Clerk	Unaisi Bainiloga	Fiji	Feb 1987	Permanent	
45 Driver/Clerk	Enele Gaunavou	Fiji	Jul 1988	Permanent	
46 Office Assistant Cleaner	Niu Daurewa	Fiji	Sep 1987	Permanent	

Appendix 3: 1998 Revised Budget and 1999 Approved Budget

Summary of Anticipated Income (including in-kind support contribution) and Expenditure by Programs

	1998 Revised Budget F\$	1999 Approved Budget F\$
PROGRAM HEADS		
Resource Development Program	1,950,285	2,219,000
Environmental Science Program	929,000	1,890,900
National Capacity Development Program	1,360,000	3,235,440
Corporate Services Program	876,200	881,216
Work Program Management Program	400,500	271,000
TOTAL	5,515,985	8,497,556

Appendix 4: Some Abbreviations used in this Report

ACTEW	– Australian Capital Territory Electricity and Water Corporation
ADB	– Asian Development Bank
AGSO	– Australian Geological Survey Organisation
AIJ	– activities implemented jointly
AOSIS	– Alliance of Small Island States
APEC	– Asian-Pacific Economic Commission
CSD	– Commission of Sustainable Development (of United Nations)
CTD	– conductivity, temperature and depth
DHI	– Danish Hydraulics Institute
ECOWOMAN	– Pacific Women & Her Environment: A better life for Communities through Science and Technology
EEZ	– Exclusive Economic Zone
ENSO	– El Niño/Southern Oscillation
EPA	– Environmental Protection Agency
ESCAP	– Economic and Social Commission for Asia and the Pacific (UN)
ESMG	– Earth Science and Marine Geology (SOPAC Certificate Course)
EU	– European Union
EVI	– Environmental Vulnerability Index
FAO	– Food and Agriculture Organisation
FAQ	– frequently asked questions
FIG	– Fiji Internet/Intranet Group
FIT	– Fiji Institute of Technology
FNTC	– Fiji National Training Council
FOC	– Forum Officials Committee
FSM	– Federated States of Micronesia
FSP	– Foundation for the Peoples of the South Pacific
GEBCO	– General Bathymetric Chart of the Oceans
GIS	– Geographic Information System
GPS	– Global Positioning System
HLC	– high-level consultations
IEEJ	– Institute of Energy Economics of Japan

IFREMER	– Institut Française de Recherche pour l'Exploitation de la Mer (formerly CNEXO) (French Oceanographic Research Institute)
IGODS	– Interactive Graphical Ocean Data System
IHO	– International Hydrographic Organisation (of IOC/UNESCO)
IOC	– Intergovernmental Oceanographic Commission (of UNESCO, Paris)
ISA	– International Seabed Authority
ISP	– Internet Service Provider
IT	– Information Technology
JAMSTEC	– Japan Marine Science and Technology Center
JICA	– Japan International Cooperation Agency
KIGAM	– Korea Institute of Geology, Mining and Materials
LAN	– Local Area Network
LPG	– Liquid Petroleum Gas
MBES	– multi-beam echo sounder
MMAJ	– Metal Mining Agency of Japan
MRD	– Mineral Resources Department (Fiji Islands)
MSR	– Marine Scientific Research
NGDC	– National Geophysical Data Center (US)
NIWA	– National Institute for Water and Atmospheric Research (NZ)
ORSTOM	– Institut Française de Recherche Scientifique pour le Développement en Coopération (formerly Office de la Recherche Scientifique et Technique Outre-Mer) (French Institute of Scientific Research for Cooperative Development)
PABX	– Private Area Branch Exchange
PET	– Pacific Exploration Technology
PIC	– Pacific Island Country
PICCAP	– Pacific Island Climate Change Assistance Project
PREP	– Pacific Regional Energy Program
PTD	– Posts and Telecommunications Department (PTD)
PV	– photo-voltaic
PWA	– Pacific Water and Wastewater Association
RAO	– Regional Approving Office (EU)
ROC	– Republic of China
RTK	– real-time kinematics
SIDS	– Small Island Developing States
SOPAC	– South Pacific Applied Geoscience Commission

SPACHEE	– South Pacific Action Committee for Human Ecology and Environment
SPC	– Secretariat of the Pacific Community
SPOCC	– South Pacific Organisations Coordinating Committee
SPREP	– South Pacific Regional Environmental Program
SSI	– Seafloor Surveys International, Inc. (US)
STAR	– Science, Technology and Resources Network
TCSP	– Tourism Council of the South Pacific
TRITON	– Triangle Trans-Ocean Buoy Network
UN	– United Nations
UNCLOS	– United Nations Convention on the Law of the Sea
UNDHA/SPPO	– United Nations Department of Humanitarian Affairs/South Pacific Program Office
UNDP	– United Nations Development Programme
UNEP	– United Nations Environment Programme
UNESCO	– United Nations Educational Scientific and Cultural Organisation
UNICEF	– United Nations Children's Fund
USP	– University of the South Pacific
WAN	– Wide Area Network
WHO	– World Health Organisation
WWII	– World War Two
WWD	– World Water Day
WSSCC	– Water Supply & Sanitation Collaborative Council