PACIFIC ISLANDS APPLIED GEOSCIENCE COMMISSION

MARINE SURVEY AND MAPPING ACTIVITIES, 2009-2010
SOPAC Report to the South West Pacific Hydrographic Commission (SWPHC)

10th IHO SWPHC Conference, Honiara, Solomon Islands, 9 to 10 October 2010

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Table of Contents

1 Introduction

Since it's inception in 1972, The Pacific Islands Applied Geoscience Commission (SOPAC) has expanded considerably to become a leading regional organisation in the provision of applied science and technical support to Pacific member countries to help them achieve and maintain their economic and social potential.

The Ocean and Islands Programme (OIP) within SOPAC is committed to improving technical knowledge of ocean and island ecosystems for the sustainable management of natural resources. OIP has extensive experience in geophysical, geological, hydrographic, oceanographic, environmental, water quality and survey work throughout the Pacific Region.

The total approved budget for SOPAC in 2009 was USD 15.7 million. SOPAC currently has some 100 staff of which one third are professional with the remainder being technical and support staff. OIP has a total of 18 staff who are directly involved in marine and coastal technical work and/or applied research. From 1st January 2010 SOPAC will transfer and integrate the core work programme of SOPAC into the Secretariat of Pacific Community (SPC) as a new Applied Geoscience and Technology Division. This division will focus on issues such as water and sanitation, disaster management, seabed resources, maritime boundary delimitation and monitoring of ocean processes.

The following Pacific Island Countries and Territories (PICTs) are members of SPC: American Samoa, Australia, Cook Islands, Federated States of Micronesia, Fiji Islands, France, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, New Zealand, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Pitcairn Islands, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, United States of America, Vanuatu and Wallis and Futuna.

At present the OIP within SOPAC has four staff members that are active in hydrographic data acquisition. This team consists of one marine geophysicist, one physical oceanographer, and two senior technical officers. A technical workshop provides assistance with equipment, and has two electronic technicians that conduct the set up of multibeam systems on vessels of opportunity. None of the operators are trained hydrographic surveyors.

This report is a summary of SOPAC's marine survey activities for 2009-2010 provided to the Chair of the South West Pacific Hydrographic Commission (SWPHC) in preparation to the 10th Conference of the IHO SWPHC to be held in Honiara, Solomon Islands on 9 and 10 November 2010.

2 Marine Survey Activities, 2009-2010

The table below summarises SOPAC's marine survey and mapping activities during the period January 2009 to October 2010.

Date	Location	Task & Equipment	Status
August, 2010	Monosavu dam, Fiji Islands	Monasavu dam siltation survey MBES 8101 and seismic profiler was used to survey the lake floor to assess the extent of siltation	Completed

April – July, 2010	Saipan lagoon, Commonwealth of the Northern Mariana Islands	Oceanographic survey, modelling and shoreline processes work in support of the Saipan Lagoon use management plan A Trimble R8 GNSS was used to survey sections of the barrier reef, in particular intertidal reef crest and reef flat areas	Completed
October - November 2009	Funafuti, Tuvalu	Tuvalu coastal erosion vulnerability project (JPACE) SBES nearshore and intertidal survey along lagoon coastal areas of Fongafale Land transect survey including lagoon and ocean reef flat intertidal areas using Trimble R8 GNSS and Total station	Completed
September – October, 2009	Yasawa, Fiji	Assistance to Fiji Hydrographic Department in charting of Yasawa waters Reson 8101 MBES and seismic profiling work for phase III. Technical assistance to Fiji Hydrographic service. A final phase IV has been discussed but at this stage there is no further planning	Completed
August, 2009	Navua, Fiji	Coastal Geological Hazard Mapping, Navua Delta and Rovodrau Bay Offshore MBES survey and single channel seismic profiling	Some additional MBES mapping may to take place in November 2010
June 2009	Gau, Nairai Rabi and Batiki, Fiji	Infrastructure development in outer islands. Survey for proposed jetty sites MBES bathymetric mapping, seismic data acquisition, and seafloor characterisation with short term tide and current monitoring and the establishment of 1st order control points Fiji Map Grid	Completed

The following is a table of future marine survey and mapping activities that are planned to commence in the coming months.

Tentative Date	Location	Activity / Task	Status
November, 2010	Tongatapu, Tonga	MBES survey of shallow platform north of Tongatapu for tsunami hazard study	Planning phase
December, 2010	Mangaia Island, Cook Islands	SBES survey of nearshore reefslopes and topographic survey of intertidal reeflat areas on Mangaia Island for coastal inundation study	Planning phase
January – June, 2010	Rangiroa Atoll, French Polynesia	MBES survey of Rangiroa lagoon for coastal wave hazard study	Planning phase

3 Survey Equipment

SOPAC currently maintains and operates a wide range of marine survey and oceanographic equipment on behalf of member countries. SOPAC does not operate a vessel, and relies on charters and boats of opportunities to conduct surveys. The list below is not exhaustive and focuses on hydrographic equipment only.

Survey Equipment Category	Details
Single beam echosounder	• Echotrac CVM with 200kHz transducer
Multibeam echosounder	• Reson SeaBat 8160, 50kHz • Reson SeaBat 8101, 240kHz
Motion sensors	• TSS DMS • VRU motion sensor
Heading	• Surveyor Meridian gyro • SCAN 2000 gyro
Conductivity, temperature, depth sensors	• Seabird SBE 19-03, 600m • Seabird SBE plus, 3500m • Seabird SBE 19-01, 1024m
Tide gauge	• RBR TWR-2050 submersible pressure sensor • Interocean WTF 904 submersible sensor
Positioning	• Trimble RTK R8 • Thales Aquarius LRK GPS • Trimble DSM12 GPs • Trimble 5800
Software	• Hypack • Surfer • Fledermaus

In addition to the above, a MarineStar 9200 G2H DGNSS receiver with a multiport licence for positioning and heading will be purchased before the end of 2010. It is envisaged that this unit will greatly reduce the cost of operations in remote areas and enhance SOPAC's ability to collect quality positional data without the need of GPS base stations.

3.1 Training

A week-long Fledermaus Professional Training Course was conducted at SOPAC for five staff members of OIP. The training was conducted by Douglas Bergersen of Acoustic Imaging, Australia. SOPAC now has three Fledermaus Pro licences valid for one year.

The SOPAC Geonetwork officer (see below for details on Geonetwork) attended a ""Basic Data Management Training" on the 13th to the 24th of September 2010. Training was fully funded by the Intergovernmental Oceanographic Commission (IOC) and the United Nations Educational, Scientific and Cultural Organisation (UNESCO), and conducted at the IODE (International Oceanographic Data and Information Exchange office in Oostende Belgium under the IODE Programme. Training was designed that all participants work on their own geographic areas of interest and all software used was Open Geospatial software.

4 Associated Activities

4.1 Maritime Boundaries

As signatories to the United Nations Convention on Law of the Sea, PICTs have obligations under the Convention to deposit and declare maritime boundary information consistent with the Convention's provisions. At the time of writing 6 Member states have declared their respective territorial sea baselines, 3 have declared their exclusive economic zones (EEZ) and only 20 of a potential 48 shared boundaries (adjoining state boundaries) are subject to treaty. Thus the greater number of baselines; territorial, contiguous and exclusive economic zones are in fact notional and poorly defined either legally or geodetically.

Eight PICTs submitted extended continental shelf (eCS) claims before their respective deadlines in 2009 to the United Nations Commission on Limits of the Continental Shelf (UNCLCS) and others are working towards later deadlines in 2013. Recent UNCLCS rulings allowed countries to submit partial claims with the opportunity to update and complete these before technical review by UNCLCS over the coming years. In many cases these submissions are also dependent on the clear definition of baselines and maritime zones and the absence of these in many PICTs will present challenges to the finalisation and successful defence of eCS submissions.

Significant technical, policy and diplomatic work remains and it is critical that PICTs embrace obligations under UNCLOS and deposit and declare their existing maritime boundary information. SOPAC has already made significant advances in regional access to accurate technical data in support of regional boundary solutions. In the next few years it will continue to support Members in the technical development of eCS submissions as well as baselines, maritime zones and shared boundaries.

4.2 South Pacific Sea Level and Climate Monitoring Project

The South Pacific Sea Level and Climate Monitoring Project (SPSLCMP) is an AusAID-funded project which has been ongoing since 1991. It initiated the establishment of the SEAFRAME array (Sea Level Fine Resolution Acoustic Measuring Equipment) or sea-level monitoring stations in Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. The Project is managed by the Bureau of Meteorology, Australia (BoMET) and implemented via a partnership between the National Tidal Facility of BoMET; Geoscience Australia (GA); and SOPAC.

SOPAC's role is as follows:

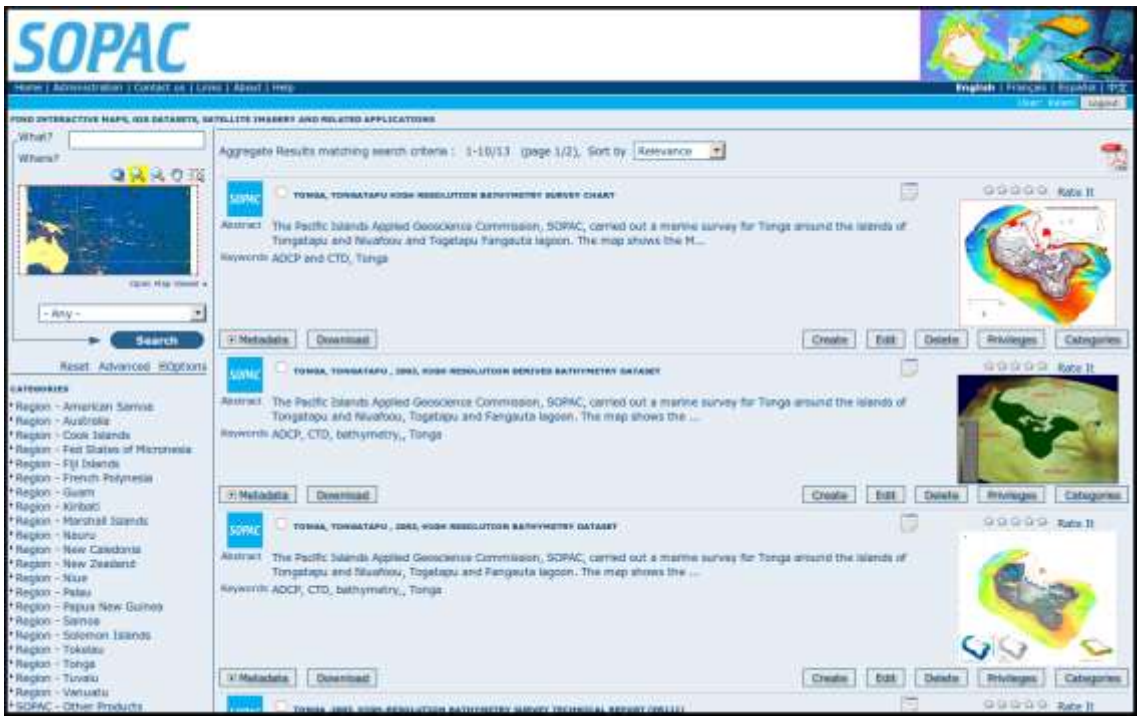
- Ongoing provision of technical services to maintain and calibrate the gauges
- Precision levelling surveys of the gauge sites in collaboration with GA
- Regional coordination and communication of the project

- Advocacy of the SPSLCMP

4.3 Data and Information Management through the GeoNetwork Server

SOPAC has an ongoing commitment to data rescue, collation, storage, data cataloguing and digitisation and undertakes to make ocean data available to members to support improved decisions. Through this continuous effort the SOPAC GeoNetwork now holds a range of ocean data and relevant products, such as regional bathymetry datasets, bathymetric charts, topography and technical reports, seismic data, coastal topography datasets and maps, marine and physio-chemical datasets, maritime boundary information, sea level data (with conjunction from the SPSLCMP), regional marine scientific research cruise, satellite imagery, and scanned aerial photographs.

The SOPAC GeoNetwork website is an online searchable digital library designed as a geographic metadata catalogue. It is based on the GeoNetwork Opensource application (http://geonetwork-opensource.org). The system implements the ISO 19115/19139 geographic metadata standards for better management and interoperability of geospatial data. The Figure below shows a screenshot of SOPAC's Geonetwork Server (http://geonetwork.sopac.org) showing bathymetry related products for Tongatapu, Tonga.



The Geonetwork Server has received about 200,000 hits in the last 12 months, along with several written requests for data release as tabled below. This illustrates the broad user base and multiple applications of SOPAC's bathymetry data.

Date	Organisation	Name of Datasets
2/11/2009	Dept. of Geology, Mines & Water Resources, Vanuatu	Vanuatu Efate Bathymetry Survey Chart 1: 100,000
28/02/2010	FSM government	FSM, Chuuk Lagoon multibeam bathymetry Survey
18/03/2010	Nautilus Minerals	Vanuatu Deepsea Minerals Resources Survey (MBES)

6/04/2010	National Institute of Water and Atmospheric Research, NIWA, NZ	Tonga, Tongatapu, 2003, High Resolution, Bathymetry
12/05/2010	University of Hawaii, Sea Grant College Program, Marshall Islands	Marshall Islands, Majuro Atoll, Sand and Gravel Resources survey, Bathymetry Maps
13/05/2010	Government of Tonga	Tonga, Tongatapu , 2003, High Resolution Bathymetry, Dataset
6/07/2010	LRNZ & University of the South Pacific	Pending
21/06/2010	Mapping and RS Unit , Vanuatu government	Vanuatu Efate bathymetry Maps
1/08/2010	University of Queensland, Australia	Solomon, Marovo- DEM and Hydrodynamic Model
11/08/2010	BECA Infrastructure Limited	Avatiu harbour bathymetry dataset, CK
19/08/2010	IWCS	N/A
5/09/2010	National Geospatial Intelligence Agency, (NGA), Bethesda, MD, USA	PNG bathymetry Maps, ER0115

5 Emerging Issues

The seafloor mapping activities within SOPAC have the potential to provide IHO standard bathymetry for charting purposes. Access to good bathymetry for updating navigation charts is an emerging issue within the region and SOPAC should coordinate its efforts with the SWPHC, AHS, and LINZ. SOPAC expends considerable resources mapping remote locations as well as heavily trafficked areas, and this has the potential to be a cost-effective way in obtaining hydrographic data for charting purposes.

In the last few years we have had multiple requests from LINZ and AHS for our multibeam data for areas under their charting responsibility, specifically data for PNG, Samoa, Niue and Tonga. We responded by providing data and underlying technical details, presenting a substantial volume of work. Additionally, SOPAC will soon conduct surveys in the French Polynesia, and a meeting with SHOM has already taken place. The updated marine charts for which we have provided data have been recently published, but SOPAC data was not included. The reasons for this have not been identified, but it may simply be that SOPAC's data accuracies are difficult to evaluate, as the surveys were conducted for purposes other than charting.

It is clear that SOPAC has been recognised as a collector of hydrographic information, even though our products may not currently meet IHO standards. It appears important that for SOPAC's potential as a cost-effective partner in obtaining hydrographic data collaboratively with agencies such as LINZ or AHS to be fully realised, we need to consider how we can meet the standards and accuracies required by these agencies. It is worth noting that NOAA have now initiate a program to use 'outside source data', e.g. from activities by the Pacific Islands Benthic Habitat Mapping Center, which conducts work similar to SOPAC in the northern Pacific for the US associated states. Under this program, NOAA is exploring procedures to use non-traditional sources to update nautical charts. So instead of improving the quality of the source data at the time of survey, NOAA are evaluating ways to deal with the resultant data that is out there. In order to improve the quality of any future data collection it would be advantageous to improve SOPAC's capacity at the time of acquisition.