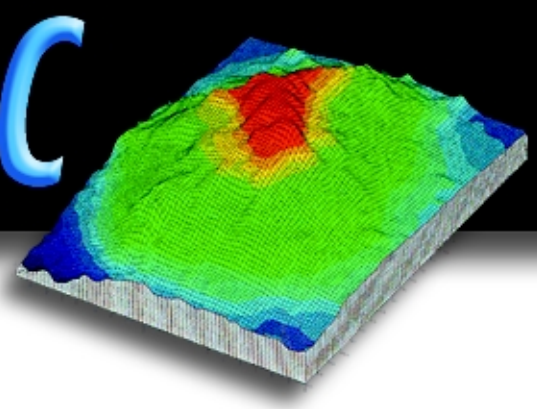
SOPAC

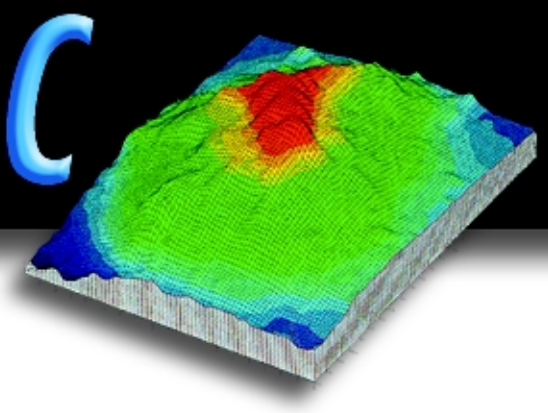


COUNTRY PROFILE

SAMOA

SOPAC Secretariat Private Mail Bag Suva Fiji.
Tel: (679) 381 377 Fax: (679) 370 040 http: //www.sopac.org.fj/

SOPAC



Our Vision

The improved health, well being and safety of the Pacific and its peoples

The South Pacific Applied Geoscience Commission (SOPAC) is an independent, intergovernmental, regional organisation established by South Pacific nations in 1972, and dedicated to providing geotechnical services to the countries it serves. Its Secretariat is located in Suva, Fiji, and has about 40 professional and support staff.

SOPAC's work for its member countries focusses on three key areas; resource development; environmental geoscience; and national capacity development in the geosciences. To effectively deliver these services SOPAC maintains a regional data centre, provides information services, and offers technical and field services for specific project work.

THIS COUNTRY PROFILE WAS PRODUCED TO PROVIDE A SNAPSHOT OF THE CURRENT ISSUES FACED BY THE COUNTRY AND SOPAC'S ROLE IN ASSISTING COUNTRIES TO ACHIEVE SUSTAINABLE DEVELOPMENT

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SAMOA COUNTRY PROFILE

SAMOA: Our Future

"…. the move towards sustainable development will require a commitment from all of us: as individuals, as members of communities, and as members of government and non -government agencies .It will require a fundamental change in our attitude to our environment - a realisation that there are limits to the seemingly abundant resources of our islands."

Honourable Tofilau Eti Alesana
Prime Minister of Samoa. (1994)

Capital:	*Apia*
Population:	*168 000 (1999 est.)*
Land Area:	*2 935 sq. km*
Max. Height above Sea-level:	*1 860 m (Mt Silisili)*
Geography:	*Mostly volcanic in origin; consists of 2 large islands and several small ones; main islands are Savai'i (1 820sq km) and Upolu (1 100sq km)*
EEZ:	*120 000 sq. km*
Climate:	*Tropical; dry season (May to September)*
Rainfall:	*Varies from 5 000 – 7 000 mm (windward side) and 2 500 – 3 000 mm (leeward side) per annum*
Mean Temperature:	*25°C*
Economy:	*Dependent on agriculture, tourism, manufacturing, remittances and aid; exports include Fresh fish, taro, coconut/copra products, beer, cigarettes, cocoa, timber*
GDP per Capita:	*US$ 1 060 (1998 est.)*
Currency:	*Tala*
Energy Sources:	*Biomass, hydro, solar, wind, geothermal*
Freshwater Sources:	*Groundwater, surface water*
Natural Hazards:	*Cyclone, storm surge, coastal flooding, river flooding, landslide, tsunami, earthquake, volcanic eruption and drought*
Mineral Potential:	*On-land – unknown; Offshore - unknown*
Languages:	*Samoan and English*
Government:	*Independent state and member of Commonwealth*
SOPAC Membership:	*Full member since 1971*
Country Representative:	*Secretary for Foreign Affairs*
	Ministry of Foreign Affairs
	GPO Box L1861
	Apia
	Tel: (685) 63 333
	Fax: (685) 21504
	Email: mfa@mfa.gov.ws

Samoa

Samoa, a volcanic archipelago, consists of two large islands (Upolu and Savaii) and several small ones with a total land area of approximately 2 935 sq km. It lies in the southwest Pacific in an Exclusive Economic Zone (EEZ) of 120 000 sq km, the smallest in the Pacific area.

The country has a total population of 168 000, estimated in 1999[1]. More than half of the population lives on Upolu, where the capital Apia is located.

Samoa has a tropical climate with a rainy season from October to April and a dry season from May to September. Rainfall varies from 5 000 mm to 7 000 mm on the windward side and 2 500 mm to 3 000 mm on the leeward side.

The mainstay of the Samoan economy is agriculture, both for subsistence and export earnings. Foreign aid and overseas remittances are other essential contributors to the economy. Tourism, though on a small scale, also contributes to the GDP of the country.

There are several resource and environmental issues, common to island nations, affecting sustainable development in Samoa. These include an array of issues from climate and sea-level variability, environmental degradation and pollution to resource management. More specific challenges to sustainable development include coastal erosion, water quality, water availability and natural hazards. Sustainable management of resources such as aggregate and renewable energy are other issues in Samoa's quest for development.

Samoa is a founding member of the South Pacific Applied Geoscience Commission (SOPAC) since 1971. SOPAC is an independent, intergovernmental, regional organisation, which provides expert technical assistance, policy advice and information on the sustainable management of these natural resources. SOPAC also contributes towards a variety of geoscientific training and educational opportunities at all levels to increase the country's capacity in science and resource management. Additional assistance is made available by SOPAC through technical support for the establishment and maintenance of database information systems and for electronic exchange of information. Expertise in hazard assessment, disaster preparedness, mitigation and management is also provided.

Children of Samoa

Resource Development & Management

For Small Island Developing States (SIDS), natural resource development and management holds the key to rapid economic development. Unwise exploitation of non-renewable resources and exploitation of renewable resources at a pace higher than the natural rate of replenishment could prove detrimental to the sustainable development plans of the country.

[1]SPC Demography Programme

MINERALS

Offshore exploration, which is still at a nascent stage in Samoa, has shown the presence of deep-sea mineral resources such as manganese nodules within its EEZ. The future exploitation of these minerals has the potential to provide great economic benefits to the country. Interest has been shown in these deposits and a further survey is currently being formulated to assess the scope and potential for development.

Staff of Apia Observatory identifying minerals

ENERGY

As developing countries become more industrialised, there is an increasing demand for energy. Samoa currently uses fossil fuels for its energy generation, resulting in the need for even greater amounts of imports and thus placing an increasing strain on the economy. Therefore, the use of renewable energy resources is considered essential to the continued sustainable development of the country.

The electrification of outer villages in Samoa is still not complete and many rely on diesel generators. Hydro-electricity is another major form of energy used in Samoa. Other sources of power, such as solar energy, have had little impact in the country.

WATER

Fresh water is a fundamental resource for small island nations. Most development plans are pivotal on the availability of fresh water. Clean water enhances the health and productivity of the work force and has particular implications for the children and future generations.

Approximately 95 per cent of the Samoan population have access to piped water. However, there is high rate of water loss through leakage because of weak infrastructure and wastage as a result of poor conservation measures.

The volcanic origin of Samoa has resulted in terrains that have abundant streams and waterfalls. Despite this, the western part of Upolu and the larger parts of Savai'i lack any surface water because of the highly permeable nature of the Mulifauna volcanic rocks. Thus, groundwater and rainwater catchments are the common sources of water in these areas.

Challenges to Sustainable Development and SOPAC's role in Samoa

ENERGY

Samoa is confronted with the urgent need to introduce supply- and demand-side management programmes to attain efficiency in the power sector. The import of fossil fuels for energy generation in the country is placing an increasing strain on the economy. Therefore the need exists in Samoa for the exploitation of renewable energy sources such as biomass and solar energy for the sustainability of the energy sector.

SOPAC realises the need to assist Samoa in encouraging the use of low-emission technologies and native energy sources. It has undertaken studies that have identified the potential of developing renewable energy as an alternative

source in Samoa[2]. The result has been the development of wave energy, which has a high resource potential and is considerably steady throughout the year[3].

Continued assistance is being provided to the Government of Samoa by SOPAC in the identification and development of renewable energy sources. Advice has also been provided towards the development of rural electrification. This assistance includes the feasibility assessment for the construction of a wave-energy plant on the southern coast of Savai'i[4] and the design and installation of a hydrological network[5].

WATER

SOPAC has attempted to assist Samoa with its water issues through field surveys, assessments and capacity building through training programmes and workshops.

Some of the projects, which have been conducted by SOPAC, include assistance with the development and application of a water database in 1999 for the Apia Observatory. This database helps to improve the nation's capacity in the handling and storage of water-sector data required for the development of the water resources[6].

Spring water measurement in Savai'i

Samoa has benefited from the Water and Sanitation Programme (WASP) through technical support and through training. SOPAC has been involved in the reviewing of the National Water Resources Master Plan and with the rural water-supply-scheme designs for Uplou and Savai'i. In addition to this, a water resource assessment for Manono Island, located between Upolu and Savai'i has been conducted by SOPAC in 1998[7].

In-country workshop

A framework for assessment[8] of hydropower potential has been formulated by SOPAC for Samoa and a workshop for the conservation of water resources has been held. SOPAC continues to work in Samoa in reducing the wastage of fresh water through good demand management and conservation practices by water suppliers and water users in selected Pacific island countries. This would in turn make more water available for environment enhancement and for future generations[9]. Identification and assessment of water resources in the outer islands of Samoa is also being conducted[10] and a Groundwater Manual, which provides guidelines for the development and management of groundwater, is under preparation[11].

In another study in 1999[12], SOPAC carried out the assessment of groundwater on Savai'i to get detailed analysis of groundwater availability in the specified region and formulate recommendations for drilling. Simultaneously, on-site staff training was provided for Samoan hydrologists.

In addition to these, SOPAC has been running an Earth Science and Marine Geology Certificate Programme for technicians from Samoa and the region for the past 21 years. Since 1995, when the Water and Sanitation Programme was first attached to SOPAC, a module relating to water issues has been added to the certificate course at the University of the South Pacific.

[2]SOPAC Preliminary Report 3
[3]SOPAC Technical Report 188 & 157
[4]Task Profile WS 99.008
[5]Task Profile WS 99.007
[6]Task Profile WS 99.004
[7]Task Profile WS 98.012
[8]Task Profile WS 99.007
[9]Task Profile WS 99.001
[10]Task Profile WS 98.012
[11]Task Profile WS 99.006
[12]Task Profile WS 99.033

Capacity development in the member states is one of the top priorities of SOPAC. Training in the field for technical personnel from the member countries is an ongoing process with the aim of enhancing in-country capacity to undertake assessment studies and field surveys. This training is carried out through workshops and seminars and through the courses in the Earth Science and Marine Geology Certificate Programme, which has been undertaken for 21 years. In-country seminars concentrating on geology, hydrology and hydrogeology were held in Apia in September 1999 for staff from departments of several ministries including those based at the Apia Observatory and also for school principals and lecturers. A correspondence course associated with the Earth Science course has also been trialed in Samoa.

Part of the coral rubble deposited during Cyclone Ofa close to Mulinu'u Point, Apia.

HAZARDS & DISASTERS

The South Pacific is one of the most natural disaster prone regions of the world, with tropical cyclones, earthquakes, tsunamis, storm surge, inundation, volcanism, landslides and human-induced hazards being common throughout the Pacific. Samoa is no exception.

From 1831 to 1990, 79 cyclones have affected Samoa. This represents an average of 5 events per decade, with associated winds of 30 knots or more.

The most recent cyclone, Cyclone Ofa, led to the loss of lives, homes and reclaimed land. The monetary value of the damages was set in millions of dollars[13].

SOPAC has been assisting Samoa prepare for these threats through numerous field investigation projects. Baseline data were developed by SOPAC for Samoa to estimate the potential extent of damages, which may occur as the result of a cyclone in the coastal region[14]. This work enables better mitigation and allows groundwork to be carried out for disaster management and mitigation. Assessment and proper management of Samoa's coastal infrastructure following cyclone events have also been undertaken[15]. From these assessments, the extent of damage and coastal changes has been identified and determined. This has enabled the Government of Samoa to plan and design efficient coastal protection works.

The linear island chain of Samoa is situated directly north-east of the Tonga-Kermadec trench which is the main source of seismicity directly affecting Samoa. In April 1995 there was a large earthquake of magnitude 8.1 in the trench that caused moderate ground shaking in the capital city, Apia. Samoa also has a long history of other damaging earthquakes, including a magnitude 7.6 in 1957 and a magnitude 8.7 in 1917. The rate of development of Apia, like other major South Pacific centres, is essentially driving a larger number of the people into vulnerable urban living conditions. Similar-magnitude earthquakes occurring today could pose a serious threat to the population, environment and economy of Samoa, especially in urban areas such as Apia. As a response to this Pacific-wide trend, the Hazards Assessment Unit of SOPAC implemented the Pacific Cities Project.

Field training in seismology

[13]SOPAC Technical Report 104

[14]SOPAC Technical Report 106
[15]SOPAC Technical Report 104

The first task of the Pacific Cities Project that was undertaken in Samoa was a microtremor geophysical survey that was carried out with the Samoan Department of Meteorology, Geophysics section, in Apia during August 1999. Once the data was analysed and the characteristic ground response and geotechnical parameters were determined a seismic microzonation map of the city was developed. In addition, the distribution frequency of earthquakes and the likely impact on the city can also be assessed. The microzonation data and map were compiled in the form of a comprehensive GIS database which can be used for hazards managers and planners, and to facilitate the design of more-earthquake-resilient building structures. The database assembled for the city will also provide a basis for assessing the vulnerability of Apia to tsunamis, storm surges and sea-level variability.

View of Sataua

Training on a geological, geotechnical and MapInfo database was also provided to the Samoan counterparts in 1997, 1998 and 1999. SOPAC also provides ongoing support in the development of a digital database of geological and geotechnical information.

To assess the vulnerable communities that may be affected by such hazard events, a building assets survey was also undertaken in August 1999. 70% of the work in the survey was undertaken and its completion remains on the scheduled task list of the Pacific Cities project. The assets survey acquires primary data to assess those characteristics of buildings used for hazard assessment. This includes information such as building usage, wall material and number of floors. The assets survey combined with population data, such as those obtained through census information, will ultimately provide a dataset for community vulnerability analysis and can be used specifically for emergency management or other urban planning and hazard mitigation requirements. This data have also been incorporated into the Pacific Cities comprehensive GIS database. The database will be the key component for the strategic implementation of in-country hazard-mitigation programmes, disaster management and the development of a culture of safety and awareness.

SOPAC has a committed interest in the consolidation of capacity building and information resources through disaster mitigation activities. Volcanic hazards also pose a great threat to the Samoan islands, and a scientific report on the volcanic hazard of Savai'i and the first draft of a response plan were discussed in an in-country seminar in September 1999. The finalisation of the response plans together with development of organisational plans and education awareness programmes remain to be completed[16].

A study of the promotion and application of the Samoan national building code has also been undertaken[17]. The technical reports and manuals have been distributed in Samoa and a workshop will be conducted in country to determine an implementation strategy for the recommendations of the study. In addition, a landslide flood audit of Samoa's main water pipeline system will be conducted. Assessment of the vulnerability of the water system will assist operational managers in contingency and maintenance planning[18].

All these hazard-assessment, mitigation and disaster-management activities contribute towards SOPAC's vision of strengthening Samoa's capability to assess natural and man-made hazards and improve post-disaster rehabilitation.

[16]reference page 80, Directors Annual Report for 1999 to council part 3
[17]ref, page 81, Directors Annual Report for 1999 to council part 3
[18]ref page 82, , Directors Annual Report for 1999 to council part 3

COASTAL MANAGEMENT

Samoa has distinctive coastal areas comprising features such as fringing reefs, lagoons, natural beaches and mangroves. There have been rapid changes in the coastal geography associated with increasing reclamation as a part of burgeoning urbanisation.

Approximately two thirds of the coastline between Apia and the airport at Faleolo has been incrementally reclaimed. To protect reclaimed land from the onslaught of the sea, various protection systems such as concrete sea walls have been constructed haphazardly in some areas. However, the success of these protection structures has been minimal owing to limited understanding of the wave and current pattern around the islands and the misconception that coasts are inherently and eternally stable. Poor construction and development practices, indiscriminate reclamation, destruction of mangrove habitats and aggregate mining causes coastal instability and beach erosion. The primary sources of sand, coral, rock and gravel (aggregate) are from beaches, lagoons and riverbeds. These materials are used mainly for the construction industry.

The indiscriminate mining of aggregate along the coastal areas has resulted in extensive shoreline erosion, together with increased silt levels and decreased depths of lagoons. Severe erosion in the coastal zone can also lead to damage and loss of infrastructure in Samoa. In addition, coastal pollution damages and destroys reef biota.

ESMG students during a beach mapping exercise

Infrastructure in Samoa is concentrated along the coastal region; therefore any loss of coastal land is of great significance in Samoa's quest for sustainable development.

To assist the Government of Samoa in resolving coastal issues, SOPAC has undertaken several projects. Examples of these projects include the identification of alternative sand-aggregate sources[19], public awareness campaigns and the training of government representatives in coastal management. SOPAC recently conducted a coastal mapping study on Savai'i[20]. The purpose was to identify coastal infrastructure under threat and assist in identifying aggregate sources. A follow- up study was done in late 1999[21], and another report will be written on the findings.

The identification of alternative aggregate sources has involved surveys in the western end of Upolu and Savai'i. Sand aggregate sources were identified and mapped together with the estimation of potential volumes of resource materials. Baseline data in the resource areas were collected and documented. However, the volume of minable sand is not easy to estimate as sand always has wide ecological and coastal erosion implications. Further studies are planned for the two areas[22 &23]. These studies will identify other sources of material.

In addition, SOPAC has conducted an in-country beach-monitoring seminar[24] in Samoa and assessed the potential magnitude and severity of hazards that cause coastal

Coastal protection structure in Apia

[19]SOPAC Technical Report 95
[20]SOPAC Technical Report 281
[21]Task Profile WS 99.009
[22]Task Profile WS 99.029
[23]Task Profile WS 99.030
[24]SOPAC Preliminary Report 65

erosion[25]. Increased public awareness campaigns and education for the effective implementation and compliance of management policies and regulations have also been carried out[26].

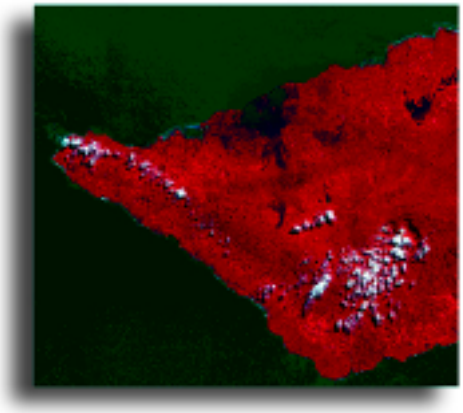
Given the critical importance of sustainable development to Samoa, SOPAC will continue playing an important role in coastal preservation and the development of sound policies to ensure better management of coastal resources.

STEPS INTO THE FUTURE: INFORMATION TECHNOLOGY & COMMUNICATION

For effective resource management and planning, the storage and processing of timely and accurate scientific data is critical. Island nations face the fundamental crisis of geographic isolation and high cost of communication between the various islands. Given the small size of these nations, technology providers are reluctant to supply cutting-edge technology because of poor economies of scale and difficulties in monitoring. Low human capital endowment further complicates the situation. These problems are a constraint in Samoa's pursuit of rapid growth.

SOPAC has been assisting Samoa to improve its management systems and train personnel in Information Technology. This assistance involves the development of relevant and effective information technology systems and support for GIS and remote-sensing capacity development[27]. Some of the other projects include the production and organisation of coastal data[28], assistance in the development of Intranet and Internet in Samoa[29], and GIS training for Government personnel[30]. In 1998 SOPAC assisted Samoa in upgrading its National and International Internet systems.

Samoan fale



Spot image

A computing unit for GIS and remote sensing (RS) work was provided by SOPAC to Samoa in 1993 through funding under Lome III. Technical assistance, hardware and support continue to be an integral part of SOPAC's workplan for Samoa.

As a regional data centre, SOPAC has been compiling geographic data on Samoa.

In future, the focus will be on:

- Development of appropriate, economic and scalable technologies.
- Increasing the number of IT professionals in the local population.
- Improving Internet access.
- Further development of Geographical Information Systems and Remote Sensing techniques.

Future directions in Samoa

In future, SOPAC will continue its partnership with Samoa, to overcome the hurdles in the path of sustainable development. SOPAC will use its key 'ownership advantage' - the expertise in applied sciences - to help Samoa manage and develop its non-living resources sustainably.

[25]SOPAC Technical Report 281
[26]SOPAC Miscellaneous Report 222
[27]Task Profile WS 98.001
[28]Task Profile WS 98.009
[29]Task Profile WS 98.008
[30]Task Profile WS 97.010

SOPAC will further its partnership with Samoa in developing offshore resources. Policy formulation will be one of the key areas that SOPAC will develop as its core professional activity. Development of appropriate legislation to manage coastal erosion and regulate aggregate mining will be a priority in the near future.

Sustainable development, conservation and management will be the guiding principles in the water and energy sectors. Policy development will be an activity in both these areas as well. Training programmes, workshops and seminars will be organised regularly to assist Samoa in creating a national capacity in geo-science. SOPAC will continue its work to reduce Samoa's vulnerability to natural disasters and improve preparedness.

Island systems management will be a future area of focus given its ability to improve database management and decision-making processes. SOPAC intends to support the development of information technology and communication infrastructure in Samoa to achieve this.

By performing its functions as the specialised scientific organisation that it is, SOPAC has been addressing some of the fundamental factors that have impeded the development process.

Reference Materials

SOPAC provides access to a variety of information relating to Samoa. This can be accessed through the library database, PIMRIS or the Internet. SOPAC holds at its Secretariat:

- Maps of Samoa
- Aerial photos
- Project reports
- Videos
- General reference material on Samoa

Please refer to the Samoa Bibliography for SOPAC's full reference and material listing.

Aerial view of Apia

For more information please contact:
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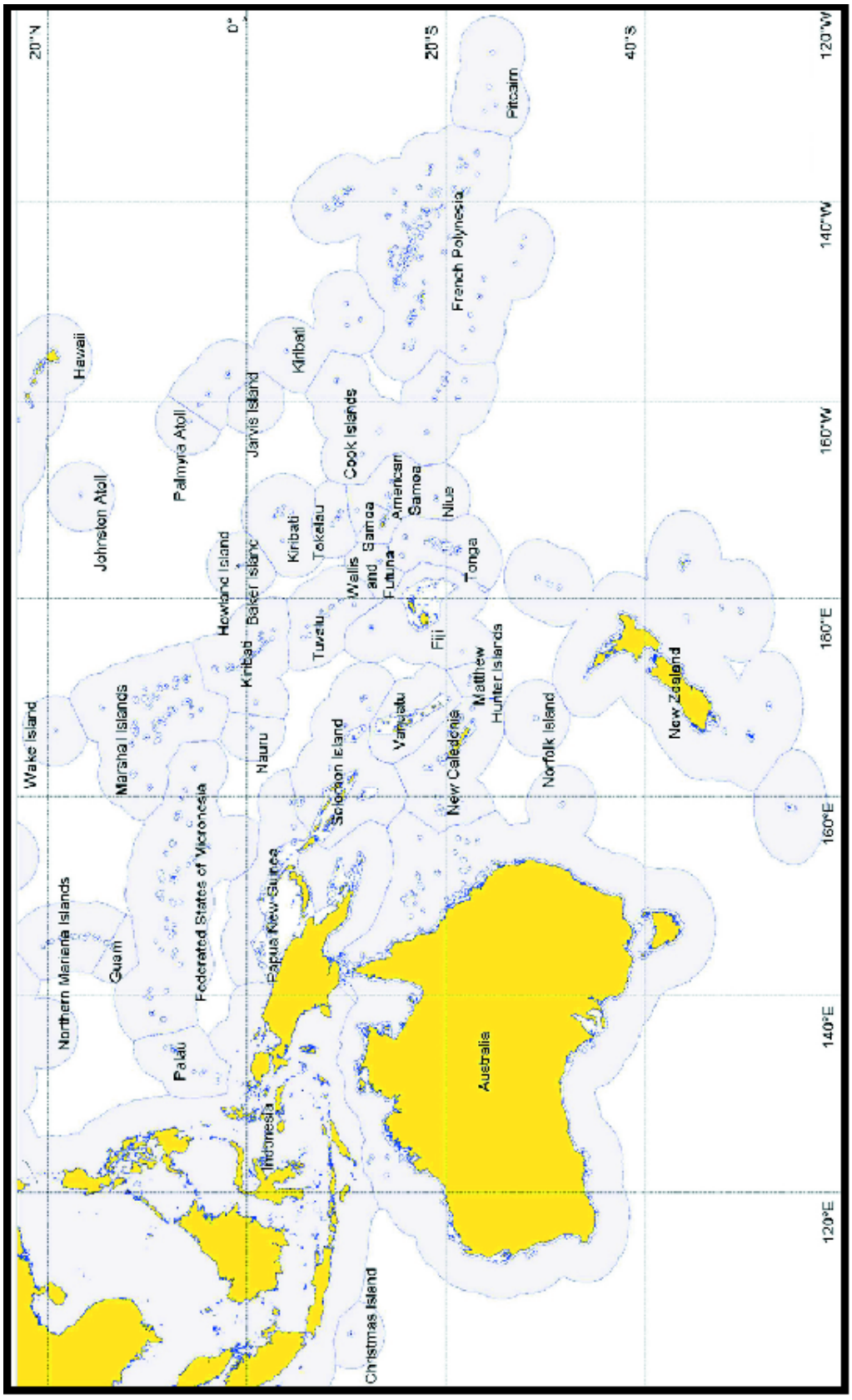
Suva, Fiji Islands

Phone : (679) 381377, Fax : (679) 370040
Email : postmaster@sopac.org.fj
Website : www.sopac.org.fj

Issues and SOPAC's Responses for Further Development

ISSUES	CONSTRAINTS	RESPONSES FOR FURTHER DEVELOPMENT
Water & Sanitation	· Limited groundwater supply · Groundwater lens is fragile and prone to contamination by saltwater intrusion · Demand for water greater than total resource, eg. SW Savai'i island · Large scale leakage and wastage from distribution system	· Encouraging the increased use of rainwater catchments · Provide advice to improve infrastructure · Public awareness campaign · Development of resource policy and legislation · Undertaking further studies and training
Coastal Management	· Poor land management · Uncontrolled mining activities leading to serious erosion · Inappropriate coastal development and protection works · Land tenure and land ownership issues	· Development and implementation of appropriate policies and legislation · Identifying alternative potential aggregate resources · Public education and awareness raising about coastal degradation and management · Dialogue with government onhow to facilitate sustainable customary land use
Minerals	· Inadequate scientific research to define full potential of resources	· Assessing the potential of manganese nodules in Samoa's EEZ · Develop resource policy and technical advice on the management and development of offshore minerals · Encourage further research
Energy	· Use of imported fossil fuels to generate energy placing increasing strain on the economy · Inadequate public awareness on renewable energy sources and management	· Assisting in the identification of viable renewable energy sources · Development and implementation of appropriate energy policies and legislation · Holding workshops and providing training to enhance the skills required by local staff for management and operation of energy sector
Hazards & Disasters	· Prone to cyclones, earthquakes, climate change and ENSO impacts · Lack of community awareness regarding the effects of natural hazard impacts	· Ensure that suitable sites are selected for future coastal developments · Provide advice on safe infrastructural design and design practices · Educate the community about natural hazards and associated effects of impact
Information Technology & Communication	· Limited availability and poor access to accurate, timely and sound scientific information · Lack of relevant regional and local data · High cost	· Development of relevant and effective IT systems · Supporting GIS and remote- sensing capacity development · Assisting in the development of Intranet and Internet in Samoa · Training local staff in IT through workshops, fellowship attachments, etc. · Coordination, compilation and creation of standardised geographic data sets
Human Resource Development	· Weak human resource base · Limited financial and institutional resources · Limited expertise	· Conducting workshops and technical training programmes to improve national capacity in the geosciences · Running the Earth Science and Marine Geology course to improve the human resource base · Fellowship attachments



South Pacific Region Maritime Limits

SOPAC Member Countries: 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.