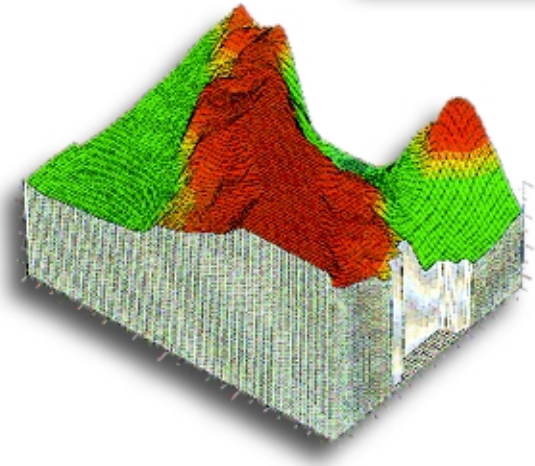
SOPAC

COUNTRY PROFILE



TUVALU

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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TUVALU COUNTRY PROFILE

Tuvalu: Our Future

"In this rapid change, the issue of maintaining our newly acquired level of development over the long term and the impacts of economic growth and cultural and environment values have not been fully addressed. Government has over the last few years, begun to change the emphasis to assigning a high priority to sustainable development."

Hon. Bikenibeu Paeniu
Prime Minister of Tuvalu. (1993)

Capital:	*Funafuti*
Population:	*9,600(1999est.)*
Land Area:	*26 sq. km.*
Max. Height Above Sea Level:	*Approximately 5m*
Geography:	*Consists of 5 atolls and 4 coral islands; the 9 islands are Vaitupu, Funafuti, Nanumea, Nanumaga, Niutao, Nui, Nukufetau, Nukulaelae, and Niulakita.*
EEZ:	*1.3 million sq. km.*
Climate:	*Tropical; marine, hot and humid, moderated by trade winds.*
Rainfall:	*Varies considerably with an average of*
	3000 mm per annum.
Mean Temperature:	*30^{0}c*
Economy:	*Mixed market-subsistence economy and also reliant on aid; exports include copra, handicrafts and philatelic stamps. agriculture & fishing*
GDP Per Capita:	*US$1,157 (1998 est.)*
Currency:	*AU$*
Energy Sources:	*Biomass, solar, wind*
Freshwater Sources:	*Rainwater, groundwater, desalination*
Natural Hazards:	*Cyclone, coastal flooding, tsunami, storm surge, drought, earthquake, landslide, erosion, saltwater intrusion*
Mineral Potential:	*On-land - unknown; Offshore-cobalt-rich manganese crusts*
Languages:	*Tuvaluan and English*
Government:	*Independent state and associate member of Commonwealth*
Sopac Membership:	*Full member since 1983*
Country Representative:	*Secretary to Government/Secretary of Foreign Affairs Office of the Pirme Minister Funafuti*
	Tel: (688) 20815
	Fax: (688) 20843

Tuvalu

Tuvalu comprises nine islands, which have a total land area of approximately 26 sq km. The islands are dispersed in an archipelago over the Pacific Ocean within Exclusive Economic Zone (EEZ) of about 1.3 million sq km.

The low-lying atolls of Tuvalu, with a maximum elevation of about 5 m above sea-level, have an estimated population of 9 600 (1999)[1]. Funafuti, the capital, has the highest population and Niulakita, the smallest island, has the lowest.

People of Tuvalu

Lying within the tradewind belt, Tuvalu has variable rainfall with an average of 3 000 mm per annum and a mean temperature of 30°C. Because of its low elevation above sea level, Tuvalu is also extremely vulnerable to storm surges and sea-level variabilities.

The mainstay of the Tuvalu economy is international aid. Subsistence activities such as agriculture and fishing support a great majority of the population as well. Tourism also plays a small part in the economy.

There are several resource and environmental issues, common to island nations, affecting sustainable development in Tuvalu. 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 sanitation. Sustainable management of resources such as aggregate, terrestrial and offshore minerals; and renewable energy are other issues in Tuvalu's quest for development.

Aerial photograph of Tuvalu's coast

Tuvalu has been a full member of the South Pacific Applied Geoscience Commission (SOPAC) since 1983. 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 to 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.

Resource Development and Management

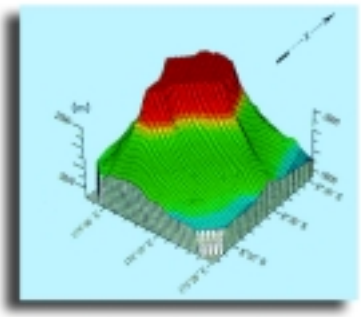
For Small Island Developing States (SIDS), natural resource development and management holds the key to rapid economic development. Unwise exploitation of non-renewable resources and exploitation of renewable resources at a pace higher than the natural rate of replenishment could prove detrimental to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

MINERALS

Tuvalu contains resources that have great potential for development. These range from offshore to terrestrial mineral deposits.

Offshore exploration, which is still at a nascent stage

[1]SPC Demography Programme



Bird's eye view of seamount

in Tuvalu, has shown the extensive presence of deep-sea mineral resources such as cobalt-rich crusts within its Exclusive Economic Zone (EEZ). The future exploitation of these minerals has the potential to provide great economic benefits to the country. Interest has been shown in these findings and a further survey is currently being formulated to assess the scope and potential for development.

In addition to this, several land occurrences of low-grade phosphatic soils have been reported. Extensive surveys and studies to assess the potential of these resources are needed in Tuvalu.

ENERGY

Energy is an essential pre-requisite for economic development as it can raise the quality of life of both the rural and urban populations. Tuvalu depends mainly on imported petroleum products for its energy generation. Motor-vehicle and marine-vessel fuels are also imported, at very high costs.

The use of renewable energy, such as solar power, has been established on the outer islands. This is run by the Solar Electric Co-operative Society Ltd., which came into force in 1984. Solar power contributes to the lighting requirements, communication system and refrigeration of vaccines in clinics and medical centres in the outer islands.

Besides, both the outer-island and urban communities use fuelwood for most of their cooking requirements. However, increasing populations and high costs of imported fuels such as kerosene have led to overexploitation of fuelwood. Thus, efficiency in production, transmission and consumption is essential to optimise available energy sources while new avenues are being explored.

WATER & SANITATION

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

Water is available in Tuvalu as rainwater and groundwater. Rainwater constitutes the main water supply and is collected mainly by roof catchments and stored in tanks. However, the poor quality of tanks, dirty roof catchments and gutters, poor filters on tank inlets and absence of taps all lead to major threats to water quality on Tuvalu.

Groundwater is very limited on the atolls of Tuvalu. It is susceptible to pollution from sewage effluents, manure of animals grazing over groundwater supply areas, solid waste disposal due to limited land area and salt-water intrusion.

Rapid population growth is placing competing demands on already constrained water resources. Only 60 per cent of households have access to piped water in Tuvalu, and all water must be boiled before drinking.

Use of burrow pit for waste disposal

Sanitation on Tuvalu is not controlled. There are no centralised sewerage systems on any of the islands. Septic tanks are fairly common in the urban areas of Funafuti and Vaitupu. These, however, do not perform effectively in the atoll environment. Nutrient-rich waste is quick to enter the groundwater because of the porous nature of the soil and the high water table. However, an AusAid funded project is currently addressing the sanitation problem.

Similarly, pit latrines, where used, will fill up eventually and require new ones, a major problem for these land-scarce atolls. Water-sealed latrines are also common, usually discharging into soakways.

Challenges to Sustainable Development and SOPAC's role in Tuvalu

MINERALS

SOPAC has been assisting Tuvalu in addressing issues related to the development of mineral resources. Assistance has included field surveys, assessment studies, training and workshops.

Deep-sea mineral resources such as manganese nodules and cobalt-rich crusts have great potential and economic significance for future prosperity of Tuvalu. Realisation of the full potential of these resources requires detailed exploration and assessment within the Tuvalu EEZ.

In 1988[2], SOPAC in partnership with Japan conducted a survey, which confirmed the presence of cobalt-rich crusts in the EEZ of the country. Further extension of research is required to assess the potential of this mineral and SOPAC signed another three-year agreement in February 2000.

Adverse social impact and economic redistribution are the biggest concerns arising out of mineral exploration. Offshore mining could unleash a whole new host of problems ranging from the irreversible destruction of the fragile ecosystem to loss of fishing grounds.

Mineral resource development often leaves indelible scars on the fabric of traditional societies through the resultant change in lifestyle, perceptions and values that it inevitably affects. While displacement and compensation for externalities form a complex range of issues on their own, the assignment of pecuniary or economic value to communally owned properties like land has often led to social disharmony. The loss of land or fishing grounds deprives many of their traditional lifestyles and the resultant unemployment catalyses alcoholism, violence and crime in the affected societies. SOPAC understands the impact of these externalities on Tuvalu's goal of sustainable development and has attempted to address them while framing policies. Social cost benefit analysis and social and environmental impact assessments are advocated for all mining projects in Tuvalu.

Aerial view of Tuvalu

SOPAC has also undertaken studies to assess the potential of low-grade phosphatic soils reported in Tuvalu[3]. The investigation identified accumulations of guano-phosphate on several islands of Tuvalu that warrant further investigation for development potential.

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.

ENERGY

Tuvalu is reliant mainly on imported fossil fuels for its energy generation together with resources such as solar energy and fuelwood, which contribute towards a small proportion of the total energy used.

SOPAC has undertaken training workshops to strengthen the country's capacity to plan and manage

[2]JICA/MMAJ Vol. 2 1997

[3]SOPAC Technical Report 57

the energy sector efficiently. To reduce the level of fuel imports, SOPAC has assisted Tuvalu in the identification of renewable energy sources and appropriate energy supply policies.

Owing to the very isolated and dispersed nature of the islands, the supply of conventional energy to the rural areas by urban-based energy utilities is generally uneconomic. For the rural dwellers, energy is often the only hope for improving their standard of living, and hence the government continues to encourage the development of new and renewable alternate forms of energy.

In 1984[4], SOPAC initiated a visual wave-observation program, which focused on obtaining wave data for use in coastal protection, and to study the feasibility of developing wave power as a future energy source. During the course of the project, a special workshop was undertaken to train technical personnel in wave data collection and wave climate. This was aimed at evaluating the technical and economic viability of wave power in Tuvalu.

Wave energy needs further investigation to ascertain its full potential. Proof is also required from developed countries that the technology has been technically and commercially proven, and is economic. To raise awareness in Tuvalu and other SOPAC member countries about the potential of wave energy resources, a regional-level brochure describing the results from the Tuvalu project and its potential was produced.

As the main government centres of Tuvalu continue to develop, so does the demand for electricity and the need to increase the utility's generating capacity. Such increases in generating capacity affect the cost of electricity, which is considered relatively high by developing country standards and costs in neighbouring countries.

Hence, in Tuvalu, opportunities exist for the introduction of supply- and demand-side management programmes that will improve the efficiency of the power utility and the consumer. Energy efficiency can be achieved through the application of predominantly technical programmes for the power utility. For the consumer, educational programmes on the efficient use of electricity will improve energy conservation.

The core energy programme now being delivered from SOPAC continues to provide assistance in the planning and review of the financial, management and institutional structures of the Tuvalu Solar Electricity Co-operative Society (TSECS). Significant recommendations have been provided on how to improve its long-term sustainability[5]. Assistance is also being provided in the development of solar photovoltaic energy as an alternate source of energy for the outer island areas. The implementation of these activities now remains a priority of the Technical Secretariat.

Coast of Tuvalu

The need for Tuvalu to encourage the use of low-emission and renewable-energy technologies is urgent. SOPAC has been encouraging Tuvalu to adopt these alternate energy options as appropriate and also to establish an energy policy statement for the urban and outer-island sectors.

SOPAC continues to provide training in energy planning and technology developments and the provides funding for demonstration projects.

[4]SOPAC Training Reports 54 & 58

[5]Task Profile TU 99.001

WATER & SANITATION

SOPAC has attempted to assist Tuvalu with the water and sanitation issue through field surveys, assessments and capacity building through training programmes.

The main source of potable water for Tuvalu is rainwater. However, storage systems are poorly developed. SOPAC assisted in the construction of 450 ferro-cement tanks under the United Nations Community Development Fund Water Supply Project[6]. This project provided most households with access to freshwater supply capable of lasting through extended periods of drought. Community storage tanks have also been provided for use in dry spells.

There is no systematic disposal of waste material in the islands with the most popular dumping sites being borrow pits and beach areas. The absence of a proper waste-management strategy can have serious health implications due to contamination of freshwater supplies, thus this calls for immediate attention.

SOPAC has assisted Tuvalu in improving its water-quality testing programmes and sanitary practices. Follow-up work has been conducted in promoting affordable waste-management practices such as the reducing, reusing and recycling of waste[7].

Further studies have also been conducted by SOPAC to gather information on water practices and to seek feedback from the community for a Solid Waste Management Plan[8].

Contaminated beach areas

Several workshops have also been organised by SOPAC to evolve strategies on water resource management and development. A workshop on Technologies for Maximising and Augmenting Freshwater Resources in Small Islands was held at the Secretariat in 1996[9]. This workshop contributed towards a Source Book of Alternative Technologies for Freshwater Augmentation in Small Island Developing States to be published by SOPAC in a user-friendly format for application by water sector managers and planners in developing countries like Tuvalu.

During the 1999 World Water Day, SOPAC organised an Essay and Poster Competition for schools. The theme 'Everybody Lives Downstream' helped raise public awareness on the flow-on effects of water pollution and mismanagement. The day also highlighted the need in island nations to manage freshwater resources wisely, and a public forum was organised as well.

In addition to these, SOPAC has been running an Earth Science and Marine Geology Programme for technicians from island nations sine 1979. 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.

CLIMATE & SEA-LEVEL VARIABILITY

Global climate variability may be responsible for increasingly more-frequent and more-severe cyclones, interspersed with scorching droughts. The impact of this variable climate has been harsh on ecosystems and coastal, terrestrial and marine biodiversity. Economically, the impact has translated into decreased agricultural yield, death of livestock and loss of marine biodiversity. As the majority of the people dependent on these sources of income are poor, the poverty implication of variable climate is high.

The Intergovernmental Panel on Climate Change (IPCC) predicts that there will be a 10-30 cm rise in sea-level by the year 2030 and 30-100 cm by the end of the 21st century. This prediction can have serious implications for sustainable development in Tuvalu. Any increase in sea-level as a consequence of global warming will have significant effects on the low-lying atolls of Tuvalu. The atolls will experience accelerated coastal erosion and saltwater intrusion, which will cause even greater scarcity of already limited freshwater resources.

[6]SOPAC Trip Report 183
[7]SOPAC Trip Report 248
[8]SOPAC Trip Report 254
[9]SOPAC Miscellaneous Report 251

In addition, damage to infrastructure by coastal inundation, wave run-up and tidal surges will be tremendous. Islands can be completely destroyed, with resultant loss of lives. The social and economic impact of this on a developing economy is huge, and can lead to persistent poverty.

Although SOPAC has not provided Tuvalu any assistance to date with the issue of climate and sea-level variability, the increasing importance of this issue and its implications to the survival and livelihood of the country will certainly require future assistance from SOPAC. Experience and expertise in coastal management, environmental vulnerability assessment, mitigation and adaptation strategy development are all part of SOPAC's capabilities and technical resources that it is able to provide countries to help address this issue.

COASTAL MANAGEMENT

Tuvalu has a coastline which encompasses extremely limited terrestrial, nearshore and natural resources. There have been rapid changes in the coastal geography associated with exploitation of aggregates such as beach sand and reef coral and blasting of reef passages or boat channels, which have caused coastal instability and beach erosion. Besides, coastal pollution destroys reef biota.

Concrete bricks acting as coastal protection structures

Coastal degradation is an increasing problem in Tuvalu owing to limited understanding of the wave and current pattern around the islands, and the misconception that coasts are inherently and eternally stable. There is urgency for Tuvalu to understand the causes of erosion and the natural dynamics of beaches. This knowledge is essential for implementation of appropriate policies and plans for coastal development and to prevent even further erosion of its already limited and valuable land.

The main sources of sand aggregates for construction activities in Tuvalu are the beaches. Unmanaged sand mining has led to coastal instability resulting in reef degradation and impingement on fisheries. Chronic coastal erosion can also lead to the loss of coastal lands and infrastructure. Even though mining of sand from beaches is banned, insufficient enforcement of laws has led to poor management of the beaches. SOPAC has proposed a beach- profiling and monitoring programme for Niutao[10] and Nukulaelae[11].

Erosion is an increasing problem in Tuvalu

The associated problems relating to the continued exploitation of beach sand in Tuvalu demand immediate address. This requires the assessment of alternative sand aggregate resources and the development of a management strategy to minimise coastal erosion. SOPAC proposes to examine alternative sources of aggregates through geophysical, bathymetric and sediment surveys in Nukufetau and Vaitupu[12].

During World War II, borrow pits were the source of construction materials for building airstrips. In-filling of these pits has been a priority of the Tuvaluan Government in order to provide additional land for various development activities. However, filling these pits requires material, which is in short supply.

SOPAC has been assisting Tuvalu in addressing the coastal-erosion issue through coastal-zone field surveys, coastal-mapping workshops and public-awareness workshops. Some of the key projects undertaken in Tuvalu are:

- Beach-profile and bathymetric survey in 1984[13] to assist in the identification of problem areas along the shoreline and provide estimates of seasonal sediment transport.
- Mapping of sand deposits in the lagoon to assess the quantities and quality of sand resources suitable

[10]Task Profile TV 99.003
[11]Task Profile TV 97.011
[12]Task Profile TV 99.011
[13]SOPAC Technical Report 68 & 69

for in-filling of borrow pits and other low-lying areas, in 1985[14].

- Training workshop in 1987[15] to train technical personnel in air-photo interpretation and carry out beach-profile, lagoon and island-mapping surveys.
- In 1992[16], an in-country seminar was also conducted to reactivate the monitoring of lagoon beaches and carry out regular surveys.
- Survey and baseline study undertaken in 1991[17] to map coastal morphology and identify areas vulnerable to erosion. Further investigation needed to assess the impact of coastal erosion on food resources.

In-country training and seminars continue to be an integral part of SOPAC's assistance for Tuvalu in addressing the coastal-erosion issue. The objectives focus on the development and production of public-awareness materials for use in a national campaign for care and maintenance of coastal areas[18].

Several other studies have been undertaken on the various atolls of Tuvalu to address coastal erosion, sand transport and sedimentation in order to improve coastal management. These consist of studies in Vaitupu and Nukulaelae (1993)[19], Fongafale (1995)[20], Amatuku (1996)[21] and Nukufetau (1996)[22].

Several recommendations have been made by SOPAC to tackle coastal erosion and manage aggregate:

- implementation of appropriate environmental policies and legislation;
- use of advanced technology for shoreline protection;
- identify alternative renewable aggregate sources; and
- increase community awareness of effective coastal protection.

Given the critical importance of sustainable development to Tuvalu, SOPAC will continue to play 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 Tuvalu's pursuit of rapid growth.

Attachment at the Secretariat for Tuvaluan personnel

Several projects have been conducted by SOPAC to improve information systems in Tuvalu. These include fellowship attachments for MapInfo training, and development of information technology strategies in Tuvalu.

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

In 1999, SOPAC was contracted by SPREP to run a GIS workshop in Tuvalu. This workshop provided training in MapInfo and remote sensing tools to the IT personnel in Tuvalu.

[14]SOPAC Technical Report 212
[15]SOPAC Training Report 14
[16]SOPAC Training Report 62
[17]SOPAC Preliminary Report 38
[18]Task Profile TV 99.005
[19]Task Profile TV 97.001
[20]SOPAC Technical Report 238
[21]SOPAC Technical Report 234
[22]SOPAC Technical Report 238

Several fellowship attachments at SOPAC were also undertaken in 1998 and 1999 for Tuvalu nationals. Training in information technology and communication, computer networking, GIS[23], MapInfo[24] and general computing skills was provided.

In addition to this, SOPAC and Forum Fisheries Agency (FFA) have created ITPACNET, a regional annual meeting which aims to standardise information technology and communications between Committee of Regional Organisation in the Pacific (CROP) and the region. This has provided a forum for developing information-technology strategies that would benefit all the member countries including Tuvalu. IT-Pacnet 2000 was held in Tuvalu.

SOPAC is currently developing a strategic implementation plan for a computing Local and Wide Area Network (LAN & WAN) and Internet Service Provider (ISP) for the government of Tuvalu with assistance from UNDP.

Future directions in Tuvalu

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

SOPAC will further its partnership with Tuvalu in developing terrestrial and offshore resources. Policy formulation will be a key area that SOPAC will develop as one of its core professional activities. 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 Tuvalu in creating a national capacity in geo-science.

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 Tuvalu 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 Tuvalu. This can be accessed through the library database, PIMRIS or the Internet. SOPAC holds at its Secretariat:

- Maps of Tuvalu
- Project reports
- Geological samples
- Deep-sea mineral database
- General reference material on Tuvalu

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

For more information please contact:
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Suva, Fiji Islands

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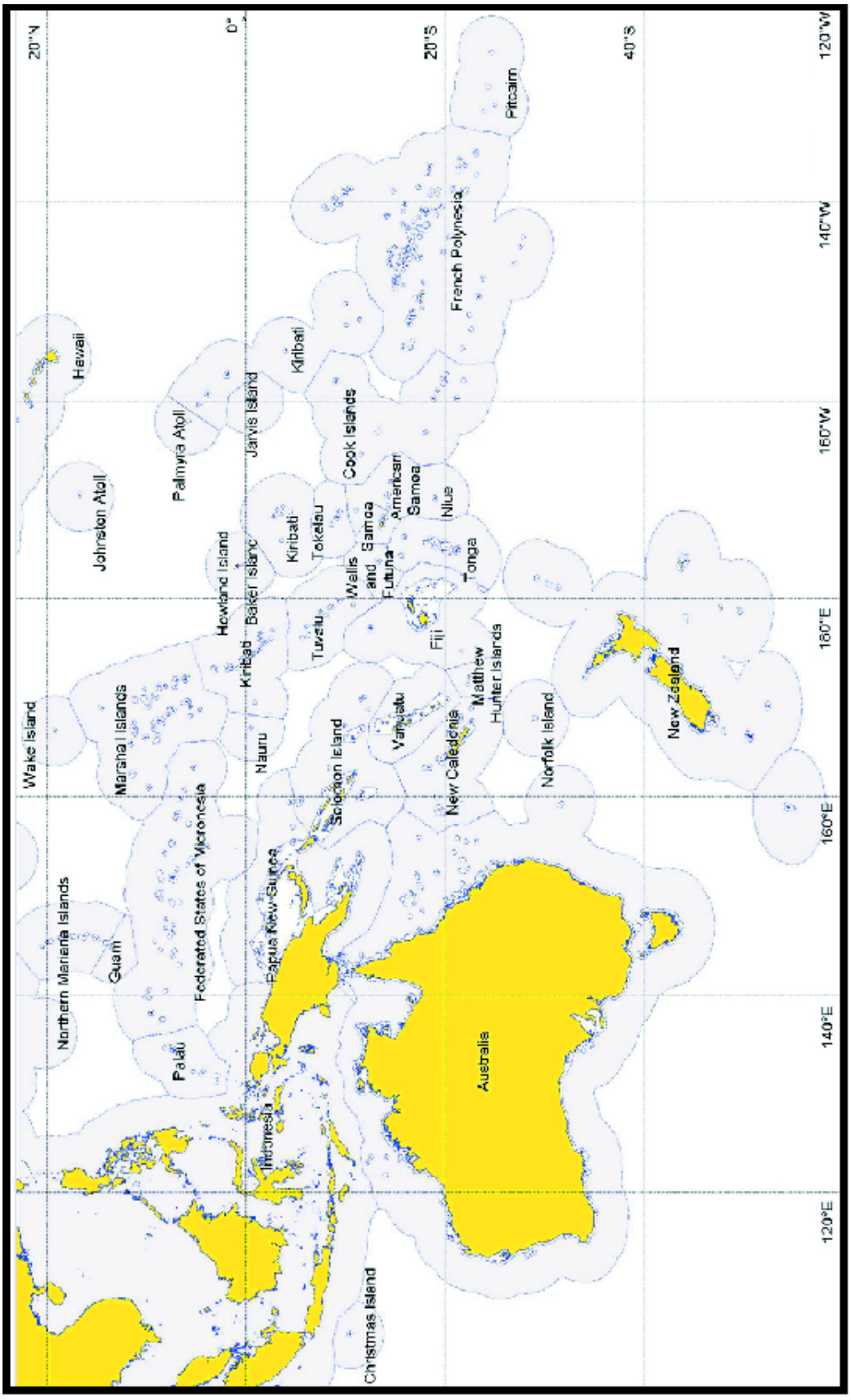
Email : postmaster@sopac.org.fj
Website : www.sopac.org.fj

[23]Task Profile TV 98.010
[24]Task Profile TV 98.004

Issues and SOPAC's Responses for Further Development

ISSUES	CONSTRAINTS	RESPONSES FOR FURTHER DEVELOPMENT
Water & Sanitation	· No surface water and limited groundwater · Inadequate water catchment and storage facilities · Contamination of groundwater by sewage effluents, saltwater intrusion, etc. · Water supply constraints owing to high population growth rate · Water wastage through poor demand and conservation practices · No centralised sewerage systems · Ineffective use of septic tanks, pit latrines and water-sealed latrines · Lack of public awareness of safe sanitation practices	· Development of resource policy and legislation · Advising on the improvement of infrastructure within the water and sanitation sector · Undertaking pilot projects, research and feasibility studies · Increasing public awareness on sustainable water management through training and workshops · Educating the public on safe sanitation and waste-disposal practices at all levels
Coastal Management	· Absence of coastal management plan · Unregulated sand mining · Inappropriate coastal development and protection works · High population growth rate putting increasing strain on coastal areas · Poor awareness of the environmental impacts of coastal degradation	· Implementation of appropriate policies and legislation · Identification of alternative potential aggregate resources using remote- sensing techniques · Educating the local people about coastal degradation and management through workshops and field training
Minerals	· Inadequate scientific research to define full potential of resources	· Assessing the potential of cobalt-rich manganese crusts in Tuvalu's EEZ · Assessing the existence of low-grade phosphatic soils in Tuvalu · Develop resource policy and advice on the management and development of these minerals · Encourage further research
Energy	· Dependence on imported petroleum products placing an increasing strain on the economy · Increasing demand for renewable energy sources due to increasing population · Inadequate public awareness on renewable energy sources and management	· Identification of viable renewable energy sources · Development of appropriate energy policies · Enhancing the skills required by local staff for management and operation of the energy sector through workshops and appropriate training
Information Technology & Communication	· Limited availability and poor access to information · Lack of skilled personnel to manage the IT section · Lack of relevant regional and local data · High costs	· Development of improved software and GIS utilities · Assisting in the development of Intranet and Internet in Tuvalu · Training of local staff in information technology · 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.