



National Tidal Facility

South Pacific Regional
Environment Programme



The South Pacific Sea Level and Climate Change Newsletter

ISSN: 1026-4124

Quarterly Newsletter Vol. 3, No. 1, January 1998



Project update

This issue covers the South Pacific Sea Level and Climate Monitoring Project (SPSL&CMP) project activities from the end of 1997 to early 1998. One important event for the project team from the South Pacific Regional Environment Programme (SPREP) and the National Tidal Facility (NTF) was the appointment of a new Director-designate to the NTF.

The position of NTF Director has been vacant since early April 1997, following the sudden departure of Dr Tad Murty who had held the post for nearly 3 years. Now, the position is about to be filled by the Director-designate Dr Wolfgang Scherer from the United States. Dr Scherer is a world-renowned scientist in the field of sea level research who has been closely associated with the NTF for many years. He is no stranger to the Pacific region, having been involved with the work and meetings of SPREP and the South Pacific Applied Geoscience Commission (SOPAC) for some years now. Recently he took part as a key resource person in round II of the SPSL&CMP short-term training attachment, in May 1997. He has been involved in the US National Oceanic and Atmospheric Administration (NOAA) since 1970 and comes to the NTF from the position of Senior Science (Oceanography) and Technical Adviser for the Office of

*Dr Wolfgang Scherer
Director-designate of
National Tidal Facility*



Ocean and Earth Sciences in NOAA. His responsibilities there ranged from oceanographic sensor development to quality control and assurance of data and products; from doing applied research to advising on

the potential effects of changes in science policy. Dr Scherer is expected to join the project and NTF as early as June 1998. The project team and SPREP extend our belated congratulations to him and look forward to working with him and his management.

The Project Coordinating Committee [PCC] held its 8th Meeting in Port Vila, Vanuatu from 4–6 February 1998 to discuss ongoing activities, oversee and provide guidance to NTF and AusAID which are implementing the project. Mr Henry Taiki, Director of the Vanuatu Meteorological Service, chaired the meeting. Other Vanuatu Government officials in attendance included Mr Wilson Vuti (Deputy Director of Meteorological Services) and Mr Johnson Naviti (Planning Office), Mr Cliff Brock of AusAID, Dr Bob Brook of the Australian Bureau of Meteorology, Prof Roger McLean of the Australian Defence Force Academy, Dr Chalapan Kaluwin, Climate Change Officer of the Project who represented SPREP, Mr John Low of South Pacific Forum Secretariat, Mr Bill Mitchell, acting Director of the National Tidal Facility and the Director-designate of NTF, Dr Wolfgang Scherer. The PCC suggested to NTF a number of important activities that could be implemented for this year. These include:

- i) continue with the training attachments for South Pacific Forum government employees for 1998–99 and invite surveyors only for one of the sessions

Contents

Project Reports

| | |
|--|----|
| Climate Change and Fiji's Sugar Cane Industry | 4 |
| AusAID's Pacific Contribution | 7 |
| A Visit of Pam to Rarotonga | 8 |
| A Closer Look at El Niño | 11 |
| What are the Seven Seas? | 13 |
| PICCAP Progress | 13 |

- ii) display the results and products of the project to the leaders of Forum governments in the Federated States of Micronesia in August 1998
- iii) prepare for the mid-term review of the project to be reviewed by an independent team on the March–April 1998
- iv) complete Parts 1 and 2 of the Curriculum Modules on climate and sea level changes for Pacific high schools

A three-week training attachment course for the Forum countries was successfully organised at the NTF at Flinders University from 13–31 October 1997. This course was part of the South Pacific Sea Level and Climate Monitoring Project's information and training component which aims to enhance the scientific and practical knowledge of meteorologists, environmentalists, hydrographers, technical personnel and surveyors of the Pacific island countries. One of the main objectives of the project is to transfer technology to the Pacific region. At the same time it is our belief that these senior technical people will contribute meaningfully to the development of appropriate policy issues on climate change and sea level rise in future.

The twelve participants in the training course were officially nominated by governments of individual Forum countries. Unfortunately the delegate from the Federated States of Micronesia (FSM) could not attend the training course due to unforeseen family problems at the last moment.

The NTF's founding Director Emeritus Professor G W Lennon, gave the opening address to the participants in the newly refurbished conference room at NTF in Adelaide.

Among the participants (nine male and three female), seven were from meteorological services, three were surveyors and two had technical and environmental backgrounds. Although their backgrounds were diverse, they shared an interest in climate change and sea level issues. During the training course, the Japanese national TV company NHK visited NTF and interviewed resource personnel and the Pacific participants on climate change and sea level issues, for a programme made in connection with the third Conference of Parties to the United Nations Framework Convention on Climate Change (UNFCCC), held in Kyoto, Japan, in December 1997.

The training attachment focused on:

- project data interpretation
- use of computer software
- integrated coastal management

- simple treatment of tides, climate change and ocean circulation
- impact analysis and vulnerability assessment with respect to sea level and climate change

Several other related topics and practical activities were also covered, based upon the background of the participants.

A total of 15 resource personnel from NTF, SPREP, the Australian Defence Force Academy in Canberra, the University of Adelaide and the School of Earth Sciences (Flinders University) assisted in the training course. Practical courses saw the Australian Bureau of Meteorology, LADS (Laser Airborne Depth Sounding), the Department of Coastal Protection and the Airborne Meteorology Group of the School of Earth Sciences explaining and demonstrating their activities to the Pacific visitors. Many thanks are due to all these institutions.

On the closing day, the State Director of AusAID, Ms Carol MacLeod delivered the closing address (see page 7) and presented the course completion certificates to the participants. The NTF's acting Director, Mr Bill Mitchell, officially closed the course after discussing the future plan with the participants. It was evident that the participants not only acquired a great deal of new knowledge from the training attachment, but also enjoyed their stay in Adelaide. The organising committee of the training attachment was elated at the success of the course. We hope to have an equally successful one again in June 1998.

Coming up.....

Other programmes and activities that are planned or ongoing include:

- Planning is now under way for another three-week training attachment, Round IV at NTF. This will run from 1–19 June 1998. As usual a total of 13 candidates from the Forum member countries of the Pacific have been invited to participate in this session. The course content will cover the following topics:
 - (1) Project Data Interpretation
 - (2) Integrated Coastal Zone Management
 - (3) NTF Information System[Real-time Display]

**More detailed information
about the Short-Term Training
Attachment Round IV is available
from NTF and SPREP.
Those who are interested in
attending are requested to approach
their individual government
officials for nomination**

- (4) Use of Information Systems [internet/www/windows 95, etc]
- (5) Simple Treatment on Tides
- (6) Climate Change and Ocean Circulation
- (7) Introduction to Numerical Modelling
- (8) Impact Analysis and Vulnerability Assessment with respect to Sea Level and Climate Change

· Curriculum modules on climate and sea-level changes for schools in the Pacific

During the last quarter, the Climate Change Officer, Dr Chalapan Kaluwin and Training Coordinator, Dr Than Aung finalised Part One (Physical Science) and Part Two (Social Science) of these curriculum modules, designed for upper primary schools and high schools in the Pacific region. Each part is presented in a separate textbook. Part One is now available for distribution, and it is hoped Part Two will be available by June. The textbooks will be sent to Forum and SPREP countries, schools, teachers, and interested groups and communities. It is pleasing to mention that we are already receiving requests for copies of this textbook. We have also received requests for copies of the lecture notes used in the NTF Training Courses.

· Pacific Islands Climate Change Assistance Programme (PICCAP)

The PICCAP project is implemented by SPREP and, like the SPSL&CMP project, covers the Forum island countries. It focuses strongly on training and capacity building and complements SPSL&CMP. A number of people will attend training courses under both programmes.

PICCAP is running two training activities this year:

- i) Greenhouse gas inventory training, held at University of the South Pacific, Suva, Fiji from 13–17 April 1998. Two participants from each of the ten Forum island countries were invited. Resource people came mainly from USP and SPREP.
- ii) Vulnerability assessment and adaptation training: a six-month course will be held at the University of Waikato, Hamilton, New Zealand, from 15 June to 15 December 1998. Nominees from 22 Forum island country governments have been invited to attend this long-term training attachment. The training is closely linked to the sea-level rise project and it is expected that participants will find the course useful and challenging.

PICCAP activities will be reported in this Newsletter from now on.

· 1998 Pacific Regional Conference for Environmental Education and Training

This conference will be held at USP, Suva, Fiji, from 29 June–3 July 1998. The conference theme is “LINKING, LEARNING, LIVING”. More than 300 participants from schools and educational institutions in Pacific countries are expected to attend this conference. The SPSL&CMP project will be represented, providing resources and personnel to conference organisers and displaying its products for teachers and children. During this meeting we will release our curriculum textbook on climate and sea level change.

· Monthly Report on Website.

We are happy to announce that the Monthly Data Report of the South Pacific Sea Level and Climate Monitoring Project is now on the Internet at <http://www.ntf.flinders.edu.au/TEXT/PRJS/PACIFIC/pacific.html>. We will continue to print the same number of copies of the report, to supply libraries, government offices in Pacific island countries, and subscribers who do not have access to the World Wide Web. However, if you now receive your Monthly Data Report from the Internet, and no longer require the mailed copy, we would appreciate it if you could tell us, so we can reduce our printing and postage costs.

· 1998 Tidal Predictions Calendar

These tidal predictions are based upon the sea-level data observed from the SEAFRAME station in individual Pacific island countries. The predictions are valid for the surrounding areas. As readers will be aware, the tidal predictions calendars are user-friendly and an excellent resource material particularly when used in conjunction with fishing, boating and swimming activities. We have a limited number of copies of this calendar remaining. Readers are reminded to contact us if you did not receive a copy or if you want an extra copy of the calendar. The training attachment course has allowed the participants to look at the issue of climate change, sea-level rise and environmental changes at global, regional and national levels. Participants are now starting to appreciate and have a better understanding of the science of climate change, its impacts and how to respond to them. While the collection of scientific data from the tide gauges is a relatively slow process which requires a longer period to allow prediction of the trends of sea level and climate changes at national and regional levels, some governments are thinking of planning for natural variability. This includes cyclones, droughts, storm surges, flooding and El Niño weather patterns, all of which have short-term impacts on the economic, environmental, social and traditional sectors, and which severely affect island countries economies in the long term.

Shifting the cane-fields – climate change and the sugar cane industry *Janita Pahalad*

Miss Janita Pahalad, senior climatologist from Fiji Meteorological in Nadi, Fiji, a technical officer, started to think about planning for climate variability and climate and sea changes as part of her course training. She looked into the subject *Vulnerability of the sugar cane industry to climate and sea changes* with the intention of applying a framework for integrated coastal management. .

This is what she has to write.....

Introduction

The Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report states that by the year 2050, expected global temperature rise will be 1–4 °C and the global sea level rise will be 13–94cm. An update shows that in the Pacific, sea surface temperatures have been rising by 0.1°C per decade and the sea-level rise has been 2mm per year. However, the observed data for 1997 for most Pacific island countries show an annual increase in sea level that is three times greater than predicted sea-level rise. This increase could have been related to El Niño–Southern Oscillation (ENSO) events.

Most Pacific island countries are threatened by inundation, severe flooding, erosion and saltwater intrusion as the climate warms and sea levels rise. Sea-level rise also increases the impact of natural disasters such as tropical cyclones, tsunamis and storm surges on the environment and the economy.

Updated information and guidance on how to cope with climate change and sea level rise should be readily available to PICs in a manner from which they can manage and implement a well planned response strategies. Integrated Coastal Management Planning (ICM) can be an ideal alternative to traditional methods of planning and managing the resources.

Sugar Cane Industry

Sugar is one of Fiji's major exports and it is the second major economic activity. The main sugar cane belt is concentrated in the western parts of Viti Levu and Vanua Levu. Total land area used by the industry is 70,000 hectares producing 450,000 tonnes of sugar annually with annual revenue of \$F270 million. The amount of water available during the maturing period is vital. About 50mm of rainfall is required during April–July. Excessive water

hinders the cane growth, producing sugar of lesser quality and quantity. Sugar cane roots can extend as far as one metre down into the ground, therefore lower groundwater tables are desirable.

The areas of sugar cane belt ranges from three to 26 meters above the sea level, with water tables ranges from three to 13 meters below the surface ground level. It is possible for the water table to rise to the surface if the sea level continues to rise.

South-western parts of Viti Levu have been experiencing sea water intrusion which is polluting the ground water. Sugar cane growth thrives in soil with pH level close to 5.2, and continuous sea water intrusion may alter the pH level.

Goals

- To protect and continue sustainability of the sugar industry by implementing an appropriate integrated coastal management programme.
- To persuade the Government to negotiate with the native landowners and draw an extended lease plan.
- To encourage and maintain interaction between appropriate government departments, Fiji Sugar Corporation (FSC) and sugar cane farmers to obtain optimum benefit, and combat climate change and sea-level rise issues.
- To design a relocation programme to overcome effects of climate change and sea level on the sugar cane industry, and with minimum impact on social, environmental and economical factors.

Issues

- Increased amount of water either from increased rainfall or raised groundwater tables will hinder the quality and the quantity of sugar produced.
- The water table depth differs in each location and is affected by topography and rainfall. The sugar cane belt is mostly located in the low-lying flat areas near the coast in the dry zone.
- Sea water intrusion may alter the pH level of the groundwater.

- Enhanced impact of natural disasters could cause some or complete damage to the sugar plantations.
- Social, cultural, environmental and economic impacts could arise due to any relocation program.
- Current land lease expires in year 2000 and needs to be resolved to allow a long-term plan to be drawn up.

Constraints

- Lack of hydrological data in some parts of the sugar cane belt.
- Climatic and hydrological conditions required to produce the best yield. These conditions are restricted to the current sugar cane belt and relocation may be difficult or limited.
- There may be little or no access to any planned future locations.
- There is little or no public awareness on climate change and sea-level rise.
- Attachment to the land is strong and there is a lack of will to migrate and make a new start.
- There is a lack of expertise and know-how.

Actions

The Ministry of Home Affairs should initiate and set up a working group comprising representatives from FSC, the Hydrology Department, the Fiji Meteorological Service, the Department of Environment, the Budgetary Committee, the Native Lands Trust Board (NLTB) and the Farmers' Union. This group would work together to draw up a protection and rehabilitation plan for dealing with climate change and sea-level rise issues.

The Hydrology Department will need to enhance its study of groundwater in the current sugar cane belt and areas selected by the working group for the future relocation plan. The department will need to build and update its database on water quality and the levels of the groundwater tables in the areas of interest. This data should be readily available to the working group.

The Fiji Meteorological Service should monitor and advise the working group on current and future climate change and sea level rise. The department should also provide climatic data and assistance in selecting the areas for relocation plan.

FSC should further its research into improving particular sugar cane characteristics that could allow adaptation to the changing climate and groundwater conditions. FSC should strengthen its links with private sugar cane farmers by providing advice and assistance on any development that may occur.

The Department of Environment will need to advise the working group on any environmental impacts that may arise due to the relocation programme, and on how to minimise them.

FSC will need to be more involved in providing climate change and sea level awareness programmes, particularly programmes researching how these issues could affect the sugar cane growth. The Fiji Meteorological Service, the Hydrology Department and the Department of Environment must assist by interpreting the above issues in simple or local language.

FSC with assistance from the Fiji Meteorological Service must install new climate stations to collect data in any future planned sites.

The working group should advise the Government of any social, environmental and economical impacts that may arise due to any future relocation program, and design a programme that will minimise or combat such impacts

Budget

The Government Budgetary Committee will need to compile a budget to fund the following:

- Relocation programme—migration and resettling of the farmers, **building new roads and setting up public utilities**
- Regular meetings of the working group
- Updating of hydrological data
- Public awareness programme for the sugar cane farmers and native landowners

FSC must provide the funds for the following:

- Relocation programme—extending its railway network to the new locations
- Public awareness programme for the farmers
- Research programmes

Time-frame

Assuming the worse scenario, a 10-year plan should be drawn with the following deadlines.

- March 1998 — Written contact should be made by the Permanent Secretary of the Ministry of Home Affairs to FSC, Hydrology Department, Fiji Meteorological Service, Department of Environment, Budgetary Committee, NLTB and the Farmers' Union
- July 1998 — Declaration of the working group members. Their first meeting should be held no later than 1 October 1998
- July 2000 — Hydrology Department to present a complete hydrological database of the current sugar cane belt and all future planned areas
- January 2001 — Submission of the first draft of the relocation programme to the Ministry of Home Affairs
- July 2001 — Relocation programme should be finalised
- January 2009 — Completion of the relocation programme



Pacific delegates with some resource personnel in front of NTF.

AusAID Contributes to Pacific Island Countries *C MacLeod*

As we all are fully aware, many Pacific island countries are small island states which are only a few metres above the sea level. They are especially vulnerable to the potential effects of climate change and sea-level rise. Island countries with higher topography are also vulnerable, since most of their infrastructure assets are located along the coast. Various sophisticated numerical models of likely climate change and its consequences predict that sea levels may have risen approximately 50 cm by about the year 2100.

In order to share the grave concerns on climate change with its Pacific neighbours, Australia, through the Australian Agency for International Development (AusAID), is helping Pacific island countries to address the climate change issue in many different ways. Australia genuinely intends to provide options for a better future for the developing countries like Pacific island countries, and to create conditions that will allow Pacific island peoples to succeed both individually and collectively in the different economic sectors.

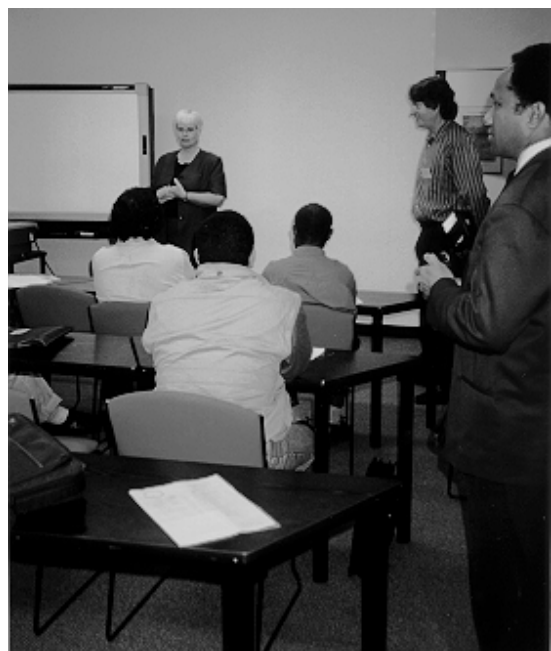
The importance of the Pacific to Australia is quite significant as evidenced by the annual contribution of \$A125 million to sectors such as education and health, and to activities aimed at enabling Pacific island governments to provide better services and policies. The aid programme supports not only projects that directly target climate change and sea level issues, but also broader socio-economic development activities which help Pacific island countries to cope better with climate change. Some projects in the Pacific that contribute directly to climate change abatement and adaptation include the following:

- ◆ Under the South Pacific Sea Level and Climate Monitoring Project, Australia has helped install 11 sea level and climate monitoring stations throughout the Pacific. These stations have been developed to collect and analyse oceanographic and meteorological data to enable Pacific island countries to predict extreme climate events and their consequences and plan to adapt to global warming and sea level rise. A total of 13 Pacific island countries are involved in the project activities.
- ◆ Under the National Forestry and Conservation Action Programme Trust Fund in Papua New Guinea, activities for community conservation, landowner awareness and reforestation are being implemented.
- ◆ Australia also supports the South Pacific Forum Secretariat's Energy Programme which promotes energy efficiency policies and renewable energy technologies.

AusAID, Australia's largest bilateral donor to the Pacific, contributes indirectly to climate change and sea level issues in the Pacific region. This contribution includes improving forestry management, environment planning and coastal management. Australia strongly supports the South Pacific Regional Environment Programme (SPREP) as the prime environment organisation in the South Pacific region.

The present short-term training attachment, Round III, is a major activity of the South Pacific Sea Level and Climate Monitoring Project and is organised by the National Tidal Facility and SPREP. The major responsibility of the participants of this training course is to provide information to policy developers and up-to-date technical information to Pacific island governments to ensure that they are reliably informed. As already witnessed by the Pacific delegates, the quality of these courses, the syllabus structure and the reputation of resource personnel are beyond reproach. On behalf of AusAID and the Australian Government, I would like to congratulate all of you on your hard work and success gained from the training course. I look forward to continuing a warm relationship with Australia's Pacific neighbours which has already been developed through AusAID's South Australia division.

Note: The above article was extracted from the closing address delivered by Ms Carol MacLeod, State Director of AusAID, Adelaide, South Australia, to the short-term training attachment Round III.



Closing Address by Carol MacLeod, State Director of AusAID

Some Features of Project Data

A Visit of *Pam* to Rarotonga

D R Strauss

For the Pacific community, tropical cyclone is a very familiar word. Almost everyone in the Pacific is likely to be affected by a tropical cyclone at least once or twice during their lifetime. By definition, a tropical cyclone can be also called a typhoon (if it occurs west of the dateline) or a hurricane (if it occurs east of the dateline). These large, violent storms can cause terrible destruction. They cause millions of dollars in damages each year through the effects of winds, associated waves, and the elevated sea levels. And yet, believe it or not, tropical cyclones actually provide a valuable service by removing excess amounts of heat in the tropics and transferring it to the mid-latitudes. Tropical cyclones release enormous amounts of energy—typically three to four billion kilowatt-hours of energy each day. An average tropical cyclone precipitates 10 to 20 billion metric tonnes of water every day.

An official definition for a tropical cyclone is that it is a *large cyclonic circulation over tropical waters*. Cyclonic circulation means the winds rotate clockwise about the centre of the storm in the southern hemisphere (and anti-clockwise in the northern hemisphere). Tropical cyclones go through several stages of development and each stage has a name as follows:

Tropical Depression:

a weak cyclonic circulation with maximum wind speeds less than 34 knots [$\sim 17 \text{ ms}^{-1}$]

Tropical Storm:

moderately strong cyclonic circulation with maximum wind speeds between 34—64 knots.

Tropical Cyclone:

strong cyclonic circulation with maximum wind speeds greater than 64 knots

Generally, tropical cyclones require some conditions that take place only in the tropics. Since tropical cyclones receive their energy from heat and moisture, an essential requirement for their formation is that the sea surface temperature should be greater than $26 \text{ }^\circ\text{C}$. Other requirements are that they form within the environments which have:

- (a) pre-existing lower or upper level disturbances,
- (b) little wind shear (changes in wind speed with distance) with height, and

(c) significant horizontal cyclonic wind shear.

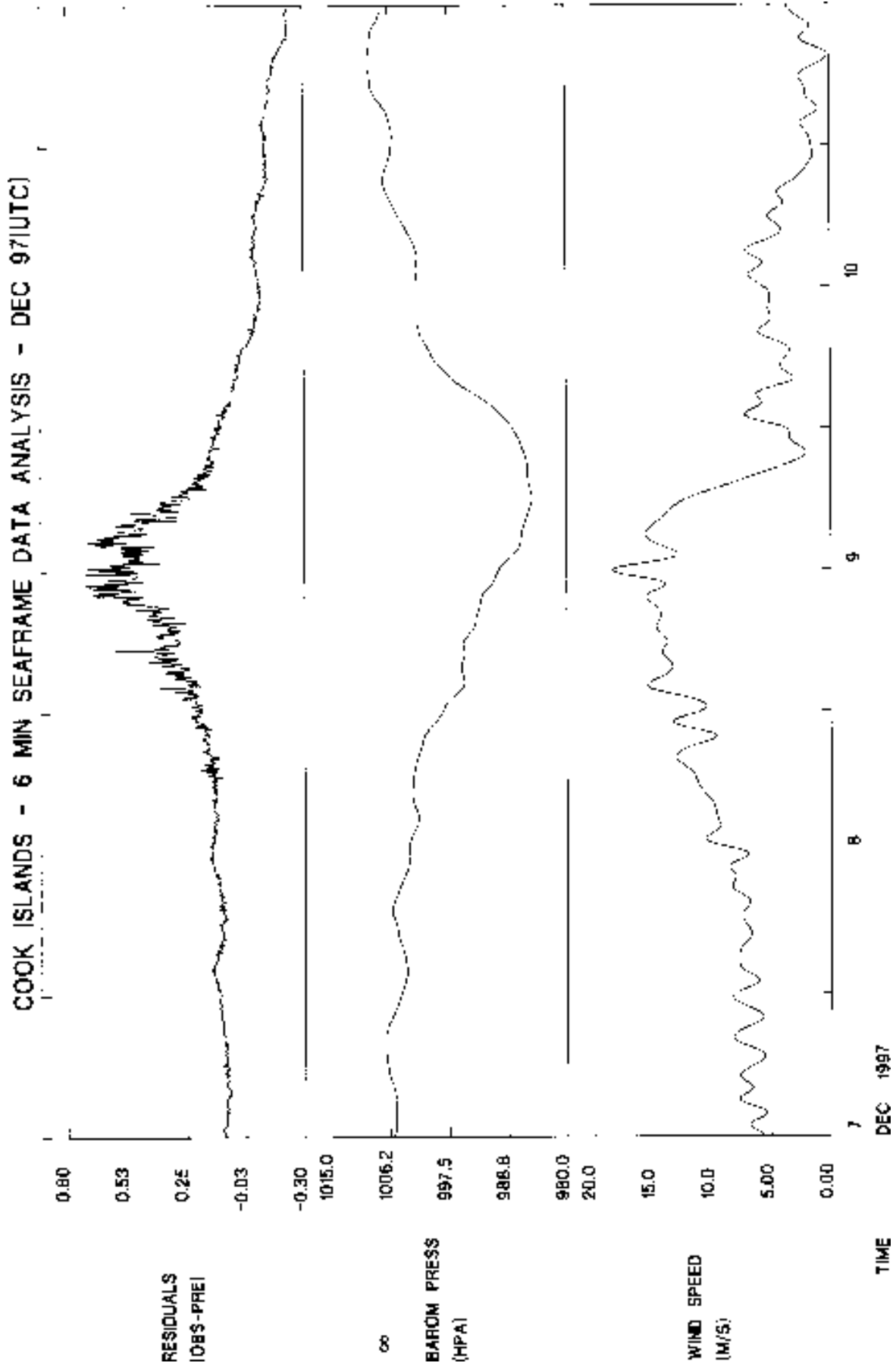
Despite decades of intense research efforts, there are many aspects of tropical cyclones which still cannot be explained, such as their origins or distribution. However, some success has been achieved in predicting the paths of tropical cyclones to warn people in low-lying coastal areas to evacuate to avoid the possible flooding. This may decrease substantially the death toll from tropical cyclones.

Tropical cyclones occur in the South Pacific from December through May when the monsoon trough is in this region. They can also form along the ITCZ (Inter-Tropical Convergence Zone where the trades meet) in the central and eastern-north Pacific. In the central Pacific, they are most likely to occur when an El Niño event is under way.

Moderately strong tropical cyclone Pam visited Rarotonga, Cook Islands during 8–9 December, only a month after the unwanted visit of Tropical Cyclone Martin in early November. Sea level residuals (observed sea level minus normal tides) on these days were approximately 75 cm higher than normal (Figure 1) even though this was a neap tides period, and although the general tidal range in the Cook Islands is the smallest among the project member countries. However, atmospheric pressure during this period was as low as 985 hPa and the pressure effect alone can cause the sea level rise of $\sim 25 \text{ cm}$. At the same time, winds were strong, hourly average wind speed was 15 ms^{-1} and the maximum wind gust went up to 25 ms^{-1} during that period.

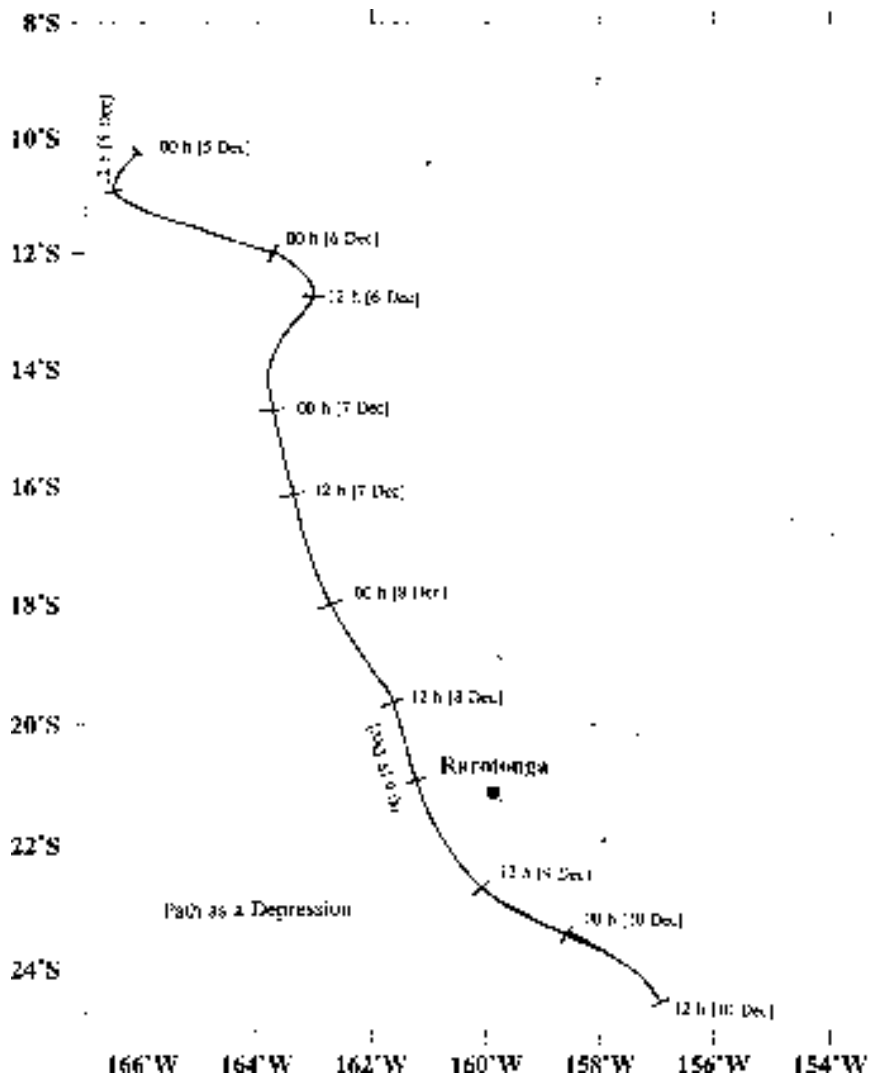
Wind setup and an inverted barometer effect associated with tropical cyclone Pam created a severe storm surge in the Cook Islands (storm surge is more damaging when it occurs during normal high tides). In consequence, there was widespread damage. According to the message from the Director of Cook Islands Meteorological Services, Mr Arona Ngari, even the tide hut (a plastic shelter) for our SEAFRAME gauge was damaged in Rarotonga.

Although the winds of a tropical cyclone can inflict much damage, it is typically the huge waves, high seas, and flooding that accompany these storms that cause most of the destruction. The high winds of a tropical cyclone can generate waves as high as 10–15 metres, which may be felt on distant shores days before the arrival of the storm itself. Although the paths of tropical cyclones are determined by the prevailing wind pattern, the actual path is often erratic. This often makes it very difficult to predict when



and where a tropical cyclone will hit. The path of tropical cyclone Pam shown in Figure 2 was kindly provided by the Fiji Meteorological Service and as you can see, tropical cyclones generated south of the equator travel south (those north of the equator travel north), taking heat away from the equator.

The El Niño signal is currently affecting the economic, environmental and social sectors of South Pacific Forum island countries. It has an enormous economic impact on our small island nations. Fortunately, as this ENSO update explains, the El Niño signal is slowly weakening and normal climatic conditions starting to return.



Note: The author, Mr Darrell R Strauss is a Computing Systems Officer of the South Pacific Sea Level and Climate Monitoring Project with strong interest in oceanography. He is based at the National Tidal Facility. Many thanks are due to Mr Alipate Waqaicelua of Fiji Meteorological Service for the tropical cyclone (TC) path and Dr Than Aung for his help and all other information provided.

A Closer Look at El Niño–Southern Oscillation (ENSO) predictions in the Pacific region

This is an extract on ENSO predictions from the Australia Bureau of Meteorology’s Seasonal Climate Outlook, issued January 1998 (Number 104). It provides some insight into what is happening to the El Niño signal in our region.

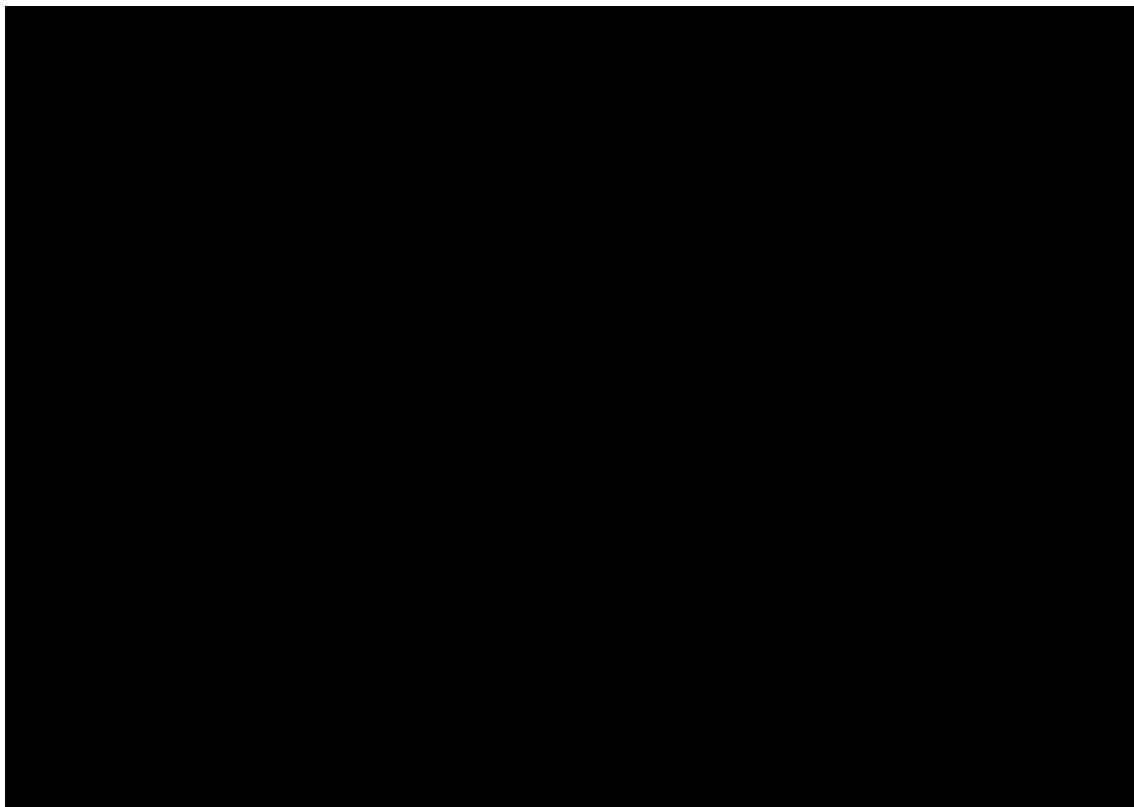
The Southern Oscillation Index (SOI) for December was -9.1, a considerable weakening from the November value of -15.2 and a continuation of the upward trend since the low point of the present phase (-24.1 in June 1997). SOI values have been significantly negative since March 1997. In December, the mean sea level pressure at Darwin was 1008.6 hPa, 1.2 hPa above the long-term average for the month, and at Tahiti the mean sea level pressure was 1010.3 hPa, 0.6 hPa below average. For comparison, during the El Niño of 1982/83, the December 1982 SOI was -21.3, whereas during the La Niña of 1988/89, the December 1988 SOI was +10.8.

Longer-term Perspective

The El Niño pattern of very much warmer than normal waters in the central and eastern equatorial Pacific ocean weakened a little during December, although a large area

of above +30C anomalies persists in the eastern Pacific. Tropical waters surrounding Australia continued to warm quite strongly.

Some guidance for the long-term trend in Sea Surface Temperatures (SSTs) is provided by a Bureau of Meteorology computer model which forecast the change in SSTs in the NINO3 region (see diagram) of the Pacific Ocean. The results of this forecast are shown on the following section. The model’s prediction for June indicates a higher probability of neutral conditions than El Niño conditions, that is, a substantial cooling from the present very high values. Most data from the Pacific indicate that the peak warmth has passed and that the cooling trend has already begun. This is consistent with the rising SOI and the recent rainfall patterns over northern Australia, which have been anything but typical for an El Niño and may be an early indication of a weakening El Niño influence. A re-strengthening of El Niño seems unlikely at this point which means we can be cautiously optimistic about a continued return to more “normal” rainfall patterns during the remainder of summer and into autumn.



Six month El Niño Outlook - valid for June 1998

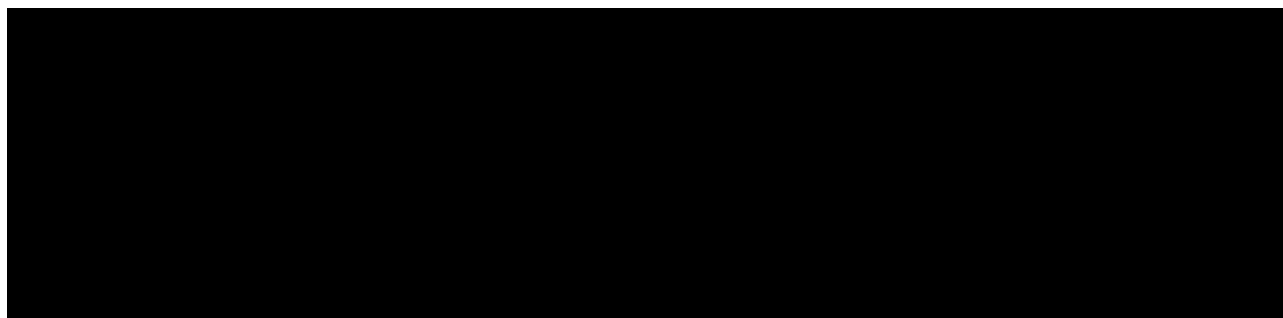
(to assess the chances of El Niño, neutral or La Niña conditions)

The Australian Bureau of Meteorology has developed a computer model to forecast the temperature anomaly (that is, the difference from normal) for the central/eastern equatorial Pacific Ocean. The temperature anomaly is averaged over an expanse of ocean from 150°W to 90°W between 5°N and 5°S, known as NINO3 (see diagram below). This ocean region is important in controlling pacific islands seasonal rainfall and can be indicative of an El Niño.

The model output is best expressed as the percentage likelihood that the temperature anomaly in the NINO3 region will fall within a certain range. The percentage

chance of temperatures being 'near normal' (neutral) for June 1998 in the NINO3 region is 54%, with 45% chance that the temperature anomaly will be more than +1°C ('El Niño'). The model also calculates a 'best estimate' of what the actual temperature anomaly in NINO3 will be. For June 1998, the predicted anomaly is +0.9°C.

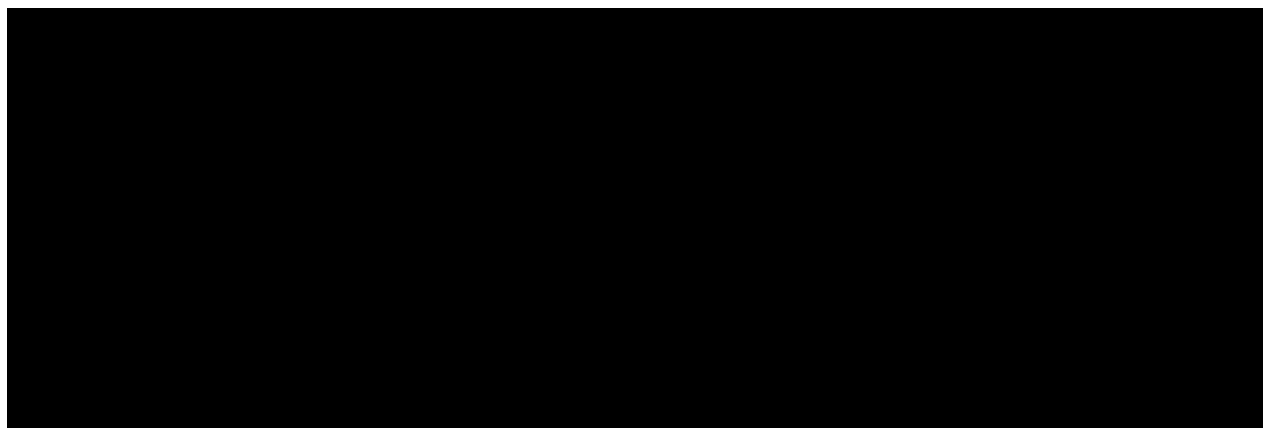
This outlook is updated every month as the computer model is run again. The model continues to predict a cooling trend through most of 1998, and by June the ocean should have cooled to such an extent that neutral conditions are more probable than El Niño. It should be remembered that this sort of model has difficulty predicting for and across the autumn period.



Explanation Of EL Niño And La Niña

El Niño - a sustained warming, in excess of 1°C above normal, of the central and eastern tropical Pacific Ocean, typically centred around the NINO3 region. This warming is usually accompanied by negative values of the SOI, a decrease in the strength of the Pacific trade winds, and a reduction in rainfall over eastern and northern Australia which often results in drought. The recent El Niño began in autumn 1997.

La Niña - a sustained cooling, in excess of 1°C below normal, of the central and eastern tropical Pacific Ocean, typically centred around the NINO3 region. This cooling is usually accompanied by positive values of the SOI, an increase in the strength of the Pacific trade winds, and higher than normal rainfall over eastern and northern Australia, sometimes with serious flooding. The most recent strong La Niña was in 1988/89; a fairly weak event occurred in late 1995 and through much of 1996.



Extracted from "Seasonal Climate Outlook", Number 104, issued January 1998. Bureau of Meteorology, Australia.

What are the Seven Seas?

T H Aung

The ancient Greeks thought of their global ocean as an endless stream surrounding the border of the Earth. Inside this ocean was the sea, namely, the Mediterranean, which was familiar to them as well as to the Romans, who called it *mare nostrum*, or *our sea*. The term *sea* is frequently used interchangeably with *ocean*. For example, we hear of the global sea, the sea around us, and the high seas, etc. But a sea is not strictly the same as an ocean. Among the seas, the name, *Seven Seas* is somehow spectacular.

To the ancients, *seven* often meant *many*, and before the fifteenth century the many seas of the world were seven: the Red Sea, the Mediterranean Sea, the Persian Gulf, the Black Sea, the Adriatic Sea, the Caspian Sea, and the Indian Ocean. Today, when the term *seven seas*, popularised by the British author, Rudyard Kipling, is used at all, the usual designations are the Arctic Ocean, Antarctic Ocean, Indian Ocean, North Atlantic Ocean, North Pacific Ocean, South Atlantic Ocean, and South Pacific Ocean. Thus, the old seven seas are really seven oceans.

Pacific Islands Climate Change Assistance Programme (PICCAP)

A programme to implement the United Nations Framework Convention on Climate Change (UNFCCC) in the Pacific region

The Pacific Islands Climate Change Assistance Programme (PICCAP) is a three-year enabling activity funded by the Global Environment Facility (GEF), implemented by the United Nations Development Programme (UNDP) and executed by the South Pacific Regional Environment Programme (SPREP). Another GEF-funded global programme, CC: TRAIN, implemented by the United Nations Institute for Training and Research (UNITAR) is integrated into PICCAP by SPREP and executed as PICCAP. The Director of SPREP and the Resident Representative of UNDP officially launched PICCAP on 7 April 1997 when they signed the project instruments at SPREP headquarters in Apia, Samoa. The programme became operational on 1 July 1997 with the appointments to the PICCAP management team of a Project Manager Mr. Wayne King (Cook Islands) and a Scientific/Technical Adviser Dr Graham Sem (PNG).

As an integrated programme PICCAP has two main objectives:

- (i) to assist 10 Pacific Island countries that signed and ratified the UNFCCC to meet their reporting and other commitments, and
- (ii) to develop, train and enhance where appropriate the capacities of Pacific Island countries to implement the UNFCCC over the long term.

A number of activities have been planned to be undertaken within each country by national climate change country teams. All countries which are Parties to the United



Signing of PICCAP Agreement by UNDP and

Nations Framework Convention on Climate Change (UNFCCC) are required to:

- undertake an inventory of the sources and sinks of greenhouse gases
- identify and evaluate mitigation options to reduce greenhouse gas emissions
- assess their vulnerability to climate change and develop adaptation options
- submit an initial national communication to the Conference of the Parties, and
- develop a national implementation strategy for mitigating and adapting to climate change over the long term.

Each of these activities has a training component, and where necessary and appropriate training of national experts will be undertaken at either regional or national levels to enhance the completion of these activities.



Meet the Press - PICCAP promotion in SPREP Office

It is important that SPREP invites and coordinates both Niue and PNG programmes so as to exchange resources and experiences.

PICCAP Activities

A number of activities have been completed and planned since PICCAP commenced on 1st of July 1997. These activities are as follows:

(a) *PICCAP Country Missions* – These missions were undertaken by the PICCAP management team to each country between July 1997 and January 1998 to (i) introduce PICCAP to the governments, (ii) hold discussions with relevant government agencies with regard to the signing of MOU, and, (iii) explain and seek government views on how best to implement PICCAP within the country.

The main organisational and operational focal point for national climate change activities is the climate change country team and the climate change country coordinator who have been nominated, appointed and hosted by a national government ministry. The partnership between SPREP as executing agency and each of the PICCAP participating countries is based on the Memorandum of Understanding (MOU) established between the two parties in relation to the implementation of PICCAP. So far all countries (Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Republic of Marshall Islands, Nauru, Samoa, Solomon Islands, Tuvalu, Vanuatu) have signed the MOU, appointed country coordinators and established the country teams to undertake the climate change activities in their own countries.

Country Coordinators

The following persons have been appointed as climate change country coordinators by their respective governments: Kelvin Passfield (Cook Islands); John Mooteb (FSM); Leone Limalevu (Fiji); Nakibae Teuatabo (Kiribati); Humiko Crisostomo (RMI); Joseph Cain (Nauru); Sailimalo Pati Liu (Samoa); Mike Ariki (Solomon Islands); Seluka Seluka (Tuvalu); and Russell Nari (Vanuatu). David Poihega (Niue) and Simon Saulei (PNG) have been appointed by their governments and are not included in PICCAP but their respective climate change programmes have been funded by GEF through the United Nations Environment Programme (UNEP) and UNDP.

(b) *PICCAP Consultation Meeting* – A one-day consultation meeting was held in Noumea, New Caledonia, on 22 August 1997 during the Third SPREP Meeting on Climate Change and Sea-Level Rise in the South Pacific. The purpose of the meeting was to deliver and discuss with government representatives the PICCAP project document, the draft MOU and its implementation strategy. The government representatives were asked by the PICCAP management team to take the documents to their countries for further consultation.

(c) *Regional Meeting of PICCAP National Coordinators* – This meeting was held in Apia, Samoa from January 26–30 1998. The purpose of the meeting was to bring together the national coordinators and to sensitise them to the opportunities and challenges of the UNFCCC in their own countries. The meeting also provided an opportunity for the national coordinators to identify and discuss climate change issues of mutual concern affecting their own countries and the region with other regional and international organizations. Representatives from other regional (SOPAC, USP) and international organisations (UNDP/GEF, UNITAR, UNESCO, WCMC) also attended the meeting.

(d) *Regional Training Workshop on National Greenhouse Gas Inventory Methodology* – This training workshop was conducted at the University of the South Pacific, Suva, from April 13-17 1998, to train Pacific islands national experts in undertaking their national inventories of greenhouse gas sources and sinks. A total

of 23 participants from Cook Islands, FSM, Fiji, Kiribati, RMI, Nauru, Samoa, Solomon Islands, Tuvalu, Vanuatu and Niue attended.

(e) *A six-month training course on climate change vulnerability and adaptation assessment* is planned to commence at the International Global Change Institute (IGCI), University of Waikato, Hamilton, New Zealand on June 15 1998. Participants from 12 countries

including Niue and PNG will attend the course. The course aims to train and enhance the proficiency of participants in undertaking climate change vulnerability and adaptation assessment for their own countries.

For further information contact Dr. Graham Sem, Scientific/ Technical Adviser – PICCAP, South Pacific Regional Environment Programme.



*Opening Speech by
Founding Director of NTF,
Emeritus Professor G.W.
Lennon*

Your Opinion!!!

We are anxious to have feedback from readers on the content and presentation of The South Pacific Sea Level and Climate Change Newsletter.

Is it too technical? Or too banal? What could we do to make it more appealing without increasing production costs? Please spare a few minutes to let us know your constructive opinion.

National Tidal Facility
Flinders University of South
Australia
GPO Box 2100
Adelaide 5001
Australia
Ph: (618) 201 7611
Fax: (618) 201 7523
Email: mota@flinders.edu.au

South Pacific Regional
Environment Programme (SPREP)
PO Box 240
Apia
Samoa
Ph: (685) 21929
Fax: (685) 20231
Email: sprep@samoanet.net

*Technical Editors: C. Kaluwin (SPREP) T. H. Aung (NTF)
Editor: J. Sinclair (SPREP)
Layout: A. Eti (SPREP)*

Air Mail



Printed Matter

South Pacific Regional Environment
Programme (SPREP)
PO Box 240, Apia, Samoa
Telephone: (685) 21929
Fax: (685) 20231
Email: sprep@sprep.org.ws