

# APN FOR GLOBAL CHANGE RESEARCH CAPABLE

## PACIFIC ISLAND TRAINING INSTITUTE ON CLIMATE AND EXTREME EVENTS



**THE UNIVERSITY OF THE SOUTH PACIFIC  
SUVA, FIJI  
15-26 JUNE 2004**

**PART I: RESOURCE MATERIALS**

APN

EAST-WEST CENTER



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*Cover Photo:* Aerial view of Nauru. Photo courtesy of the US Department of Energy Atmospheric Radiation Measurement Programme (US DOE ARM) in the Tropical Western Pacific (TWP).

## **EXECUTIVE SUMMARY**

This course is concerned with the critical examination of the science and policy response to climate variability and change in Pacific Islands. The Course will consist of the following components:

- Climate Variability and Change: An Overview of the Science and Policy Response
- Climate Information and Prediction Services
- Applications of Climate and Prediction Services
- Enhancing communications between users and providers of climate information and services
- Climate Vulnerability and Adaptation and
- Managing Climate Risks

The course is a combination of lectures, hands-on climate forecasting and media training and reviewing findings from latest research on the fundamentals of the science of and policy response measures to climate variability and change in Pacific Islands. It is anticipated that by the end of the course, participants will have an improved understanding of the above topics so they can successfully manage climate and weather sensitive sectors in their respective countries.

## 1.0 INTRODUCTION

This **Booklet: Part I** is one of two booklets prepared for the *Pacific Island Training Institute on Climate and Extreme Events* course to be held from 15 to 26 June 2004 at the University of the South Pacific (USP), Suva, Fiji. It provides *background information* and a *summary of abstracts* on the course topics. **Booklet: Part II** provides the *required readings* for each topic.

## 1.1 PACIFIC ISLAND TRAINING INSTITUTE ON CLIMATE AND EXTREME EVENTS

The *Pacific Island Training Institute on Climate and Extreme Events* is a joint collaboration by USP, the East-West Center (EWC), University of Hawaii (UH) and the New Zealand National Institute of Water and Atmospheric Research Limited (NIWA). The Asia-Pacific Network for Global Change Research (APN) and the U.S. National Oceanic and Atmospheric Administration (NOAA) are the main sponsors of the Institute with additional contributions from USP, EWC and NIWA. Contributions in the form of lectures, climate forecasting and assessment tools and resource materials are provided by a number of other regional partners including the Commonwealth Bureau of Meteorology (BOM), the International Research Institute (IRI) for climate prediction at Columbia University, the Pacific ENSO Applications Center (PEAC), National Meteorological and Hydrological Services throughout the Pacific region, the weather and climate programmes of the Secretariat for the Pacific Regional Environment Programme (SPREP), the risk management and water resource programmes of the South Pacific Applied Geosciences Commission (SOPAC), and other collaborators in the Pacific region.

Small Island Developing States (SIDS), including those in the Pacific region are considered among the most vulnerable to the consequences of climate variability and change and associated extremes:

- Year-to-year variability such as ENSO has significant consequences for Pacific Island nations;
- Economic plans for most Pacific Island nations are dependent on climate-sensitive sectors (e.g., agriculture and tourism) and resources (e.g., coral reefs);
- Water resources are already stressed in many jurisdictions and many low-lying atoll nations are totally dependent on rainfall; and
- Climate-related extreme events such as droughts, floods, tropical cyclones and high temperatures already present significant challenges to public safety and community infrastructure.

According to the 2002 World Disaster Report, the International Federation of Red Cross and Red Crescent Societies, the number of people in the wider Pacific region affected by weather-related disasters has increased from 1.2 million to 18 million over the past 30 years. Droughts make up one of the largest components of such disasters, and the experiences during the 1997-1998 El Niño event highlights the significant consequences that such climate-related extreme events can have for Pacific Island communities. Increasingly, the disaster management community and development organisations like UNDP, ADB, the World Bank and national development

agencies are recognising the importance of managing climate risk as an essential element of comprehensive emergency management programmes and development planning. The potential economic benefits of proactive planning through climate adaptation were reflected in a recent Munich-Re analysis suggesting that the projected costs of damage inflicted by climate change could reach or exceed \$300 billion per year.

The Institute will help create a regional network of scientists, decision makers and institutions skilled in the use of climate information and services to support practical decision-making in key sectors such as agriculture, water resource management, public health and safety, tourism and community planning and resource development.

## **1.2 INSTITUTE OBJECTIVES AND FOCUS**

The overarching goal of the Training Institute is to enhance the regional network of scientists, forecasters, disaster management officials and resource managers skilled in the development and use of climate information to increase the resilience of Pacific Island nations in the face of climate-related extreme events. Through an intensive, two-week program of lectures, small group discussions, training sessions and collaborative research activities, the Institute has been designed to achieve the following learning objectives:

- Increased understanding of the consequences of climate variability and change on communities, businesses and natural resources in the Pacific Islands with a specific emphasis on climate-related extreme events such as droughts, floods, tropical cyclones and high temperatures;
- Increased awareness of and familiarity with available climate forecasting and assessment tools and information services, including forecasts of the El Niño-Southern Oscillation (ENSO) cycle;
- Enhanced understanding of current and potential applications of these tools to reduce climate vulnerability in key sectors, including disaster management, water resources, public health, agriculture, tourism, fisheries and coastal resource management; and
- Exploration of the challenges and opportunities associated with the integration of climate information to support economic development and community planning in the Pacific.

## 2.0 TRAINING SYLLABUS

### DAY 1: Tuesday, 15 June.

#### 0800 – 1030 **OPENING CEREMONY**

Traditional Fijian Kava Ceremony

Welcome, Professor Konai Thaman, Acting Deputy Vice-Chancellor,  
University of the South Pacific

Keynote Speaker, Hon. Banuve, Minister for Agriculture or Minister for  
Environment, Government of Fiji.

Opening Remarks

- Dr Kanayathu Koshy, USP PACE-SD (representing Institute Co-Directors)
- Dr Candyce Clark, NOAA Office of Global Programs
- H.E. Mr. Adrian Simcock, New Zealand High Commissioner to Fiji
- US Ambassador to Fiji
- Regional Organizations (CROP rep, WMO Sub-Regional Office)

#### **GROUP PHOTO**

#### 1030 – 1100 **MORNING TEA**

#### 1100 – 1240 **INTRODUCTIONS**

Institute Director moderates a session during which each participant provides a brief introduction to himself/herself and their expectations (approximately 3-5 minutes each).

#### 1240-1300 **The Training Institute - Ms Eileen Shea, East West Center, Hawaii**

#### 1300 – 1400 **LUNCH**

#### 1400 – 1440 **The Pacific Climate System – Dr Jim Salinger, NIWA, NZ**

An introduction to the key features driving the climate and weather of the Pacific region.

#### 1440 – 1510 **The Impacts of climate extremes on Pacific Islands – Ms Eileen Shea, East West Center, Hawaii**

#### 1510 – 1525 **AFTERNOON TEA**

#### 1525 – 1555 **The El Niño/Southern Oscillation (ENSO) – Ms Ashmita Gosai, NIWA, NZ**

- 1555 – 1625 An overview of present and future climate variability in the Pacific - Prof. Murari Lal, USP, Fiji
- 1625 – 1655 The United Nations Framework Convention on Climate Change – Mr. Penehuro Fatu Lefale, NIWA, NZ
- 1655 – 1725 Climate Vulnerability and Adaptation – Dr Kanayathu Koshy, USP, Fiji
- 1800 – 2000 Ice Breaker Reception**

**DAY 2: Wednesday, 16 June.**

- 0830 – 1000 STATEMENTS OF INTEREST  
Ms Eileen Shea moderates the session where participants provide a brief synopsis on the reasons for wanting to attend this Training Institute, their experiences with climate information and application in the Pacific region, and their plans for using newly-acquired skills in their current positions (build on participants' written statements of interest).
- 1000 – 1015 MORNING TEA
- 1015 – 1200 COMPLETE STATEMENTS OF INTEREST
- 1200 – 1300 LUNCH
- 1300 – 1400 SEASONAL CLIMATE PREDICTION  
The seasonal climate predictions – Dr Simon Mason, IRI, USA
- 1400 – 1430 Pacific ENSO Applications Center (PEAC) – Mr. Jim Weyman, NOAA NWS
- 1430 – 1500 Island Climate Update (NIWA) – Dr Jim Salinger, The Editor, ICU, NIWA
- 1500 – 1530 Enhanced Application of Climate Predictions in Pacific Island Countries - Mr Grant Beard, BOM, Melbourne, Australia
- 1530 – 1545 AFTERNOON TEA
- 1545 – 1615 Seasonal Climate Forecasting in Fiji – Mr Simon McGree, Fiji Met Service, Fiji
- 1615 – 1730 SEASONAL FORECASTING TOOLS AND TECHNIQUES  
Introduction to techniques of downscaling Global Regional Climate Model forecasting to the region of interest. Tropical cyclones, droughts and floods etc. - Dr Simon Mason, IRI, USA

**DAY 3: Thursday, 17 June.**

**Prof. Lal of USP will chair this session**

**0830 – 1000 INTRODUCTION TO SEASONAL FORECASTING TECHNIQUES**

- Ms Ashmita Gosai, NIWA, NZ

Participants will be introduced to the specific forecasting techniques that are widely used for climate forecasting. Basic introduction to steps involved in data analysis for seasonal climate forecasting.

**1000 – 1015 MORNING TEA**

**1015 –1300** Participants investigate statistical techniques available for forecasting using designed exercises. They will explore also explore spatial statistics using Internet based tools like KNMI. Overall, the first part of the exercise will involve investigating relationship between rainfall and temperature and various global climate predictors like Southern Oscillation Index (SOI), NINO region sea surface temperatures (SSTs), equatorial SOI etc.

The second part will involve working with Internet tools like KNMI to investigate relationship between climate and spatial climate predictors like Out-going Longwave Radiation (OLR), global SSTs, global pressure etc.

**1300 – 1400 LUNCH**

**1400 – 1515** This session will introduce participants to simple forecast verification methods that is currently being used for production of climate forecasting in Island Climate Update.

Interactive discussion on seasonal forecasting techniques and verification tools.

**1515 – 1530 AFTERNOON TEA**

**1530 – 1730 SEASONAL FORECAST VERIFICATION**

- Dr Simon Mason, IRI, USA

**DAY 4: Friday, 18 June.**

**0830 – 0900 INTEGRATING TRADITIONAL KNOWLEDGE AND PRACTICES**

A Polynesian perspective of integrating traditional knowledge and practices into Science – Mr Penehuro Lefale, NIWA, NZ

**0900 - 1000** Panel presentations and facilitated discussion of the opportunities associated with more effectively integrating traditional knowledge and practices in the development and application of climate predictions and enhancing resilience in

the face of climate variability and change (Panel TBA) Moderators (Dr Joeli Veitayaki and Mr. Rajendra Prasad, Fiji)

1000 – 1015 MORNING TEA

1015 – 1230 FROM FORECASTING TO APPLICATIONS: USER PARTNERSHIP AND PRACTICAL USES OF CLIMATE INFORMATION (EXPLORING THE FORECASTER-USER PARTNERSHIP AND THE PRACTICAL USES OF CLIMATE INFORMATION)\_

- Moderated by Ms Eileen Shea, EWC, Honolulu, Hawaii

Panel presentations and Group discussions of recent experience in the development and use of climate forecast information to support decision making; importance of understanding the information needs of users; theoretical and practical considerations in establishing collaborative partnerships between the providers and users of climate information; implications of lessons learned for designing future Pacific climate information services.

1230 – 1330 LUNCH

1330 – 1500 IMPROVING COMMUNICATIONS BETWEEN USERS AND PROVIDERS OF INFORMATION – ROLE OF THE MEDIA

Communicating climate forecasts – challenges and opportunities: Improving scientific understanding of media and public communication processes – Dr Jan Sinclair, the University of Auckland, NZ

The overview (Fiji TV, Radio Fiji, USP Journalism Head, Kay Gregory (TVNZ), Jan Sinclair, (Auckland University), Cheryl Anderson (University of Hawaii), Eileen Shea, Jim Salinger, Pene Lefale). Discussions with media (radio, TV and print) on challenges of communicating climate information and forecast to users and public.

The media: the crucial interface: brief initial presentations from media panel on situation from their perspective, then open to group discussion, questions, strategising. Dynamism of media, science/media communication differences, positive communication examples.

1500 – 1515 AFTERNOON TEA

1515 – 1730 IMPROVING COMMUNICATIONS BETWEEN USERS AND PROVIDERS OF INFORMATION – ROLE OF THE MEDIA continues

Climate and media panels: improving interaction between climate forecasters and users of climate information: the media role in informing decision makers.

Panel discussion then group discussion. Agreement on important points to emerge from discussions.

**DAY 5: Saturday, 19 June.**

0830 – 1000 IMPROVING COMMUNICATION BETWEEN USERS AND PROVIDERS OF INFORMATION continues  
The PEAC Experience – Ms Cheryl Anderson, University of Hawaii

**MEDIA TRAINING EXERCISES**

Presentation by media panelists followed by one-to-one training with participants.

Television communication of climate information – Ms Kay Gregory, TVNZ, Auckland, NZ

**INFORMAL DISCUSSIONS**

An opportunity for discussions on course material with lecturers from the first week. There will also be opportunity for participants to focus on improving their statistical seasonal forecasting models.

1000 – 1015 MORNING TEA

1015 – 1200 MEDIA TRAINING EXERCISES

**DAY 6: Sunday, 20 June. FREE**

**DAY 7: Monday, 21 June.**

0830 – 1000 INFORMAL DISCUSSIONS  
An opportunity for discussions on course material with lecturers from the first week. There will also be opportunity for participants to focus on improving their statistical seasonal forecasting models.

1000 – 1010 Introduction to field trip

1010 – 1015 MORNING TEA

1030 – 1600 FIELD TRIP  
– Agricultural Research Institute  
– Verata Village Visit (LMMA-Alifereti Tawake)  
– Navua Town (AIACC Project site-Melchior Mataki)

**DAY 8: Tuesday, 22 June.**

- 0830 – 1000 CLIMATE VULNERABILITY AND ADAPTATION ASSESSMENT IN PACIFIC ISLANDS  
Conveners: Dr Kanayathy Koshy, Dr Jito Vanualailai, Prof. Lal - USP  
Introduction to scenario development, Vulnerability Adaptation Assessment tools (e.g. Cosmic, Maggic/Scengen VandaClim/FijiClim etc.) and programmes (V & A Training) at USP.  
Global and regional climate modelling - The current status of available tools, uncertainties and future prospects (CSIRO)
- 1000 – 1015 MORNING TEA
- 1015 – 1100 GLOBAL AND REGIONAL CLIMATE MODELLING – THE CURRENT STATUS OF AVAILABLE TOOLS, UNCERTAINTIES AND FUTURE PROSPECTS - Dr John McGregor, CSIRO
- 1100 - 1300 CLIMATE CHANGE ADAPTATION–AND ADAPTATION MAINSTREAMING: LESSONS LEARNED FROM VARIABILTY –  
(Chair: R. Chandra or Ms. Pulea, SPREP)  
Conveners: Ms Eileen Shea, Dr Koshy, Dr Mahendra Kumar.  
A discussion on recent national, regional and international discussions/negotiations of how adaptation to climate variability provides insights for enhancing resilience in the long-term (e.g. UNFCCC, WSSD, BPoA+10).
- 1300 – 1400 LUNCH
- 1400 – 1300 OVERVIEW OF CROSS – SECTORAL LINKAGES  
Chair: Prof. Leon Zann, USP  
Panel presentations and facilitated discussions on case studies (SOPAC, SPREP, agricultural, coastal, health, fisheries and water resources). Note: Panel members may be drawn from Institute participants presenting experiences from their own countries.
- 1300 – 1315 AFTERNOON TEA
- 1315 – 1730 SECTORAL CASE STUDIES AND CROSS-SECTORAL LINKAGES continues' Chair: Prof Randy Thaman.

**DAY 9: Wednesday, 23 June.**

0830 - 1730    **NATIONAL CLIMATE COMMUNICATIONS AND ASSESSMENT REPORTS** Chairs: Mr. Epeli Nasome, Dr Russell Howarth, Dr K. Koshy, SPREP  
Panel presentations and facilitated discussion of key findings and issues emerging from drafting of National Climate Communications and Assessment Reports, National Sustainable Development Strategy and National Capacity Self Assessment. Note: Panel members and discussants may be drawn from Institute participants who have been actively involved in these activities in their own countries.

**DAY 10: Thursday, 24 June.**

0830 – 1000    **The Forecasting Game**  
- Ms Ashmita Gosai, NIWA, NZ and Ms Eileen Shea, EWC, Honolulu, Hawaii

Participants will use a designed scenario of a disaster and role-playing exercise amongst various stakeholders involved in disaster forecasters and sectoral decision makers and media. The focus will be on the communication aspect of the development, dissemination and evaluation of seasonal and disaster forecasts to decision makers. The four key players would be national meteorological and hydrological services, sectoral decision makers like water managers etc, the media and technical experts like NGOs, governments etc. (There will be four players in each group)

1000 – 1030    MORNING TEA

1030 – 1300    **The Forecasting Game Cont'd**  
Role-playing group discussions will continue. Each group is expected to prepare 15-minute presentations, which will focus on communication and understanding of information provided, by the disaster forecasters and media. The presentation will also address issues with regards to the actual forecast like timeliness and level of language (of forecast). The presentations will identify advantages and disadvantages of forecast dissemination from a users perspective.

1300 – 1400    LUNCH

1400 – 1500    **The Forecasting Game Cont'd**

1500 – 1530    AFTERNOON TEA

1530 – 1730    **Role-Play Group Presentation**

Informal group presentation based on the role-play exercise with discussions on problems with communication of seasonal forecasts.

**DAY 11: Friday, 25 June.**

- 0830 – 1000 LESSONS LEARNED FROM THE FORECASTING GAME
- 1000 – 1015 MORNING TEA
- 1015 – 1300 MANAGING CLIMATE RISKS IN THE PACIFIC REGION  
Panel presentations and facilitated discussion of Risk Management:
- Pacific experience in climate risk management (participants)
  - Vulnerability and Hazards Assessment in the Pacific - CHARM, Atu Kaloumaira, SOPAC
  - Monitoring sea level changes in the Pacific - Dr Chalapan Kaluwin, AMSTEC, Fiji
  - Climate Risk Management and Sustainable Development – Taito Nakalevu, SPREP
- 1300 – 1400 LUNCH
- 1400 – 1500 NATURAL HAZARDS MITIGATION IN PACIFIC ISLANDS  
A Case Study – risk of natural hazards on vulnerable small Pacific Islands. Group discussions on risk management and response strategies during and after a natural hazard. (SOPAC/ RED CROSS/ DISMAC)
- 1500 – 1515 AFTERNOON TEA
- 1515 – 1730 CASE STUDY continues

**DAY 12: Saturday, 26 June.**

- 0830 – 1000 CASE STUDY GROUP PRESENTATIONS  
Lessons learned and recommended response strategies to climate-related natural hazards
- 1000 – 1015 MORNING TEA
- 1015 – 1100 LINKING CLIMATE SCIENCE TO SOCIETY: A LOOK AHEAD
- 1100 – 1200 TRAINING INSTITUTE INSIGHTS AND RECOMMENDATIONS  
Participants' give resource lecturers on feedback and how the Training Institute can progress in future. Directors of the Institute review lessons learned and next steps.
- 1200 – 1300 CLOSING CEREMONY.

### 3.0 RESOURCE MATERIALS

The resource materials are divided into two parts. Part I provides a compilation of the two page summary in the format: *abstract, objectives, outputs/outcomes, required readings and further readings*, for each topic. Part II provides the *required readings* for each topic (see Booklet II.) Table 1 provides a guide to each lecture. Table 2 gives the list of participants.

**TABLE 1: LECTURE GUIDE**

TOPIC	RESOURCE PERSON/ORGANISATION
<b>3.1 PART 1. CLIMATE VARIABILITY AND CHANGE: AND OVERVIEW</b>	
3.1.1 THE PACIFIC CLIMATE SYSTEM	DR JIM SALINGER, NIWA
3.1.2 THE IMPACTS OF CLIMATE EXTREMES ON PACIFIC ISLANDS	EILEEN SHEA, EWC
3.1.3 AN OVERVIEW OF ENSO	ASHMITA GOSAI, NIWA
3.1.4 AN OVERVIEW OF PRESENT AND FUTURE CLIMATE VARIABILITY IN THE PACIFIC	PROF. MURARI LAL, USP
3.1.5 THE UNITED NATIONS FRAMEWORK ON CLIMATE CHANGE (UN FCCC) AND PACIFIC ISLANDS	PENEHURO F. LEFALE, NIWA
3.1.6 CLIMATE VULNERABILITY AND ADAPTATION	DR KANAYATHU KOSHY, USP
<b>3.2 PART II. CLIMATE INFORMATION AND PREDICTION SERVICES</b>	
3.2.1 SEASONAL CLIMATE PREDICTION	DR SIMON MASON, IRI
3.2.2 THE PACIFIC ENSO APPLICATION CENTER (PEAC)	JIM WEYMAN, NOAA
3.2.3 THE ISLAND CLIMATE UPDATE (ICU)	DR JIM SALINGER, NIWA
3.2.4 ENHANCED APPLICATION OF CLIMATE PREDICTIONS IN PACIFIC ISLANDS	GRANT BEARD , BOM
3.2.5 SEASONAL CLIMATE FORECASTING IN FIJI	SIMON MCGREE, FMS
3.2.6 SEASONAL FORECASTING TOOLS AND TECHNIQUES	DR. SIMON MASON, IRI ASHMITA GOSAI, NIWA
3.2.7 SEASONAL FORECASTING METHODS	DR SIMON MASON, IRI
3.2.8 SEASONAL FORECAST VERIFICATION	DR SIMON MASON, IRI ASHMITA GOSAI, NIWA
3.2.9 INTEGRATING TRADITIONAL KNOWLEDGE AND PRACTICES	PENEHURO F. LEFALE, NIWA
3.2.10 THE CLIMATE FORECASTING GAME	ASHMITA GOSAI, NIWA EILEEN SHEA, EWC
<b>3.3 PART III. IMPROVING COMMUNICATIONS BETWEEN USERS AND PROVIDERS OF CLIMATE INFORMATION AND SERVICES</b>	
3.3.1 FROM FORECASTING TO APPLICATIONS: EXPLORING THE CLIMATE FORECASTER-USER PARTNERSHIP AND THE PRACTICAL USES OF CLIMATE INFORMATION	EILEEN SHEA, EWC
3.3.2 IMPROVING SCIENTIFIC UNDERSTANDING OF MEDIA AND PUBLIC COMMUNICATION PROCESSES	JAN SINCLAIR, UOA

3.2.2 IMPROVING COMMUNICATIONS BETWEEN USERS AND PROVIDERS OF INFORMATION, US-AFFILIATED PACIFIC ISLANDS EXPERIENCE FROM PEAC	CHERYL ANDERSON, UH
3.3.4 TELEVISION COMMUNICATION OF CLIMATE INFORMATION	KAY GREGORY, TVNZ
<b>3.4 PART IV. VULNERABILITY AND ADAPTATION</b>	
3.4.1 GLOBAL AND REGIONAL CLIMATE MODELLING – THE CURRENT STATUS OF AVAILABLE TOOLS, UNCERTAINTIES AND FUTURE PROSPECTS	DR JOHN MCGREGOR, CSIRO
3.4.2 CLIMATE CHANGE ADAPTATION AND ADAPTATION MAINSTREAMING: LESSONS LEARNED FROM VARIABILITY	DR R. CHANDRA, USP EILEEN SHEA, EWC DR KANAYATHY KOSHY, USP DR MAHENDRA KUMAR, USP
<b>3.5 PART V. CROSS-SECTORAL LINKAGES</b>	
3.5.1 OVERVIEW OF CROSS-SECTORAL LINKAGES	PROF. LEON ZANN, USP
3.5.2 SECTORAL CASE STUDIES AND CROSS-SECTORAL LINKAGES	PROF. RANDY THAMAN, USP
3.5.3 NATIONAL CLIMATE COMMUNICATIONS AND ASSESSMENT REPORTS	EPELI NASOME, USP DR RUSSELL HOWARTH, SOPAC DR KANAYATHU KOSHY, USP
<b>3.6 PART VI: MANAGING CLIMATE RISKS IN THE PACIFIC</b>	
3.6.1 VULNERABILITY AND HAZARDS ASSESSMENT IN THE PACIFIC A COMPREHENSIVE HAZARD AND RISK MANAGEMENT (CHARM); A REGIONAL RISK AMAGEMENT GUIDELINE	ATU KALOUMAIRA, SOPAC
3.6.2 NATURAL HAZARDS MITIGATION IN PACIFIC ISLANDS	SOPAC RED CROSS, DISMAC
3.6.3 MONITORING SEA LEVEL CHANGES IN THE PACIFIC	DR. CHALAPAN KALUWIN, AMSTEC
3.6.4 CLIMATE RISK MANAGEMENT AND SUSTAINABLE DEVELOPMENT	TAITO NAKALEVU, SPREP

**TABLE 2: LIST OF COURSE PARTICIPANTS**

<b>NAME</b>	<b>COUNTRY</b>	<b>OCCUPATION</b>	<b>CONTACT DETAILS</b>
<b>MR VAINÉ MOROKOR</b>	COOK ISLANDS	DIRECTOR, NATIONAL DISASTER MANAGEMENT OFFICE	C/- POLICE DEPARTMENT, AVARUA, RAROTONGA, COOK ISLANDS. PHONE: (682) 22499 FAX: (682) 29331 E-mail: <a href="mailto:mack@disaster_management.gov.ck">mack@disaster_management.gov.ck</a>
<b>MR JOHNSON ELIMO</b>	FSM CHUUK	METEOROLOGIST IN CHARGE & OPERATIONAL FORECASTER, US NATIONAL WEATHER SERVICE-PAC. REGION	CHUUK WEATHER SERVICE OFFICE, PO BOX A, CHUUK STATE, FSM 96942 PHONE: (691) 330-2548 FAX: (691) 330-4494. Email: <a href="mailto:johnson.elimo@noaa.gov">johnson.elimo@noaa.gov</a>
<b>MR JAI GAWANDER</b>	FIJI	RESEARCHER, SUGARCANE RESEARCH CENTRE, FSC LTD.	SUGARCANE RESEARCH CENTRE, PO BOX 3560, LAUTOKA, FIJI. PHONE: 666-1839 FAX: 6661082 Email: <a href="mailto:jai@fsc.com.fj">jai@fsc.com.fj</a>
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## **3.1 PART I. CLIMATE VARIABILITY AND CHANGE: AN OVERVIEW OF THE SCIENCE AND POLICY RESPONSE**

### **3.1.1 THE PACIFIC CLIMATE SYSTEM**

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#### **Abstract:**

The Pacific climate system is part of the general circulation of the atmosphere. The South Pacific is set between the equatorial trough where the climate circulation of the northern and southern hemispheres meet, and the anticyclones of the subtropical high pressure belt towards the poles. In the South Pacific, the key climate zones are the intertropical convergence zones, tropical easterlies, south east trade wind belt, the South Pacific Convergence Zone and the subtropical high pressure belts. The annual modulation of these features of the climate circulation gives the seasonal cycle in the South Pacific climates. The Pacific climate system is unique in that there are climate drivers on seasonal to interannual and decadal time scales that modulate the climate system: the well known El Nino/Southern Oscillation, and the recently described Interdecadal Pacific Oscillation. Underneath the seasonal to decadal variability increasing greenhouse gases are causing a warming of the South Pacific climates.

#### **Objectives:**

- Introduce participants to the key circulation features of the Pacific climate system
- Describe seasonal, annual, decadal and longer term climate trends in the Pacific and impacts of global warming on Pacific climates

#### **Outputs/Outcomes:**

- Improved understanding of the key features of the general climate circulation of the South Pacific
- Increased understanding of factors causing variability on all time scales of South Pacific climates, and longer term trends

#### **Required Readings:**

1. Steiner, J.T. 1968 'The climate of the Southwest Pacific Region'. Pages 1-10. New Zealand Meteorological Service Technical Publication No. 166.
2. Salinger, M.J., Allan, R., Bindoff, N., Hannah, J., Lavery, B., Lin, Z., Lindesay, J., Nicholls, N., Plummer, N and Torok, S. 1996. 'Observed variability and change in

climate and sea level in Oceania'. In W.J. Bourma, G. Pearman, M. Manning (eds), *Greenhouse: Coping with Climate Change*, CSIRO, Melbourne, 100-126.

3. Salinger, M.J. 2004. 'Climate variability and change: Past, present and future – an overview.' *Climatic Change* (in press).

### **Further Readings:**

1. Folland, C.K., Renwick, J.A., Salinger, M.J., Mullan, A.B; (2002). 'Relative influences of the Interdecadal Pacific Oscillation on the South Pacific Convergence Zone.' *Geophysical Research Letters*, 29 (13), 21-1-21-4.

2. Folland, C.K., Salinger, M.J., Jiang, N., Rayner, N; (2003). Trends and variations in South Pacific island and ocean surface temperatures. *Journal of Climate* **16**, (17) 2859-2874.

3. Salinger, M.J., Renwick, J. A. and Mullan, A.B. (2001) "Interdecadal Pacific Oscillation and South Pacific climate." *International Journal of Climatology*, 21, 1705-1721.

4. Salinger, M.J.; (2001). Climate variation in New Zealand and the Southwest Pacific. In Sturman, A. P. and Spronken-Smith, R.A. (Eds), *The Physical Environment, a New Zealand Perspective*. Oxford University Press, Melbourne, pp130-149.

### 3.1.2 THE IMPACTS OF CLIMATE EXTREMES ON PACIFIC ISLANDS

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#### **Abstract:**

A number of recent scientific reports on weather and climate make a strong case for studies of extreme events linked to societal vulnerability as a valuable research focus with an emphasis on understanding the decision processes that influence that vulnerability. Understanding and responding to climate-related extreme events was also highlighted as a high priority during the initial U.S. Assessment of the Consequences of Climate Variability and Change for Pacific Islands and is emerging as a priority in planning for the IPCC Fourth Assessment. Increasingly, discussions among national and international development, disaster management and humanitarian relief agencies include focused attention on the importance of climate-related extreme events. Understanding the process of preparing for, anticipating and responding to extreme events can also provide valuable insights into the decision-making context for the development and use of climate information. In addition to the theoretical rationale for a focus on climate-related extreme events, there is a practical reason for choosing extreme events -- the number of people in Oceania affected by weather-related disasters has increased by a staggering 65 times in the past thirty years with droughts, extreme temperature events and tropical cyclones producing the most significant impacts (International Federation of Red Cross and Red Crescent Societies, 2002).

#### **Objectives:**

- Provide an overview of key findings from recent regional and international assessments of the consequences of climate variability and change for Pacific Islands with particular attention to the implications of climate-related extreme events (e.g., droughts, floods, tropical cyclones);
- Explore options for enhancing resilience to climate-related extreme events in key sectors;
- Identify current gaps in understanding and critical information needs.

#### **Outputs/Outcomes:**

- Understanding of the impacts of climate variability and change for Pacific Islands;
- Identification of challenges and opportunities facing Pacific Island governments and communities as they search for ways to reduce climate-related vulnerability;
- Summary of lessons learned and critical issues from experiences in Pacific Island countries represented by participants in the Training Institute.

**Required Readings:**

1. Shea, E. L., et al. 2001. *Preparing for a Changing Climate: The Consequences of Climate Variability and Change for Pacific Islands*. Honolulu: East-West Center. (<http://www2.eastwestcenter.org/climate/assessment>)
2. Hay, John E. et al. 2003. *Climate Variability and Change and Sea-level Rise in the Pacific Islands Region: A Resource Book for Policy and Decision Makers, Educators and Stakeholders*. South Pacific Regional Environment Program.

**Further Readings:**

1. Intergovernmental Panel on Climate Change (IPCC). 2001. *Contribution of Working Group 1 to the Third Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, UK: Cambridge University Press. (<http://www.ipcc.ch>)
2. Watson R.T., Zinyowera, M.C. and R.H. Moss (Eds). 1997. *The Regional Impacts of Climate Change: An Assessment of Vulnerability*. Cambridge, UK: Cambridge University Press. (<http://www.ipcc.ch>)
3. International Federation of Red Cross and Red Crescent Societies, 2002. *World Disaster Report: Focus on Reducing Risk* – Chapter 4. (<http://www.ifrc.org/publicat/wdr2002>)

### 3.1.3 AN OVERVIEW OF THE EL NIÑO/SOUTHERN OSCILLATION

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#### **Abstract:**

Over the last 3 decades, the El Niño phenomenon has received substantial attention throughout the world mainly due to its global impacts. For over half of the last century, climate scientists were baffled by this phenomenon. However, research over last few decades has uncovered many facets of this event, like the physical characteristics and its dynamic effects. Glantz et al (1991) iterate that the El Niño occurrence is now seen as the most prominent source of inter-annual variations in weather and climate around the world.

#### **Objectives:**

- Basic knowledge of El Niño and La Niña
- Understand the El Niño Southern Oscillation development
- Understand impacts of El Niño on global climate system
- Introduction of available global ENSO forecast information

#### **Outputs/Outcomes:**

- Improve understanding of ENSO and its implication on climate systems in the Pacific region.
- Understand the process of El Niño and La Niña – development and decay phases

#### **Required Readings:**

1. Glantz, M, Katz, RW & Nicholls, N (1991). Teleconnections Linking Worldwide Climate Anomalies. Cambridge University Press. (Chapter 2, Chapter 7, Chapter10 and Chapter 17).
2. Kidson, J & Renwick, J A (2002). The Southern Hemisphere Evolution of ENSO during 1981-99. Journal of Climate Vol 15 pp 847-863.

3. Larkin, N K & Harrison, D E (2002). ENSO Warm (El Niño) and Cold (La Niña) Event Life Cycles: Ocean Anomaly Patterns, Their Symmetries, Asymmetries and Implications. *Journal of Climate* Vol 15 pp 1118-1140.

**Further Readings:**

1. Trenberth, K (1997). The Definition of El Niño. *Bulletin of American Meteorological Society* Volume 78, No 12, December 1997.
2. Trenberth, K and Caron, J (2000). The Southern Oscillation Revisited: Sea Level Pressures, Surface Temperatures and Precipitation. *Journal of Climate*, Volume 13.
3. Kidson, J W, Revell, M, Bhaskaran, B, Mullan, B and Renwick, J (2002). Convection patterns in the Tropical Pacific and Their Influence on the Atmospheric Circulation at Higher Latitudes. *Journal of Climate*, Volume 15, January 2002.
4. Folland, C, Renwick, J, Salinger, M and Mullan, A (2002). Relative Influences of the Interdecadal Pacific Oscillation and ENSO on the South Pacific Convergence Zone. *Geophysical Research Letters*, Volume 29, No 13, 10.1029/2001GL014201, 2002.

### 3.1.4 AN OVERVIEW OF PRESENT AND FUTURE CLIMATE VARIABILITY IN THE PACIFIC

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#### **Abstract:**

The key focus of this lecture is to review and assess our current understanding on the variability of the weather and climate over the tropical Pacific region occurring on multi-seasonal, multi-year, multi-decade and even multi-century time scales and have direct impacts on several Pacific island communities causing loss of life, destruction of habitation and loss of food crops.

Variability in weather and climate is pervasive. This variability ranges over many time and space scales, from small-scale weather phenomena such as localized thunderstorms to larger-scale features such as low pressure weather systems (fronts and storms), to even more prolonged features such as droughts and floods, to longer-lived climate phenomenon, to even longer decadal trends such as Pacific Decadal Oscillations. In general, the longer time-scale phenomena are often associated with changes in the atmospheric circulation that encompass areas far larger than a particular affected region. At times these persistent circulation features occur simultaneously over vast areas of the hemisphere, or even the globe, and result in abnormal weather, temperature and rainfall patterns in many regions. The important aspects of interannual variability in weather patterns in PICs are linked to a global-scale, naturally occurring phenomenon known as the El Niño/ Southern Oscillation (ENSO) cycle. There is also strong decade-to-decade variability in tropical Pacific rainfall, which is thought to be an important source of inter-decadal trends for the atmospheric circulation and associated weather patterns. For example, a decadal modulation of inter-annual teleconnections between El Niño events and south Pacific rainfall has been observed. When tropical Pacific SSTs are warm on the decadal timescale, the interannual correlation between El Niño and La Niña events and south Pacific rainfall decreases, with the converse being true during periods of anomalously cold tropical Pacific decadal SSTs. One of the dominant feature of the atmospheric circulation in the southwest Pacific is South Pacific Convergence Zone (SPCZ) whose location varies systematically with ENSO-related expansion and contraction of the west Pacific warm pool and such movements of SPCZ result in large rainfall anomalies in the region on interannual and decadal timescales. Tropical rainfall also exhibits strong variability on sub-seasonal time scales. These fluctuations in rainfall often go through an entire cycle in 30-60 days, and are referred to as "intra-seasonal oscillations" (also known as "Madden-Julian Oscillation" or "MJO").

The MJO is characterized by an eastward progression of large regions of both enhanced and suppressed tropical rainfall, observed mainly over the Indian Ocean and western Pacific Ocean. The anomalous rainfall is usually first evident over the western Indian Ocean, and remains evident as it propagates over the very warm ocean waters of the western tropical Pacific. This

pattern of tropical rainfall then generally becomes very nondescript as it moves over the cooler ocean waters of the central and eastern Pacific but reappears over the tropical Atlantic and Indian Ocean. Each cycle lasts only about 30-60 days. There is a strong year-to-year variability in MJO activity, with long periods of strong activity followed by periods in which the oscillation is weak or absent. This interannual variability of the MJO is partly linked to the ENSO cycle. Strong MJO activity is often observed during weak La Niña years or during ENSO-neutral years, while weak or absent MJO activity is typically associated with strong El Niño episodes. The strongest impacts of intra-seasonal variability associated with MJO on the rainfall in Islands located in western south Pacific occur during the summer months when these islands receive the bulk of their annual precipitation. Of particular concern in Pacific Islands are the extreme precipitation events which are linked to flooding. In the tropical Pacific, summers with ENSO-neutral conditions are often characterized by enhanced 30-60 day MJO activity. In these summers there is a stronger linkage between the MJO events and extreme precipitation events. During La Niña episodes also, many of the South Pacific Islands experience increased storminess, extreme precipitation events and more overall days with measurable precipitation thus enhancing the risk of flooding. However, the relative influences of ENSO and the MJO on the summer precipitation regime of south Pacific Islands are as yet not well understood. The MJO also has a modulating effect on the development of tropical cyclones (particularly for the strongest storms) in western Pacific Ocean by providing a large-scale environment that is favorable for development. The strongest tropical cyclones tend to develop when the MJO favors enhanced precipitation. While this relationship appears robust, it should be noted that the MJO is one of many factors that contribute to the development of tropical cyclones. For example, it is well known that SSTs must be sufficiently warm and vertical wind shear must be sufficiently weak for tropical disturbances to form and persist.

### **Objectives:**

To review data requirements (including the use of satellite-derived data to indicate regions of strong convective activity) and analysis techniques to monitor and study the evolution of intra-seasonal oscillations and interannual variability in rainfall over Pacific Island Countries for prediction purposes.

### **Outputs/Outcomes:**

- Understanding the current knowledge on the relative influences of ENSO and the MJO on the summer precipitation regime of south Pacific Islands.
- Improved understanding on implications for weather and short-term climate variability in the Pacific Island Countries for local adaptation response measures and policies.
- Enhanced knowledge on prediction potential of climate extremes and thus capacity building in protection of life and property in PICs.

## Required Readings:

1. Fedorov, A. V., Harper, S. L., Philander, S. G., Winter, B. and Wittenberg, A. How predictable is El Niño? *Bull. Am. Meteorol. Soc.* 84, 911–919 (2003)
2. Penland, C. & Sardeshmukh, P. D. The optimal growth of tropical sea surface temperature anomalies. *J. Clim.* 8, 1999–2024 (1995)
3. Moore, A. M. and Kleeman, R. Stochastic forcing of ENSO by the intraseasonal oscillation. *J. Clim.* 12, 1199–1220 (1999)
4. Thompson, C. J. and Battisti, D. S. A linear stochastic dynamical model of ENSO. Part I: Model development. *J. Clim.* 13, 2818–2832 (2000)
5. Perigaud, C. M. and Cassou, C. Importance of oceanic decadal trends and westerly wind bursts for forecasting El Niño. *Geophys. Res. Lett.* 27, 389–392 (2000)
6. McPhaden, M. J. and Yu, X. Equatorial waves and the 1997/98 El Niño. *Geophys. Res. Lett.* 26, 2961–2964 (1999)
7. Boulanger, J. P. et al. Role of non-linear oceanic processes in the response to westerly wind events: New implications for the 1997 El Niño onset. *Geophys. Res. Lett.* 28, 1603–1606 (2001)
8. Goswami, B. N. and Shukla, J. Predictability of a coupled ocean-atmosphere model. *J. Clim.* 4, 3–22 (1991)
9. Chen, D., Zebiak, S. E., Busalacchi, A. J. and Cane, M. A. An improved procedure for El Niño forecasting: implications for predictability. *Science* 269, 1699–1702 (1995)
10. Xue, Y., Cane, M. A. and Zebiak, S. E. Predictability of a coupled model of ENSO using singular vector analysis. Part I: Optimal growth in seasonal background and ENSO cycles. *Mon. Weath. Rev.* 125, 2043–2056 (1997)
11. Barnston, A. G., Glantz, M. H. and He, Y. X. Predictive skill of statistical and dynamical climate models in SST forecasts during the 1997/98 El Niño episode and the 1998 La Niña onset. *Bull. Am. Meteorol. Soc.* 80, 217–243 (1999)
12. Kaplan, A. et al. Analysis of global sea surface temperature 1856–1991. *J. Geophys. Res.* 103, 18567–18589 (1998)
13. Chang, P., Ji, L., Li, H. & Flugel, M. Chaotic dynamics versus stochastic processes in El Niño-Southern Oscillation in coupled ocean-atmosphere models. *Physica D* 98, 301–320 (1996)
14. Latif, M. et al. A review of the predictability and prediction of ENSO. *J. Geophys. Res.* 103, 14375–14393 (1998)
15. Zebiak, S. E. & Cane, M. A. A model El Niño-Southern Oscillation. *Mon. Weath. Rev.* 115, 2262–2278 (1987)
16. Cane, M. A., Zebiak, S. E. & Dolan, S. C. Experimental forecasts of El Niño. *Nature* 321, 827–832 (1986)
17. Chen, D., Cane, M. A., Kaplan, A., Zebiak, S. E. and Huang, D. Predictability of El Niño over the past 148 years. *Nature* 428, 733–736 (2004)
18. Folland, C. K., Salinger, M. J. and Rayner, N. A comparison of annual south Pacific island and ocean surface temperatures. *Weather and Climate* 17(1), 23–42 (1997)
19. Salinger, M. J., Basher, R. E., Fitzharris, B. B., Hay, J. E., Jones, P. D., MacVeigh, J. P. and Leleu, I. Climate trends in the south-west Pacific. *Int. Jr. Climatol.* 15, 285–302 (1995)
20. Salinger, M. J., Renwick, J. A. and Mullan, A. B. Interdecadal Pacific oscillation and south Pacific climate. *Int. Jr. Climatol.* 21, 1705–1721 (2001)

### 3.1.5 THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (FCCC) AND PACIFIC ISLANDS

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#### **Abstract:**

The early 1980s alerts of the likelihood of global climate change due to increase concentration of carbon dioxide and other greenhouse gases (GHG) from human activities (burning fossil fuels – coal, oil and natural gas, agricultural practices, land use and land use change and forestry, etc.) led to a wave of international meetings which culminated in the negotiations and ultimately adoption of the United Nations Framework Convention on Climate Change (FCCC) in June 1992 and the Kyoto protocol to the FCCC in December 1997. This lecture examines the key principles, commitments and other issues underpinning the FCCC and Kyoto Protocol from a Pacific Islander's perspective. The lecture summarises the international negotiations under the United Nations to address climate change, key provisions of the FCCC and Kyoto Protocol and how the FCCC impacts on Pacific Islands.

#### **Objectives:**

- Provide a broad picture of the key international efforts to address climate change
- Examine the key principles, commitments and other matters in the FCCC and possible implications on Pacific islands policy formulation.

#### **Outputs/Outcomes:**

- A detailed paper on the history of the FCCC/Kyoto protocol from a Pacific Islander's observations
- Improved understanding of the FCCC/Kyoto protocol from a Pacific Islander's perspective
- Increased awareness of the Pacific Islands' response to climate change
- Participants to share their experience in meeting their governments' national obligations under the FCCC/Kyoto protocol
- Establishing the links between local, national, regional and international responses to address climate change and participants programmes and activities

## Required Readings:

1. Lefale, P.F.: 2004, 'International Environmental Law Making: Observations from the United Nations Framework Convention on Climate Change (FCCC) negotiations', Paper prepared for the APN/USP/NOAA/NIWA Training Institute Workshop on Climate Extremes and Climate Variability, University of the South Pacific (USP), Suva, Fiji, 15-26 June 2004.
2. Schipper, L., 2004.:, 'Climate Negotiations, Doubt and desperation, but not defeat', *Tiempo*, Issue 51, pp 8-12, available at <http://www.cru.uea.ac.uk/tiempo/floor0/recent/>
3. UNFCCC Secretariat, 1992: The United Nations Framework Convention on Climate Change (FCCC), UNFCCC Secretariat, Bonn, Germany. Available online at <http://ww.unfccc.ch/>
4. UNFCCC Secretariat, 1997: The Kyoto Protocol to the UNFCCC, UNFCCC Secretariat, Bonn, Germany. Available online at <http://www.unfccc.ch/>
5. Lefale, P.F., (2003): 'Equity, Climate Change & Sustainable Development', In: World Wide Life Fund for Nature (WWF), Workshop Report "The Kyoto Protocol and Preventing Dangerous Climate Change", Rarotonga, Cook Islands, 22-24 September 2003, WWF Pacific, Suva, Fiji, pp.11-12.

## Further Readings:

1. SPREP, (2000): *Pacific Islands Framework on Climate Variability, Climate Change and Sea Level Rise*, SPREP Secretariat, Apia, Samoa.
2. The United Nations Intergovernmental Lefale, P.F., et al (2002): *Your Passport to Climate Change*, Canadian International Development Agency (CIDA), South Pacific Regional Environment Programme (SPREP)
3. Nurse, L., Sem, G., et al (2001), 'Small Island States', In: *Climate Change 2001, Impacts, Adaptation, and Vulnerability, Contribution of Working Group II to the Third Assessment report of the Intergovernmental Panel on Climate Change (IPCC)*, World Meteorological Organization (WMO) and United Nations Environment Programme (UNEP), Cambridge University Press, Cambridge, UK and New York, USA.

### 3.1.6 CLIMATE VULNERABILITY AND ADAPTATION

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#### **Abstract:**

Current climate scenarios place Pacific Island Countries amongst the most vulnerable to the projected impacts of climate change and variability. The small physical size, isolation, limited natural and human resources, high economic sensitivity, high population growth and poorly developed infrastructure contribute to the vulnerability of these island countries. Any adaptive capacity enhancement must take place through the broad framework of sustainable development taking both environmental and socio-economic considerations into account. Reactive adaptation is often the most expensive, instead proactive measures must be encouraged. Mainstreaming of win-win adaptations ('no-regret' options) which are usually process based and are part of national sustainable development strategies moderate harm and exploit benefits. Risk assessment and management, observational and forecasting capacity enhancement, addressing data and information needs, traditional and modern technology use and overall human and institutional capacity building are an essential part of response measures to climate vulnerability and adaptation. The lecture will highlight Pacific initiatives to address the topic.

#### **Objectives:**

- To discuss Pacific perspectives on Climate change.
- To assess PICs vulnerability to climate change.
- To consider Pacific sensitive and cost effective adaptation options.
- To consider discrete and process based adaptation measures.

#### **Outputs/Outcomes:**

- Improved understanding of climate vulnerability on a sectoral basis
- Better view of adaptation both as a process and as a discrete measure.
- Greater appreciation of adaptation mainstreaming for sustainable development

#### **Required Readings:**

1. Hay, J, Mimura, N., Nunn P., Nakalevu T., Koshy K. Climate Variability and Change and Sea-level Rise in the Pacific Islands region; A resource book for Policy and Decision makers, Educators and other stakeholders. etal SPREP 2003.
2. Koshy K., Philip. L, Capacity Enhancement for the Pacific: TIEMPO, Issues44/45 Sep 2002.

3. Lal. M, Takahashi. K., Future climate changes and its impacts over small island states, Climate research, Vol 19, 2002.

**Further Readings:**

1. Burton. I., We Can, Must, and Will Adapt, Adapting to Climate Change and Variability (file material).
2. Burton. I, Huq. S., Lim. B, etal From Impacts Assessment to Adaptation Priorities: The shaping of Adaptation Policy (file material)
3. IPCC (2001) Impacts, Adaptation, and Vulnerability, Working Group II, Third Assessment; McCarthy. J., Canziani. O., Leary. N., Dokken. D., White. K. (eds) Cambridge University Press, UK.
4. UNFCC National Communications, see <http://www.UNFCCC.int>.
5. Vulnerability and Adaptation to Climate Change: Concepts, Issues and Assessment Methods (file material).
6. UNDP (2001) An Adaptation Policy Framework: Capacity building for Stage II Adaptation (file material).

## **3.2 PART II. CLIMATE INFORMATION AND PREDICTION SERVICES**

### **3.2.1 SEASONAL CLIMATE PREDICTION**

Dr. Simon Mason  
International Research Institute for Climate Predictions (IRI)  
Columbia University  
San Diego  
USA.  
Email:

**Abstract:**

**Objectives:**

**Outputs/Outcomes:**

**Required Readings:**

**Further Readings:**

### **3.2.2 THE PACIFIC ENSO APPLICATION CENTRE (PEAC)**

Jim Weyman  
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Hurricane Centre  
US NOAA NWS  
Honolulu, Hawaii  
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**Abstract:**

**Objectives:**

**Outputs/Outcomes:**

**Required Readings:**

**Further Readings:**

### 3.2.3 THE ISLAND CLIMATE UPDATE (ICU)

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New Zealand  
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#### **Abstract:**

The Island Climate Update (ICU) is a multi-national monthly climate bulletin. Its primary goal is to assist Small Island Developing States of the South Pacific make informed planning and management decisions relating to climate sensitive sectors like agriculture, water, tourism, fisheries, energy through the provision of timely and accurate seasonal climate forecasts. Seasonal to interannual prediction in the six years during and since the 1997/98 El Niño event has become a major research and application issue in the Southwest Pacific. The results so far from the ICU and work have demonstrated unequivocally that short-range climate prediction is achievable with skill. In the Southwest Pacific with the development of the ICU seasonal climate forecasting project useful skill has been achieved in the seasonal forecasting of seasonal rainfall departures and ENSO events with hit rates greater than 70% being achieved in some parts of the region. This new technology offers much promise for disaster preparedness strategies for all end users in the region.

#### **Objectives:**

- Introduce participants to multinational collaboration in the preparation of seasonal to interannual climate forecasts and obtaining Pan-Pacific agreement on trends in ENSO
- Demonstrate the range of techniques used in the preparation of regional climate guidance and attaining consensus

#### **Outputs/Outcomes:**

- Improved understanding of the seasonal climate forecasting processes and developing regional consensus
- Increased regional collaboration in the preparation of seasonal to interannual climate forecasts

#### **Required Readings:**

1. Gosai, A., Lefale, P. and Salinger, M.J. ‘The Island Climate Update.’ *Tiempo, Issue 51*, pp 18-22, available at <http://www.cru.uea.ac.uk/tiempo/floor0/recent/>
2. Salinger, M.J., and Lefale, p. ‘The occurrence and predictability of extreme events over the Southwest Pacific with particular reference to ENSO.’ World Meteorological Organization (WMO) Commission on Agriculture and Meteorology (CAGM) Expert Group Meeting on Reducing the Impact of Natural Disasters and Mitigation of Extreme

Events in Agriculture, Rangelands, Forestry and Fisheries, Beijing, China, 18-20 February 2004.

**Further Readings:**

1. Glantz, M.H., Katz, R.W. and N. Nicholls. 1991. Teleconnections linking worldwide climate anomalies, Cambridge University Press, Cambridge, 535 pp.
2. Goddard, L., *et al.*, 2001. Current approaches to seasonal to inter-annual climate predictions, *International Journal of Climatology* 21: 1111-1152.
3. Hamnett, M., Anderson, C.L. and A. Gosai. 2002. Pacific Islands Summary. Pages 38-42 in *Preparing for El Niño: Advancing regional plans and interregional communication*. International Research Institute for Climate Prediction, New York, USA.

### 3.2.4 ENHANCED APPLICATION OF CLIMATE PREDICTIONS IN PACIFIC ISLANDS

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#### **Abstract:**

In 2001 a needs analysis for strengthening Pacific Islands Meteorological Services found that the majority of National Meteorological Services (NMSs) in the region were struggling, and often failing, to provide basic services for the citizens and industries of their countries. The report identified the need for assistance programs in two clear priority areas, one of which was to enhance seasonal climate prediction services.

The needs analysis report included a project concept to expand and enhance the prudent use of climate predictions. The aim of the project would be to meet the general goals of improving weather and climate services and products to ensure the safety, security and general well-being of the people, and thereby to help achieve sustainable development. In response to this conceptual proposal, the Australian overseas aid and development agency, AusAID, in collaboration with the Australian Bureau of Meteorology developed a project proposal for establishing a climate prediction capacity in participating Pacific Island Countries (PICs). The project, now funded to the level of AUD2.2 million, emphasizes the need to develop a framework for incorporating climate prediction information into planning across a broad range of agencies and industries. To ensure a satisfactory level of confidence in the prediction scheme from the outset, it was seen as essential that it be based on sound science and proven techniques. For this reason the proposed scheme is based on the current operational seasonal climate prediction system used by the Bureau of Meteorology for Australia.

#### **Objectives:**

- Strengthen PICs capacity in climate prediction, through providing proven seasonal prediction system (based on Australian Bureau of Meteorology's operational system), and training in its prudent use.
- Enhance ability of PICs to provide a sustainable climate prediction service to meet needs of users in climate-sensitive industries, through in-country workshops involving NMSs and potential user representatives.

#### **Outputs/Outcomes:**

- At the end of the project implementation, the NMS of each participating country will have software tailored for use in its location, and a thorough understanding of how seasonal climate prediction services can be applied to support climate-sensitive industries.
- Key representatives of climate-sensitive activities (e.g. agriculture, water management, disaster mitigation) will have received training in the effective use of climate predictions in a risk management context.
- Once the information is incorporated into planning and decision-making across a number of agencies and organizations, the wider community will benefit from the improvements that should result.

**Required Readings:**

Pacific Meteorological Services: Meeting the Challenge, published in November 2001 by the South Pacific Regional Environment Programme (SPREP).

### 3.2.5 SEASONAL CLIMATE FORECASTING IN FIJI

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Fiji Meteorological Service  
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#### **Abstract:**

The use and production of climate predictions in the Fiji Islands and Fiji Meteorological Service (FMS) has developed significantly since the 1998 drought. Prior to 1999, FMS had little knowledge of climate prediction and there were no tools to generate these predictions. Predictions during the 1998 drought were issued for upcoming two months and were ‘guessed’ based on the ENSO status. No proper statistical analysis was done probably due to the relationship between rainfall and SOI not being fully realised. Not much importance was given to drought till 1998. Since then the Fiji Meteorological Service has been involved with a number of research projects which include SOI/SST – Rainfall relationships, it presently runs two rainfall predictions models and is involved with the ICU Teleconference/bulletin and uses a number of other tools/sources of ocean/atmosphere information.

#### **Objectives:**

- Overview of the Climate of Fiji especially ENSO-Rainfall relationship
- Explain how the Fiji Meteorological Service deals with ENSO Monitoring and Rainfall Prediction
- Experiences with the presently used Statistical rainfall prediction models and Island Climate Update especially during the 2003 ‘drought’
- Future development and constraints.

#### **Outputs/Outcomes:**

- Describe to PIC participants the Fiji success story with Rainfall Prediction and that with some initial assistance, research and good data they can produce their own Statistical Rainfall Predictions and Drought Prediction Scheme.
- Climate Predictions in the Pacific Islands are very useful but teaching industry to use Climate Predictions will be more difficult than in ‘more-developed’ countries – but it is possible.

#### **Required Readings:**

1. Pahalad, J and McGree, S. (2002). *Rainfall Forecasting and its Applications* (Fiji Case Study). Case study presented as part of Theme 2, Island Vulnerability, at the Pacific Regional Consultation Meeting on Water in Small Island Countries, Sigatoka, Fiji Islands,

29 July - 3 August 2002.

[www.adb.org/documents/events/2002/water\\_small\\_island/Theme2/rainfall\\_fij.pdf](http://www.adb.org/documents/events/2002/water_small_island/Theme2/rainfall_fij.pdf)

2. Pahalad, J. (2003). *Drought Prediction Scheme for Fiji*. 7th International Conference on Southern Hemisphere Meteorology and Oceanography. *American Meteor. Society*. 171-173.

### **3.2.6 SEASONAL FORECASTING TOOLS AND TECHNIQUES**

Dr. Simon Mason  
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Columbia University  
San Diego  
USA.  
Email:

**Abstract:**

**Objectives:**

**Outputs/Outcomes:**

**Required Readings:**

**Further Readings:**

### **3.2.7 SEASONAL FORECASTING METHODS**

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USA.  
Email:

**Abstract:**

**Objectives:**

**Outputs/Outcomes:**

**Required Readings:**

**Further Readings:**

### **3.2.8 SEASONAL FORECASTING VERIFICATION**

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Email:

**Abstract:**

**Objectives:**

**Outputs/Outcomes:**

**Required Readings:**

**Further Readings:**

### 3.2.9 INTEGRATING TRADITIONAL KNOWLEDGE AND PRACTICES

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#### **Abstract:**

Long before the advent of complex numerical climate models, Pacific indigenous communities have used changes in their natural environment to predict changes in weather and climate. This is the focus of this lecture. The main goal of this lecture is to review and assess major developments at the international, regional and local level which, in recent years, have emphasized the importance of incorporating systems of traditional knowledge into contemporary approaches to natural resources management and adaptation. In particular, the lecture examines the findings from a research carried out in New Zealand and Samoa to document traditional knowledge of climate in selected Polynesian communities: Maori and Samoans. As Shea, et al (2001) suggested ‘by exploring traditional knowledge, people and institutions in the Pacific today can perhaps relearn the value of greater personal intimacy with the environment that sustains generations for years and thereby respond more holistically to the cues it continually provides.’

#### **Objectives:**

- Review findings from current traditional indigenous research programmes and activities on weather and climate
- Improved understanding of the value of traditional indigenous knowledge in developing appropriate adaptation response strategies to climate variability and change.

#### **Outputs/Outcomes:**

- Enhanced information on traditional indigenous knowledge programmes and activities currently available in the region.
- Participants to share their own experience on traditional methods of weather and climate forecasting
- Integrate traditional knowledge with scientific knowledge as part of adaptation response strategies.

#### **Required Readings:**

1. Lefale, P.F., and Salinger, M., J.: 2003, ‘The role of traditional indigenous knowledge in improving scientific understanding of weather and climate: The Samoa Experience’, *Climatic Change, An Interdisciplinary, International Journal Devoted*

*to the description, Causes and Implications of Climatic Change*, Kluweer Academic Publishers/Dordrecht, Boston, London.

2. Correa, C. M.: 2001, 'Traditional Knowledge and Intellectual Property: Issues and options surrounding the protection of traditional knowledge; A Discussion Paper' Quaker United Nations Office Geneva (QUNO), Geneva, Switzerland. The document is available in downloadable electronic format from: <http://www.geneva.quno.info/pdf/tkcol3.pdf>
3. Jolly, D., Berkes, F., Castleden, J., Nichols, and the Community of Sachs Harbor., 2002., 'We can't predict the weather like we used to: Inuvialuit Observations of Climate Change, Sachs Harbor, Western Canadian Artic.', in Krupnik, I., and Jolly, D., (eds.), *The Earth is Faster Now, Indigenous Observations of Arctic Environmental Change*, Washington, DC, pp 93-125.

### **Further Readings:**

1. Berkes, F.: 1993, 'Traditional Ecological Knowledge in Perspective.' in Inglis, J.T. (ed). *Traditional Ecological Knowledge: Concepts and Cases*, Ottawa: International Program on Traditional Ecological Knowledge and International Development Research Center, Canada: p3.
2. Berkes, F.: 2001, 'Making Sense of Artic Environmental Change?' In Krupnik, I. and Jolly, D. (eds.), *Navigating Social-Ecological Systems, Building Resilience for Complexity and Change*, Washington, USA, pp 335-349.
3. Brown, G., and Penisimani, 1861-1870.: 1974, *Rev George Brown Papers, Penisimani, Samoan stories, vol. 1, vol. 2, Part A, pp1-132, Part B, pp.1-79*, Council of the Library of New South Wales, Manuscript in the Mitchell Library, CY Reel 181, Filmed by W. &F. Pascoe Pty. Ltd., NSW, Australia, pp1-11.
4. Davis, S.: 1997, 'Documenting Aboriginal seasonal calendar.', in Webb, E. (ed.), *Windows on Meteorology : Australian Perspective*, Commonwealth of Australia, Scientific, Industrial and Research Organisation (CSIRO), CSIRO Publishing, Collingwood, Victoria, Commonwealth of Australia.
5. Meleisea, M.: 1987, *Lagaga, A Short History of Western Samoa*, University of the South Pacific, Oceania Printer, Suva, Fiji.
6. Overton, J., 1999.: 'Sustainable Development and the Pacific Islands' in Overton, J., et al (eds.), *Strategies for Sustainable Development, Experiences from the Pacific*, London, U.K.
7. Pratt, 1862.: *Pratt's Grammar & Dictionary of the Samoan Language*, Reprinted 1960, Printed and Published by the Malua Printing Press, Malua, Samoa.

8. Riedlinger, D., and F. Berkes.: 2000, 'Contributions of Traditional Knowledge to Understanding Climate Change in the Canadian Arctic.' Available online at [http://www.arcus.org/award/pdf/5th\\_pdf/Riedlinger\\_Abstract.pdf](http://www.arcus.org/award/pdf/5th_pdf/Riedlinger_Abstract.pdf) .
9. Solf, George II, and Hunter, H.: 1907, *The Cyclopedia of Samoa, Tonga, Tahiti, and the Cook Islands (Illustrated). A Complete Review of the History and Traditions and the Commercial Development of the Islands, with Statistics and Data never before compiled in a single publication*, Sydney, N.S.W., Australia, pp 11-48.
10. Turner, G.: 1884, *Samoa: A Hundred Years Ago and Long Before*, London Missionary Society, First Printed London 1884, reprinted 1984, 1986, 1989, Institute of Pacific Studies, University of the South Pacific, Suva, Fiji, pp 3-9, 201.
11. Turner, G.: 1861, *Nineteen Years in Polynesia: Missionary Life, Travels, and Researches in the Islands of the Pacific.*, John Snow, Paternoster Row, 1861, London, United Kingdom, pp 245-255.

### 3.1.10 THE CLIMATE FORECASTING GAME

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#### **Abstract:**

Participants will use a designed scenario of a disaster to accomplish a group exercise where decisions would have to be based on current conditions and seasonal climate forecasts. Each group will be comprised of four key players - national meteorological and hydrological services, decision makers like water managers etc, the media and technical experts like NGOs, governments etc. The focus will be on the communication of the dissemination and evaluation of seasonal and disaster forecasts to decision makers.

#### **Objectives:**

- The users of climate information make informed decisions in their respective sector.
- Enhance dialogue between climate forecasters and the users of climate information.
- Involve NGOs, governments and other technical experts in decision making process.

#### **Outputs/Outcomes:**

- A 20 minute presentation based on the discussions in each group which will identify problems and limitations from both user and climate forecasters perspective.

### 3.3 PART III. IMPROVING COMMUNICATIONS BETWEEN USERS AND PROVIDERS OF INFORMATION

#### 3.3.1 FROM FORECASTING TO APPLICATIONS: EXPLORING THE CLIMATE FORECASTER-USER PARTNERSHIP AND THE PRACTICAL USES OF CLIMATE INFORMATION

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##### **Abstract:**

The impacts of the 1997-1998 El Niño, the recent devastation wrought by tropical cyclones and the ongoing work of the Intergovernmental Panel on Climate Change (IPCC) confirm that changes in climate matter to individuals, communities, businesses and governments who call Pacific Islands home. As Charles Morrison, President of the East-West Center, said to participants in a November 2000 Workshop on Climate and Island Coastal Communities:

“Your valuable natural resources, traditional ways of life, critical economic sectors, community support infrastructure and, to a great extent, your future, depend on developing an effective response to the challenges presented by climate variability and change” (Shea, 2001).

Experience over the past decade has helped demonstrate the value of ENSO-based climate forecasts in critical sectors such as disaster management, water resource management, agriculture and fisheries. While acknowledging the anecdotal nature of such knowledge, the U.S. National Research Council’s report entitled “Making Climate Forecasts Matter” points to the usefulness of information on the responses of weather-sensitive sectors and actors to past climate forecasts as a guide to the future use of climate forecasts (National Research Council, 1999). Exploring these experiences also provides valuable insights into the central importance of establishing and sustaining a collaborative partnership that effectively engages both the providers of climate information and the users of that information in a process of shared learning and joint problem-solving (what social scientists would call the “co-production of knowledge”).

##### **Objectives:**

- Explore lessons learned from recent Pacific Island experience with the development and application of ENSO-based climate forecasts including:
  - disaster risk management and hazard mitigation approaches during the 1997-1998 El Niño for clients of the Pacific ENSO Applications Center (PEAC);

- exploration of climate forecast applications in support of agriculture and the sugar industry in Fiji; and
  - similar experiences in other Pacific Island countries represented by Training Institute participants.
- Understand these Pacific Island experiences in the context of broader regional and international efforts to understand how climate forecast information has been and can be used to improve decision making and enhance resilience;
  - Identify some of the characteristics shared by successful climate forecast applications efforts;
  - Explore the benefits of participatory processes in the development and use of climate forecast information; and
  - Investigate the implications of lessons learned for the establishment of effective Pacific Island climate information system(s).

### **Outputs/Outcomes:**

- Increased understanding of the implications of climate variability for critical sectors and enhanced knowledge of current and potential uses of climate forecasts to support decision making;
- Development of theoretical and practical guidelines for use in designing future programs in climate forecast applications and information services; and
- Shared insights into the challenges and opportunities associated with supporting local, national and regional climate information services.

### **Required Readings:**

1. Hamnett, M., C.L. Anderson, and C.P. Guard. 2000. *The Pacific ENSO Applications Center and the 1997-98 ENSO Warm Event in the US-Affiliated Micronesian Islands: Minimizing Impacts through Rainfall Forecasts and Hazard Mitigation*. Honolulu: Pacific ENSO Applications Center as a report presented to the National Oceanic and Atmospheric Administration's Office of Global Programs.
2. Kaloumaira, A. 2001. "Fiji Experience" in Mickey Glantz, *Once Burned, Twice Shy*. United Nations University.
3. Shea, E. and A. R. Subbiah. 2004. *Symposium on Climate and Extreme Events in Asia-Pacific: Enhancing Resilience and Improving Decision-Making*. East-West Center. (<http://www.eastwestcenter.org>)
4. Glantz, M. 2001. "Overview" in Mickey Glantz, *Once Burned, Twice Shy*. United Nations University.

**Further Readings:**

1. National Research Council. 1999. Summary and Chapters 1, 2, 3 and 4 in *Making Climate Forecasts Matter*. Washington, DC: National Academy Press.
2. Shea, E. L., et al. 2001. *Preparing for a Changing Climate: The Consequences of Climate Variability and Change for Pacific Islands*. Honolulu: East-West Center.  
(<http://www2.eastwestcenter.org/climate/assessment>).
3. Gosai, A., Pahalad, J., Koshy, K., Gawander, J., 2002. *ENSO Impact on Sugar Cane in Fiji*, NOAA report. Available from Fiji Meteorological Service, Nadi, Fiji.

### 3.3.2 IMPROVING SCIENTIFIC UNDERSTANDING OF MEDIA AND PUBLIC COMMUNICATION PROCESSES

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#### **Abstract:**

An MA thesis analysis of scientific and governmental reports investigating how science could improve its communication with the public reveals that while all reports acknowledge that the public obtain most of their scientific information from the media, the media are not mentioned in any of the reports' conclusions or recommendations. The absence of a key player from strategies to improve science communication is likely a significant reason why opinion polls in the UK and the US (MORI and National Science Foundation) show substantial public and scientific dissatisfaction with current attempts to communicate scientific information to the public. The analysis suggests also that science does not understand the processes of public discourses which shape understanding and opinions of any issue. It shows that science tends to treat media and public as passive entities which absorb all information presented by scientists. In reality, the media, by definition, mediate. Scientific information must be translated to be comprehensible to the public. Moreover, public consumption of any information is active, depending on an individual's prior interests and experience, and on the attention being paid at the time. Media and cultural studies theory suggests significant differences between the scientific and media modes of communication. Science prefers cognitive language and closed meanings. The popular media, on the other hand, aiming to attract as wide as possible an audience, prefer open meanings, and affective language which appeals to people's emotions, intuitions and life experience. Improved scientific understanding of these processes could improve communication of science to the public.

#### **Objectives:**

- Review findings of analysis of official scientific and governmental investigations into improving science communication
- Discuss media and cultural studies theories which explain some differences between science and media modes of communication
- Discuss research into public discourse processes
- Strategise to improve participants' understanding and use of the media

#### **Outputs/Outcomes:**

- Participants share experience of communicating via the news media
- Participants improve understanding of media communication modes
- Participants strategies on ways of including the media in plans to improve dissemination of scientific information
- Participants use news media more satisfactorily in future, to communicate scientific information
- Public receives more comprehensible information

### **Required Reading:**

1. Jan Sinclair. The media: a key tool in communicating science to the public. APN Newsletter Vol 10 No 2 April 2004. Available at <http://www.apn.gr.jp/indexe.html>

### **Further Readings:**

1. Ang, I. (1991). *Desperately Seeking the Audience*. London, New York: Routledge.
- Condit, C. M., Parrott, R., & Harris, T. M. (2002). Lay Understandings of the relationship between race and genetics: Development of a collectivized knowledge through shared discourse. *Public Understanding of Science*, 11(4), 373-387.
2. Cronin, K., & Marchant, J. (2002). *Towards dialogue in science communication: Research report for the Royal Society of New Zealand*, from <http://www.rsnz.govt.nz/news/talks/media/ScienceCommunication.pdf>
3. Doble, J. (1994). Public opinion about issues characterized by technological complexity and scientific uncertainty. *Public Understanding of Science*, 4(2), 95-118.
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5. Fiske, J. (1987). *Television Culture*. London and New York: Methuen.
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7. Goleman, D. (1996). *Emotional intelligence: why it can matter more than IQ*. London: Bloomsbury.
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10. Grove-White, R., Macnaghten, P., Mayer, S., & Wynne, B. (1997). *Uncertain World: Genetically Modified Organisms, Food and Public Attitudes in Britain* (Web page): Economic and Social Research Council Global Environmental Change Programme.
11. Habermas, J. (1979). *Communication and the evolution of society* (T. McCarthy, Trans.). Boston: Beacon Press.
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20. Morley, D. (1992). *Television, Audiences and Cultural Studies*. London, New York: Routledge.
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22. Nelkin, D. (1987). *Selling Science: how the press covers science and technology* (1995 ed.). New York: W H Freeman and Company.
23. Page, B. I., & Shapiro, R. Y. (1992). *The Rational Public: Fifty years of trends in Americans' policy preferences*. Chicago, London: The University of Chicago Press. Science Media Centre. (March 2002). *Consultation Report*, from <http://www.sciencemediacentre.org/aboutus/consultationreport.html>

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25. Watson, J. (1998). *Media Communication: An introduction to theory and process*. London: Macmillan.

### 3.3.3 IMPROVING COMMUNICATIONS BETWEEN USERS AND PROVIDERS OF INFORMATION, US-AFFILIATED PACIFIC ISLANDS EXPERIENCE FROM PEAC

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#### **Abstract:**

Experiences from the Pacific ENSO Applications Center before, during, and following the 1997-98 ENSO warm event demonstrate the importance of communications in dealing with the impacts. Communications involve the available infrastructure, the tools and products providing information, and the methods and ways that we communicate. By broadly conceptualizing what we refer to in communications, we realized that we had a wide range of options for communicating climate forecast information in the US-affiliated Pacific Islands, extending into concepts of using indigenous methods of communication and understanding access to information to broaden participation in dealing with impacts of extreme climate events.

#### **Objectives:**

- Review lessons learned from communication of climate forecast information during the 1997-98 ENSO warm event for the clients of the Pacific ENSO Applications Center
- Consider a broad range of communication methods in the Pacific Islands
- Consider access to information and participatory planning needed to build appropriate risk management strategies.

#### **Outputs/Outcomes:**

- Broader conceptualization of communications methods, tools, and infrastructure in the Pacific Islands and the ways that these can all be used interchangeably depending on what we want to communicate.
- Increased awareness on who gets information in their communities and how information is understood and applied.

#### **Required Reading:**

Anderson, C.L. 2003. Communication and Participation in the Pacific: Lessons for Adaptation to Climate Change and Variability. Background paper for "Insights and Tools for Adaptation: Learning from Climate Variability" sponsored by the US NOAA Office of Global Programs, 18-20 November 2003, Washington, D.C.  
<http://www.climateadaptation.net>.

### 3.3.4 TELEVISION COMMUNICATION OF CLIMATE INFORMATION

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#### **Abstract:**

The art of conveying accurate climate information through the media of television requires skilled interactions between climate scientists and media professionals. Information has to be timely, yet understandable to a large viewing audience. The information required has to be clear with a definite message. The information requires a strong story line, appropriate visual information to convey the message and understandable climate information that the television journalist can voice over. Interaction between the climate scientist and journalist during the preparation of the information to be broadcast is essential to ensure that accurate information is disseminated, and that understandable climate information is prepared for the public. Improved understanding of the critical scientist/journalist interactions in the preparation of climate information and stories for television media can only improve the mainstreaming of climate information to the public.

#### **Objectives:**

- Review the ingredients of preparation of television tracks on weather and climate
- Discuss the scientist/journalist relationships required for good communication
- Improve familiarity in the preparation of television items on climate

#### **Outputs/Outcomes:**

- Participants share experience of communicating via the television media
- Participants improve understanding of television communication
- Participants receive media training for television tracks on climate
- Public receives more comprehensible climate information

#### **Required Readings:**

1. Gascoigne, T and Metcalfe, J. 1997. 'Incentives and impedimenta to scientists communicating through the media'.  
<http://www.usyd.edu.au/su.fasts/1997/GascoigneMetcalfe.html>
2. Gascoigne, T. 1996. 'Why scientists should communicate.'  
<http://www.asc.asn.au/commun/why.html>

3. Davidson, K. 'Media goofed on Antarctic data: Global Warming Interpretation Irks Scientists.' San Francisco Chronicle 4 Feb 2002. <http://www.mindfully.org/Air/Media-Goofed-Global-Warming4Feb02.htm>

## 3.4 PART IV. CLIMATE VULNERABILITY AND ADAPTATION

### 3.4.1 GLOBAL AND REGIONAL CLIMATE MODELLING – THE CURRENT STATUS OF AVAILABLE TOOLS, UNCERTAINTIES AND FUTURE PROSPECTS

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#### **Abstract:**

This lecture will start with a brief review of the status of coupled atmosphere-ocean global climate models (CGCMs). To provide detailed climate effects for small regions such as island states, it is necessary to downscale from the CGCM using either dynamical or statistical techniques, or a combined approach. The talk will summarise the principles of dynamical downscaling, and show applications from two CSIRO regional climate models (RCMs): DARLAM, a limited-area model, and C-CAM, a variable-resolution global climate model. The DARLAM simulations will include some at 30 km resolution for studying the changing behavior of tropical cyclones in the Australian region, and also a pilot study at 10 km resolution over Samoa. Most C-CAM simulations have been performed at 60 km resolution over Australia and Asia, but examples will also be included of 14 km resolution simulations over Indochina and Tasmania. Tropical convection issues will be briefly discussed, including the challenge of correctly simulating the diurnal timing of the occurrence of convection. Suggestions will be given regarding the best way forward for performing dynamically downscaled climate simulations over island states.

#### **Objectives:**

- Introduce participants to the principles and benefits of regional climate modeling
- Provide examples of regional climate simulations over various locations

#### **Outputs/Outcomes:**

- An improved understanding of the principles of regional climate modeling
- An appreciation of the possibilities and limitations of dynamical downscaling, especially in regard to island states

#### **Required Readings:**

1. McGregor, J. L., 1997: Regional climate modelling. *Meteor. Atmos. Phys.*, **63**, 105-117.

2. Walsh, K. J. E., K.-C. Nguyen, and J. L. McGregor, 2004: Fine-resolution regional climate model simulations of the impact of climate change on tropical cyclones near Australia. *Climate Dyn.*, **20**, 47-56.

**Further Readings:**

1. Intergovernmental Panel on Climate Change (IPCC), 1991: *Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, UK: Cambridge University Press. (<http://www.ipcc.ch>)
2. McGregor, J. L., and M. R. Dix, 2001: The CSIRO conformal-cubic atmospheric GCM. In *IUTAM Symposium on Advances in Mathematical Modelling of Atmosphere and Ocean Dynamics*, P. F. Hodnett (Ed. ), Kluwer, Dordrecht, 197-202.
3. Whetton, P. H., J. J. Katzfey, K. J. Hennessy, X. Wu, J. L. McGregor, and K. C. Nguyen, 2001: Developing scenarios of climate change for Southeastern Australia: an example using regional climate model output. *Climate Research*, **16**, 181-201.

### 3.4.2 CLIMATE VULNERABILITY AND ADAPTATION AND ADAPTATION MAINSTREAMING: LESSONS LEARNED FROM VARIABILITY

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#### **Abstract:**

Changes in climate have profound implications for Pacific Island communities. Leo Falcam, President of the Federated States of Micronesia emphasized this reality in an August 21, 2001 op-ed piece in the **HONOLULU ADVERTISER** entitled *Death by Warming* when he stated: “For Pacific island states, climate change and its associated effects are our main security concern.” A recent Pacific Islands Regional Assessment of the Consequences of Climate Variability and Change (Shea, 2001) recognized the importance of climate variability and change to Pacific Island communities and highlighted the importance of developing an effective response to the challenges presented by climate variability and change (Shea, 2001). Social and natural systems in Pacific Islands are vulnerable to changes in climate on a variety of timescales from year-to-year variations in rainfall, temperature, tropical cyclone patterns and ocean conditions associated with El Niño to long-term changes in conditions associated with climate change. From the standpoint of adaptation, unlike mitigation, the source of those changes doesn’t really matter. What matters is having the ability to understand, monitor and, where possible, anticipate those changes in order to manage the risks and capitalize on the opportunities associated with those changes in climate. Experience in the Pacific suggests that effectively responding to changing climate conditions is most effective when it is supported by both directed research and a continuing assessment of vulnerability (exposure, sensitivity and resilience). Since changes in natural variability may represent some of the principal ways in which any of us will “feel” climate change, developing and sustaining a capacity to monitor, anticipate, understand and respond to ENSO-related changes in rainfall, temperature, tropical cyclones and ocean conditions is an example of adaptation – at least in the Pacific.

#### **Objectives:**

- Introduce key findings of recent national, regional and international meetings and selected reports highlighting the importance of responding to climate variability as an element of climate adaptation programs;
- Review some of the relevant lessons learned from ENSO-based climate risk management programs in the Pacific; and
- Explore opportunities to more effectively integrate (“mainstream”) information on climate variability and change to enhance resilience of Pacific Island communities.

## **Outputs/Outcomes:**

- Understanding the role of adaptation to climate variability as an element of national adaptation programs;
- Shared insights into the challenges and opportunities associated with mainstreaming climate information to support decision-making and enhance resilience.

## **Required Reading**

1. Shea, E. L. 2003. *Climate Adaptation in the Pacific: Lessons Learned*. Honolulu: East-West Center.
2. Sewell, G. and J. Smith. 2004. *Mobilizing Solutions for Adaptation: Enhancing Resilience*. Washington, DC: Stratus Consulting Inc.

## **Further Reading**

1. Shea, E. and A. R. Subbiah. 2004. *Symposium on Climate and Extreme Events in Asia-Pacific: Enhancing Resilience and Improving Decision-Making*. East-West Center. The full report can be found in the Publications section of the East-West Center website (<http://www.eastwestcenter.org>)
2. Shea, E. L., et al. 2001. *Preparing for a Changing Climate: The Consequences of Climate Variability and Change for Pacific Islands*. Honolulu: East-West Center. (<http://www2.eastwestcenter.org/climate/assessment>)

## **3.5 PART V. CROSS-SECTORAL LINKAGES**

### **3.5.1 OVERVIEW OF CROSS-SECTORAL LINKAGES**

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**Abstract:**

**Objectives:**

**Outputs/Outcomes:**

**Required Readings:**

**Further Readings:**

### **3.5.2 SECTORAL CASE STUDIES AND CROSS-SECTORAL LINKAGES**

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**Abstract:**

**Objectives:**

**Outputs/Outcomes:**

**Required Readings:**

**Further Readings:**

### 3.5.3 NATIONAL CLIMATE COMMUNICATIONS AND ASSESSMENT REPORTS

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**Abstract:**

**Objectives:**

**Outputs/Outcomes:**

**Required Readings:**

**Further Readings:**

## 3.6 PART VI. MANAGING CLIMATE RISKS IN THE PACIFIC

### 3.6.1 VULNERABILITY AND HAZARDS ASSESSMENT IN THE PACIFIC COMPREHENSIVE HAZARD AND RISK MANAGEMENT (CHARM); A REGIONAL RISK MANAGEMENT GUIDELINE

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#### **Abstract:**

The Pacific region is well known as one of the most vulnerable regions in the world to natural hazard. The science of plate tectonics show the vulnerability of our island countries, particularly those along the plate boundaries, to seismicity related hazards of tsunamis, landslides, volcanoes and earthquakes. However it is encouraging that increasingly, applied researches are now tackling the mapping of these hazards with a view to assist identify the more vulnerable areas and the potential damages likely to occur so as to enhance decision-making in the management of these geo-hazards.

Similarly the Pacific, constituting the largest ocean region containing and bordering the equator, encompasses the heated water body mass that serves as the motive force driving ENSO and its extreme climate systems. Here again the advent of science and researches has produced many models that make available climate data for use at global, regional and national level enabling improvements to forecasting and prediction tools. Having easy access to knowledge and information is essential for risk managers in their pursuit to improve resilience and preparedness, to save lives and properties and to improve the planning and the maintenance of development programmes.

Knowledge about society, its cultural practices and resource management is also essential and very important in equating our efforts towards sustainable development and enhancement of public safety. Hence it is very important to empower community so that the society becomes more proactive and strong in contributing to efforts to managing national risks and conservative use of natural resources. Throughout the Pacific islands we have a number of local and international community focused organizations (Caritas, FSPI, IFRC, WWF etc) that are very active in developing various effective community-based vulnerability analysis tools. Specifically for climate change, SPREP has developed a Pacific regional guideline for community capacity building in climate change vulnerability assessment and development of adaptation measures (CBDAM).

Science and societal driven knowledge and information have to be pooled together to drive better development planning. Traditionally governments drive development planning through its ministries and departments. The bureaucracy of governments have left with us a legacy of sectorally driven development planning that will not be sustainable as they soon become competitors from the perspectives of limited island based resources, increasing and urbanization

population yet dwindling rural dwellers. In view of these varied and on-going activities happening at various levels within a country, an approach is needed that allows government and the community to together better plan and manage national development strategies and programmes.

SOPAC has developed a risk management guideline that features such an integrative and comprehensive approach linked very closely to national development planning. The Comprehensive Hazard And Risk Management (CHARM) guideline is a very suitable integrative process and approach to the management of vulnerability and risks associated with the various hazards of climate change.

### **Objectives:**

- Learn development history of disaster risk management in the region with added insight into political roles
- Learn of conceptual transition from disaster to risk management
- Familiarise with the concepts of CHARM and typical application model.

### **Outputs/Outcomes:**

- Raise awareness for a smarter integrated approach to climate risk management
- Participants to champion an integrated application of climate risk management

### **Required Readings:**

1. Regional Comprehensive Hazard And Risk Management (CHARM) Guidelines for Pacific Island Countries (SOPAC Publication)
2. Australia /NZ Risk Management Standard AS/NZ 4360:1999
3. Disaster Risk Management (Counter Disaster & Rescue Services, Queensland Government Department of Emergency Services)

### **Further Readings:**

1. Building Safer Urban Communities in the South Pacific Regional Workshop Report (Publication of UNOCHA Suva Office)
2. Concept Paper: Towards Managing Environmental Vulnerability In Small Island Developing States (SOPAC Misc. Report 461)
3. Report: APN Workshop on Local Perspectives on Climate Change and Variability in the Pacific Islands (Macmillan Brown Centre for Pacific Studies, Uni of Canterbury, NZ)

4. Preparing for a Changing Climate: The Potential Consequences of Climate Variability and Change (A report of the Pacific Islands Regional Assessment Group for the U.S. Global Change Research Program)
5. Disaster Loss Assessment Guidelines (Queensland Government Department of Emergency Services)
6. Fiji Experience, Mickey Glantz Once Burned Twice Shy (United Nations University)
7. Various ISDR publications on risk management strategies ( UN International Strategies for Disaster Reduction)

### **3.6.2 NATURAL HAZARDS MITIGATION IN PACIFIC ISLANDS**

SOPAC  
Red Cross

**Abstract:**

**Objectives:**

**Outputs/Outcomes:**

**Required Readings:**

**Further Readings:**

### 3.6.3 MONITORING SEA LEVEL IN THE PACIFIC

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**Abstract:**

**Objectives:**

**Outputs/Outcomes:**

**Required Readings:**

**Further Readings:**

### **3.6.4 CLIMATE RISK MANAGEMENT AND SUSTAINABLE DEVELOPMENT**

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**Abstract:**

**Objectives:**

**Outputs/Outcomes:**

**Required Readings:**

**Further Readings:**