

# **Report to APN**

## **Scoping Workshop**

**Climate Variability and Change and Human Health in the Pacific Islands:  
The Cook Islands, Federated States of Micronesia and Fiji**

**Fiji Meteorological Service, Nadi, Fiji  
25-26 July 2001**

**APN Project Ref: 2001-02**

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Project Leaders**

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**APN Funding:** \$ 15,000

**Participants from the following countries were funded:**

Fiji  
Cook Islands  
Federated States of Micronesia  
United States

### **Brief Introduction and Background:**

Researchers from the University of Hawaii organized the workshop to finalize plans for a research project aimed at increasing the capacity of Pacific Island countries to address health problems resulting from climate variability and change. The workshop brought together researchers, meteorological service officials, and public health officials from the University of Hawaii, the Fiji School of Medicine and the Governments of the Cook Islands, Federated States of Micronesia (FSM) and Fiji as potential participants in the research effort proposed to the Office of Global Programs at the National Oceanic and Atmospheric Administration (NOAA). The project has since been approved for funding by NOAA/OGP (\$70,000). The workshop provided an opportunity to assess data availability and future data needs and to develop a common protocol for research in Cook Islands, Fiji, and FSM. Because of funding limitations the work is being initiated in Fiji and the Cook Islands.

The larger research project is aimed at gaining a better understanding of the relationship between climate variability and health in Cook Islands and Fiji. These nations have been chosen because they have reasonably good climate and epidemiological data, which is available at the sub-national level. They also have climate regimes, and island geomorphologies and ecologies representative of much of the rest of the Pacific Islands region.

The specific objectives of the larger research project are to (1) determine if the relationship between climate variability and the risks of vector-borne diseases (including dengue fever), diarrheal diseases, respiratory diseases, and other conditions can be clearly established at the local level in two Pacific Island countries; (2) develop simple analytical tools for assessing the relationship in other countries; and (3) make recommendations to governments and regional organizations on the development of systems to make more effective use of climate forecast and applications information to reduce the public health risks posed by climate variability and change.

A by-product of the proposed project will be a better understanding of local-level climate variability. This will include an understanding of the impact of ENSO events of varying strength on rainfall and temperature at the sub-national level and the impact of the Pacific Decadal Oscillation on ENSO events and local climate variability. This understanding will be of value for climate applications in health and other sectors.

The agenda (see Appendix One) was organized to provide participants with a thorough overview of the work that had been done previously on climate variability and health in the Pacific and to allow participants to share their observations on the relationships between variability in rainfall and temperature and the occurrence of extreme events and the incidence of vector-borne diseases and other conditions.

#### **Outline of activities conducted:**

The workshop was held July 25-26, 2001 at the Fiji Meteorological Service in Nadi, Fiji. A workshop agenda was shared with participants, participating governments and organizations in advance of the workshop and participants were asked to bring readily available climate and health data.

The organizers of the workshop reviewed their earlier NOAA funded regional project on climate variability (ENSO) and water-borne and vector-borne disease in the Pacific region and discussed the impact of the 1997-1998 El Niño on health in the Pacific Islands. The meteorological service officials from Cook Islands, Fiji, and FSM presented overviews of seasonal and inter-annual variability in climate in their countries. The health service officials added their observations on the influence of seasonal and inter-annual climate variability on the incidence of important diseases. In order to assure that all members of the interdisciplinary teams had a basic understanding of the processes involved, an overview on climate forecasting concluded the first day of the workshop. An important premise of the proposed project is the need for a clearer understanding of climate and disease dynamics for the application of forecast information in the health sector.

Workshop participants reviewed the goals, objectives and the scientific framework for the project proposed to NOAA OGP and agreed that they were appropriate and achievable. Participants addressed a number of questions including the disease and climate data that needed to be compiled and analyzed, the degree of temporal and spatial resolution, the retrospective time period to be covered, initial analyses to be conducted, the contextual data to be gathered and analyzed, and policies on the use and sharing of data. Agreement was reached on all of these issues and a workshop report has been produced and shared with all participants, participating governments and organizations. The questions are listed in Appendix Two along with a discussion of additional methodological considerations.

Drs. Lewis and Hamnett met with a number of individuals and organizations in Suva, Fiji including representatives of the Fiji School of Medicine, the Ministry of Health, the World Health Organization, Fiji Land Information System, the South Pacific Applied Geoscience Commission, START Oceania, the University of the South Pacific and the Embassy of the Federated States of Micronesia to further explore possibilities for collaboration.

**Outcomes/Products:** The initial product was the workshop and the refinement of the research protocol. An additional related outcome was the approval for funding by NOAA (\$70,000) to conduct the research in Fiji and the Cook Islands.

The diseases the participants identified for inclusion in the project are: dengue fever, diarrheal disease (0-4; 5 and over), leptospirosis, cholera, acute respiratory infection (ARI), influenza, fish poisoning (ciguatera), pneumonia, and filariasis.

The initial analysis will consist of spatial and temporal correlations of the meteorological station data with the health data for the available time periods for each of the two countries, with appropriate lead and lag relationships taken into account. A comparison will be made of the meteorological station data to the large-scale NCAR/NCEP Reanalysis Dataset to determine the accuracy of coarse resolution grid data as compared to station data, which is dependent on local-scale variations. Composites of both meteorological and health data for ENSO events (El Niño and La Niña) will be made to give an initial determination of the association of disease with climate impacts resulting from ENSO. Variations in ENSO strength (i.e. Niño 3 SST anomaly and SOI) between events will then be taken into account, and specific events will be analyzed in terms of the magnitudes of the climate variations and the subsequent health impacts.

The variability of strength and timing of warm and cold events (which has been termed the "flavors" of El Niño) can significantly affect the resulting climate impacts for the Pacific Island nations. Some nations, such as Fiji, are located very near to the "zero-line" of temperature and precipitation changes associated with warm events. Shifts in the magnitude and timing from normal of a particular ENSO index (i.e. the Niño3 SST anomaly) during a warm event can greatly change the magnitude of, for instance, the austral winter drought in Fiji. Building on compilations of data already in existence, e.g. He, Hilton, and Barnston's *A Precipitation Climatology for Stations in the Tropical Pacific Ocean*, an analysis of such shifts in the climate impacts is planned. This will provide greater knowledge of the finer details of expected climate

impacts resulting from a variation in the strength and timing of a particular warm (or cold) event. This will have utility beyond the health sector.

Once the spatial and statistical analyses are complete, the patterns will be analyzed with respect to contextual data and our understanding of the vector ecologies and disease processes involved. Climate is only one of a myriad of factors potentially influencing the distribution of a given disease. The feasibility of extending the research to other Pacific Island locations including the Federated States of Micronesia will be assessed. The Global Environment Fund (GEF) has indicated interest in this research. If the project in Fiji and the Cook Islands is successful, we will seek funds to expand the research. Recommendations will be made to island governments on the development of climate information and application systems to reduce health risks posed by climate variability and change. The NOAA OGP proposal included a request for funding for a region-wide dissemination workshop, but funding was secured for the research phase only. A proposal has been submitted to the APN (APN 2001-14) for funding the dissemination workshop.

**Definitive project targets for year two:** We have initiated data analysis for Fiji and the Cook Islands, and barring unexpected circumstances, we expected to have an initial analysis complete by mid-year 2002. As noted above, we have submitted a proposal to APN (APN 2001-14) for funding for a dissemination workshop. Assuming funding is secured from APN or other sources, we plan to hold a dissemination workshop in September 2002.

## **Appendix One**

### **Climate Variability & Change and Human Health in the Pacific Islands: The Cook Islands, Federated States of Micronesia and Fiji Scoping Workshop**

July 25-27, 2001

**Fiji Meteorological Service  
Nadi, Fiji**

### **AGENDA**

- 8:55 – 9:00 Participants to be seated
- 9:00 – 9:10 Welcoming Note and Introduction by MC
- 9:10 – 9:20 Address by Director of Meteorology, Mr. Rajendra Prasad
- 9:20 – 9:25 Announcements and Appreciation
- 9:25 – 9:35 Group Photograph
- 9.35 – 10:00 Morning tea
- 10:00 – 10:15 Overview of Workshop
- 10:15 – 11:00 Climate Variability and Climate Change and Human Health:  
Pacific Perspectives
- 11:00 – 11:15 Questions
- 11:15 –12: 30 Climate Variables, Extreme Events, ENSO – Participants  
discussion (questions attached)
- 12:30 – 1:00 Discussion
- 1:00 – 2:30 Lunch Maharaja's Restaurant, Namaka  
(Please confirm your attendance and menu by 10:30)
- 2:30 – 4:00 Dengue, Cholera, Diarrheal Disease, Leptospirosis, Ciguatera,  
Influenza, Other Diseases and Climate Variables – Participants  
discussion (questions attached)
- 4:00 – 4:15 Break
- 4:00 – 5:30 Discussion and Wrap-Up
- 6:30 – 8:00 Reception at Skylodge Hotel, Waqadra, Nadi  
(RSVP by midday)

Thursday, July 26—Day 2

**Forecasting, Applications, Data**

9:00 – 9:30 Forecasting: Future trends

9:30 – 10:00 Sources and Uses of Climate Information in the Region

10:00 – 10:15 Break

10:15 – 11:00 Data Availability, Data Needs

**Methods of Analysis, Workplan,**

11:00 – 1:00 Methodological Issues, Analysis

1:00 – 2:30 Lunch Chopsticks Restaurant  
(Please confirm your attendance and menu by 10:30 am)

2:30 – 3:30 Workplan

3:30 – 3:45 Break

3:45 – 5:30 Communication, Coordination, Funding

## Participant List

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## **Initial Project Contacts in Suva**

Following the workshop, Drs. Lewis and Hamnett traveled to Suva for meetings with Fiji Ministry of Health Officials, South Pacific Applied Geoscience Commission Disaster Management Unit Staff and Faculty and Staff from the Fiji School of Medicine and the University of the South Pacific. Arrangements for most of these meetings were made through the courtesy of Mr. Navi Litidamu of the Fiji School of Medicine. The meetings were invaluable to planning for the proposed research project and Drs. Lewis and Hamnett are most grateful to Mr. Litidamu and all of those who took time from their busy schedules to discuss the Climate and Health project. The following is a list of with whom Drs. Lew and Hamnett met.

Dr. Salimoni Tuqa  
Medical Superintendent  
Fiji Ministry of Health

Dr. Jan Pryor  
Research Coordinator  
Fiji School of Medicine

Dr. Lepani Wagatakiwewa  
Chief Medical Officer (Public Health)  
Fiji Ministry of Health

Dr. Michael O'Leary  
Medical Officer/Epidemiologist  
World Health Organization

Mark Williams  
FLIS Manager  
Fiji Land Information System

Rashmi Rita  
FLIS Project Manager  
Fiji Land Information System

Atu Kaloumaria  
Risk Reduction Program Manager  
South Pacific Applied Geoscience Commission

Alan Mearns  
Disaster Management Coordinator  
South Pacific Applied Geoscience Commission

Dr. K. Koshy  
Director  
Institute of Environmental Management and Sustainable Development  
University of the South Pacific  
and  
Director  
START Oceania Secretariat

Mahendra Kumar  
Head of Department  
Chemistry  
University of the South Pacific

Kadaro M. Gallen  
Ambassador  
Embassy of the Federated States of Micronesia  
Suva, Fiji

Gabriel Ayin  
Deputy Chief of Mission  
Embassy of the Federated States of Micronesia  
Suva, Fiji

## Appendix Two

### Questions Addressed and Additional Methodological Considerations

#### 1. Which diseases?

Participants agree that the following diseases should be included in the initial data compilation and analysis:

- Dengue fever
- Diarrheal disease (0-4; 5 and over)
- Leptospirosis
- Cholera
- Acute Respiratory Infection
- Influenza
- Fish Poisoning (ciguatera)
- Pneumonia
- Filariasis

#### 2. At what spatial resolution should the health data be compiled and analyzed? done?

- Cook Islands: Northern & Southern groups
- Federated States: Four States (phase 2)
- Fiji: Four Divisions

#### 3. At what spatial resolution should the climate data be compiled and analyzed?

- Cook Islands: Seven major stations
- Federated States of Micronesia: Initially four State capitols but need to evaluate data from others (phase 2)
- Fiji: 25 stations with data back to WWII and three or four specific stations to evaluate the impact of the Pacific Decadal Oscillation on rainfall

#### 4. What time depth would be ideal? What is possible?

- Disease Data: Cooks—1965; Fiji—1980; FSM—1980 (phase 2)
- Climate Data: broad coverage to depth of health data; long-term data series for trends; ‘flavors of El Niño’

#### 5. How do we compile health data temporally?

- Running monthly totals by geographic area by disease

#### 6. Specifics of climate data?

- Monthly rainfall, running means and standard deviations
- Mean monthly min & max temp + running days over temperature threshold
- Mean monthly humidity

- 7. How do we segregate out extreme events? How to separate out rainfall extremes?**
  - Note heavy rainfall events (>~3 standard deviations above daily average). Will have to evaluate data
- 8. What software do we want to use for initial tables?**
  - Excel files & Comma Delimited ASCII files for statistical analysis using a variety of packages
- 9. What contextual data do we want to include?**
  - National/regional situation; relative location
  - Sub-national: urban/rural; low island/high island; vegetation type and agricultural practices; land use; settlement pattern; dominant house type; socioeconomic status; population movement patterns.
- 10. What will the policy be on access to and use of data?**
  - Data will remain the property of the government providing the data. Data can be compiled and analyzed for use by research project team members. Data can be shared with other researchers but requests must be made to and responded to by the government providing the data;
  - Data may be transferred to the University of Hawaii for statistical and graphical analysis, but the University of Hawaii is not at liberty to share those data with a third party unless approved to do so by the government concerned.
- 11. What will the policy be on publication of results?**
  - Papers, reports, and other publications and dissemination mechanisms for the results of this project will include all names of all member of the project team.
  - Collaborative publications among project team members will be permitted with the role of the entire team acknowledged.
- 12. What opportunities for capacity building exist in the participating countries?**
  - Cook Islands: there is potential for involving students in data compilation and analysis.
  - Federated States of Micronesia: there is potential for involving University of the
  - South Pacific (USP), UH, and Fiji School of Medicine students (phase 2).
  - Fiji: Fiji School of Medicine and USP have students who can be involved in the project;
  - All three governments agree that as a matter of policy students and/or junior members of the departments should be sought for data compilation and analysis.
- 13. Are there common terms we need to define and use?**
  - A glossary of health and climate terms is needed.
  - ENSO event definitions will be drawn from the Climate Prediction Center/PEAC Atlas, *A Precipitation Climatology for Stations in the Tropical Pacific Ocean*.

## **Additional Data and Methodological Considerations**

It was determined during the discussion on data sharing and organization that Excel files were to be used as the common format for the health data. Each spreadsheet was to consist of data from a given station (or region) for a particular year, and will include monthly incidence of each of the specific diseases included in this study. Care will be taken to distinguish 'no cases' from 'no report.' The Excel files would then be transferred to the University of Hawaii for any necessary format conversion and subsequent analysis. It was agreed that the meteorological data would not be converted to a specific common data format, as the present formats were sufficiently compatible to be employed with the analysis software that is planned for use with this project.