



SPREP

South Pacific Regional Environment Programme

*The  
Science  
and  
Impacts  
of  
Climate Change  
in the  
Pacific Islands*

***Meeting Report***

*Apia, Samoa*

*29 April - 3 May 1996*

**SPREP Library Cataloguing-in-Publication Data**

The Science and Impacts of Climate Change in the Pacific Islands (1996 : Apia, Samoa)

The Science and Impacts of Climate Change in the Pacific Islands, 29 April - 3 May 1996, Apia, Samoa : meeting report. - Apia, Samoa : SPREP, 1998.

vii, 25 p. ; 30 cm.

ISBN: 982-04-0182-8

I. Climate changes - Oceania. 2. Climate changes - Research - Oceania. I. Pacific Islands Climate Change Assistance Programme (PICCAP). II South Pacific Regional Environment Programme (SPREP)

551.699

Published in August 1998 by the  
South Pacific Regional Environment Programme  
PO Box 240  
Apia, Samoa  
<http://www.sprep.org.ws/>  
[sprep@sprep.org.ws](mailto:sprep@sprep.org.ws)

Produced by SPREP's Publication Unit with funding assistance from the Government of Denmark

Printed on recycled paper 110gsm  
Savannah Matt Art (60%) by  
Commercial Printers Ltd  
Apia, Samoa

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Original Text: English

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**Published by the  
South Pacific Regional Environment Programme (SPREP) with  
funding assistance from the Government of Denmark**

**August 1998**

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# Acronyms

AGBM	Ad Hoc Group on the Berlin Mandate
AIJ	Activities Implemented Jointly
AOSIS	Alliance of Small Island States
COP	Conference of the Parties
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CZM	Coastal Zone Management
ENSO	El Nino/Southern Oscillation
FSM	Federated States of Micronesia
GEF	Global Environment Facility
IPCC	Intergovernmental Panel on Climate Change
ITCZ	Inter-tropical Convergence Zone
MOU	Memorandum of Understanding
NGO	Non-governmental Organisation
NOAA	National Oceanic and Atmospheric Administration
NRI	National, Regional, International
ORSTOM	L'Institut Français de Recherche Scientifique pour le Développement en Coopération
PIC	Pacific Island Country
PICCAP	Pacific Islands Climate Change Assistance Programme
SIDS	Small Island Developing States
SPCZ	South Pacific Convergence Zone
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change



## Meeting Conclusions and Recommendations

The participants of the meeting agreed on the following conclusions and recommendations:

1. The meeting participants welcomed the valuable and timely initiative of the organisers to convene this meeting. In particular, it was agreed that the diverse group of scientists, policy makers, negotiators, economists and legal experts facilitated a unique opportunity to examine, in some detail, their common experiences relating to climate change. All participants recommended that such meetings be convened in the future, and widely publicised.
2. The meeting underlined the essential importance of the human (i.e. social, economic and cultural) dimensions of climate change in small island states, and urged that these issues be given greater attention in future work programmes at all levels. Greater effort needs to be placed on engaging all disciplines, especially economists, into studies on the effects of climate change on small island states.
3. Having heard the key findings of the Intergovernmental Panel on Climate Change (IPCC) Second Assessment report, and mindful of the extreme vulnerability of small islands to climate change, the meeting acknowledged the valuable initiative of the Alliance of Small Island States (AOSIS) in the preparation and submission of its draft protocol. The participants agreed that the AOSIS draft protocol reflects an appropriate sense of urgency in light of the latest scientific findings on climate change and its impacts. It was stressed that AOSIS negotiating initiatives should continue to be supported by scientific and technical inputs.
4. Participants recognised the significant research under way in the Pacific region which was both of high quality and relevance to the international climate change negotiation process. It was agreed that these studies should be injected into major global assessments, as in the IPCC, and global negotiations processes. It was also agreed that in the context of Small Island Developing States (SIDS), steps should be taken to relate and coordinate Pacific research with equivalent work being carried out in other AOSIS regions.
5. It was recognised that major gaps in our scientific and technical knowledge still exist. Participants saw a need to remedy this situation, in particular

the strengthening of linkages between global research efforts and their applicability to small islands. Future research should cover the broad spectrum of atmospheric and marine sciences, human dimensions (social, environment, and economic issues) and the geosciences. Such research should include, *inter alia*:

- studies of sea-level rise and its possible regional variations and impacts;
- studies of important climate phenomenon relevant to the Pacific such as the El Nino, Asia Monsoon, and behaviour of tropical cyclones;
- studies of the impact of climate change on coral reefs;
- studies on food security and agriculture in small islands; and
- studies of the effects of climate change policies and measures on small island economies.

The results of this research should be made available in a timely manner and in a form responsive to the needs of SIDS policy makers and climate change negotiators.

6. Concern was expressed by participants at the limited amount and fragile state of data sets relevant to climate change in the Pacific. The large gaps in historic scientific and economic databases were seen as a significant hindrance to current research. This underscored the need for future efforts to secure high quality, verifiable, and long term data through the continuing support of well calibrated monitoring networks.

Basic data collected to support climate change studies should be relevant and responsive to the needs of small islands, and should be exchanged regionally and internationally. Where necessary, such databases should be held within the Pacific region, and be easily accessible.

7. The meeting recognised the urgent need to develop reliable regional climate scenarios for the small island regions which cover, *inter alia*, the following parameters:
  - sea-level and its regional variations;
  - frequency, magnitude and spatial variation of extreme events (tropical cyclones, rainfall, drought, ENSO);
  - water balance parameters;



- characteristics of monsoons;
  - positions of jet streams, the Inter-tropical Convergence Zone (ITCZ), the South Pacific Convergence Zone and major ocean currents;
  - direct, diffuse and global solar radiation, and net radiation;
  - concentrations of relevant atmospheric gases, and
  - wave and wind climate parameters.
8. The meeting noted that many specific methodologies developed by the international community to assess greenhouse gas emission inventories, as well as climate change vulnerability and impacts, are often not applicable to small islands, especially atolls. It was recognised that there is a need to develop regionally appropriate methodologies for vulnerability and adaptation assessment. These methodologies should also be capable of making contributions to international understanding and assessment of climate change vulnerability and adaptation.
  9. The meeting strongly recommended that, where possible, regional scientific and technical research be published in peer reviewed literature. Another option put forward was the establishment of a peer reviewed journal focusing on small island environmental issues. SPREP, together with other regional and international institutions, was requested to investigate the feasibility of such a publication and report to the Chairman in a timely manner.
  10. The need was seen for scientific and technical support for small island climate change initiatives in international negotiations e.g. the AOSIS draft protocol. The meeting considered that the establishment of an informal network of scientific and technical experts could perform such a supporting role. It was further noted that such a network could assume the functions of some existing technical advisory groups, and interface with other AOSIS regions. This network could, *inter alia*:
    - facilitate coordination between the scientific community;
    - feed information from scientists to international negotiators in an appropriate and timely manner;
    - provide technical review of IPCC reports and other scientific material; and,
    - help significantly in the formulation and implementation of regional climate change projects.
- SPREP is asked to coordinate among institutions within the framework of AOSIS, investigation into the feasibility of such a network and report to the Chairman in a timely manner.
11. Given the long term nature of the climate change problem, the meeting wished for urgent steps to be taken by regional universities and institutions to further develop and strengthen courses and other activities which focus on education, training and research related to climate change. Such capacity building would benefit the region, and would furthermore help ensure the availability of personnel with appropriate skills who could be involved in the on-going international climate change negotiation process.
  12. Participants were pleased to learn of the considerable scientific and technical research being undertaken on measures to reduce greenhouse gas emissions in small islands. The meeting recognised the importance of such initiatives in providing international leadership, as well as the significant benefits to the environment and economies of small islands. The meeting recommended that such research continue with greater vigour, and that governments should consider seriously how such research could be integrated into practice and policy.
    - The meeting urged that all programmes relating to climate change acknowledge, where appropriate, the importance of traditional knowledge and practices in adapting to climate change impacts.
    - Recognising the valuable information for policy and decision makers in the IPCC Second Assessment Report, it was recommended that SPREP consider initiating a briefing of senior public servants and ministers by the IPCC at the forthcoming Ninth SPREP Meeting. This would assist in the timely and efficient dissemination of such information within the Pacific region.

# Report of the Meeting

## Introduction

With financial assistance from the Government of Denmark, the South Pacific Regional Environment Programme (SPREP) convened this meeting in order to provide a forum where government officials, scientists and other technical experts from the region could interact with individuals working at the international level in climate change research, assessments, negotiations and institutional and financial support.

## Objectives

The objectives of the meeting were:

- to facilitate a greater understanding, especially at the international level, of the scientific, economic, social and other issues related to climate change and small islands; and
- to increase awareness amongst Pacific Island Countries (PICs) and individuals of international and regional activities and opportunities related to climate change.

Specifically, the workshop was an opportunity for the Intergovernmental Panel on Climate Change (IPCC) representatives and other internationally recognised experts to relay the latest scientific, technical and policy information. This would enable Pacific scientists and others, to support their governments and regional organisations at the on-going United Nations Framework Convention on Climate Change (UNFCCC) negotiations.

Twenty individuals attended the meeting. Participants included international diplomats, a senior IPCC official, international lawyers, senior government decision makers and officials from regional organisations in addition to scientists and technical experts from government, universities and other organisations. In this regard, the meeting was able to cover the spectrum of climate change ranging from science to policy to action. The participants list is attached as Annex 1.

The meeting was opened by the Director of SPREP, Dr Fuavao. He reminded participants of the priority which Pacific island governments give to the issues of climate change and accelerated sea-level rise. He expressed appreciation to the participants for their

commitment to addressing the scientific, technical and policy implications and stressed the importance of achieving both of the meeting's objectives.

A statement from His Excellency Ambassador Eric Fiil, Ambassador for Sustainable Development from the Government of Denmark, submitted on behalf of the meeting sponsors, was read to the meeting. Both opening statements are included in this report as Annexes 2 and 3.

Participants elected Ambassador Tuiloma Neroni Slade of Samoa to chair the meeting. The Provisional Agenda was approved, with minor revisions, and is included as Annex 4. Participants were then invited to introduce themselves.

Following the opening formalities, the first of its seven formal sessions began. Each session and presentation, was followed by a discussion.

## Keynote Presentations

**Climate change and Pacific island development** (*Professor Bill Pattie, University of the South Pacific, Alafua Campus*)

Professor Pattie described the wide range of adverse impacts climate change could have on Pacific island countries. He stressed the need for immediate action given the seriousness of the problem. The difficulty of incorporating climate change in policy for development was noted. There is a need to incorporate climate change in the development policies of all sectors.

### *Discussion*

The meeting spent some time discussing the diverse impacts of climate change on small island countries, including consideration of beneficial impacts. Few of the latter could be identified.

**Climate change negotiations, a brief history** (*Mr James Stovall III, Federated States of Micronesia*)

Mr Stovall presented and interpreted a detailed chronological outline of events leading up to and including negotiation and implementation of the United Nations Framework Convention on Climate Change (UNFCCC). The chronology began with the commencement of the first direct measurement of

atmospheric concentrations of CO<sub>2</sub> in 1958, and he noted that science was driving the political negotiations. He highlighted the repeated differences between the most entrenched financial interests in the world and an equally determined moral force. In an incredibly short time the latter succeeded in gaining worldwide acceptance of a legal agreement unprecedented in scope, more than a framework in its final form that addresses an environmental issue which few in the world can really comprehend.

#### *Discussion*

Participants sought clarification on the timing and significance of a number of events leading up to the implementation of the UNFCCC.

#### **The Intergovernmental Panel on Climate Change (IPCC); its role and function** (*Dr Narasimhan Sundararaman, IPCC*)

Dr Sundararaman provided a comprehensive overview of the history, structure, tasks and outputs of the IPCC. He demonstrated how science is driving the political negotiations and the budget which supports these activities was described. The presentation went on to outline the IPCC work programme for 1996-2000. The programme includes the production of several special reports as well as a third assessment due for completion in 2000. The guidelines for preparing an IPCC assessment were described and guidance given as to the various ways in which individuals and countries in the Pacific could participate in the assessment process.

#### *Discussion*

It was pointed out that there are numerous science-based issues underlying the responses to climate change. For example, how to distinguish between natural and anthropogenic emissions, defining “dangerous anthropogenic interference with the climate system”, use of inadequate scenarios on which vulnerability assessments are based and the focusing of such assessments on one or two sectors. There is a need for adequate funding in order to conduct thorough scientific studies. Such funding is very difficult to obtain, especially for the Pacific.

The need for work on defining expressions used in the UNFCCC was endorsed by another speaker; this included recognition of sovereignty in such definitions. There is an urgent need for action, rather than waiting for full research programmes to be completed. This raised the question, “at what point should we agree with the action to be taken, without full information and understanding?”

#### **Strengthening commitments to reduce greenhouse gas emissions; the Berlin Mandate process** (*Ambassador Tuiloma Neroni Slade, Samoa*)

Ambassador Slade reviewed the intensive negotiation and other activities leading up to the adoption of the Berlin Mandate. This does not introduce any new commitments for developing country parties, but rather it reaffirms existing commitments in the UNFCCC and seeks continued advancement of the implementation of these commitments. This would be done by elaborating policies and measures as well as setting quantified limitation and reduction objectives within specified time-frames, for anthropogenic emissions by sources and removal by sinks of greenhouse gases.

Ambassador Slade noted the strong sense of urgency about the Berlin Mandate. It requires that the “process should begin without delay and be conducted as a matter of urgency”. A legal instrument must be adopted in 1997 at Conference of the Parties (COP3). This gives barely a year for the international community to find ways to strengthen commitments. This must be done in light of the acknowledged inadequacy of current developed country (Annex 1 countries) commitments, and against the inability of developed countries to find the means and the will to establish even a basic stabilisation target. The Alliance of Small Island States (AOSIS) target of a 20 percent cut in CO<sub>2</sub> emissions is realistic and achievable, but is not sufficient. However, it is the necessary first step to put the global community on the right track towards further reductions. He argued that the small island states, through AOSIS, must continue to press for no less than this target, and to reject any efforts to maintain the status quo.

#### *Discussion*

A participant questioned the position of AOSIS and other parties with respect to their position of no new commitments for developing countries. In light of the growing recognition of the need for urgent and comprehensive responses to climate change such a position seemed indefensible. In response, it was noted that AOSIS was focusing on giving greater effect to existing agreements under the Convention, rather than adding new ones. It was also pointed out that the apparent inequity of the AOSIS position depended on the time frame being considered. If one looked at the situation from the standpoint of emissions over the past few decades and into the future, the position of no new commitments for developing countries might appear iniquitous, but if one looked at accumulated emissions and their effects from the time of industrialisation, the position was defensible.

In response to a question about equal treatment for the concerns and needs of territories relative to those articulated by their capital, it was noted that this was a difficult issue with no easy or clear answers.

## Implementing the UNFCCC

**Institutional linkages** (*Mr Jake Werksman, Foundation for International Environmental Law and Development*)

Mr Werksman presented a paper which located the UNFCCC, and the institutions it has created, in the wider family of international organisations. These institutions were considered from the point of view of their ability to:

- provide legal and institutional frameworks for designing and promoting climate change related policy;
- provide scientific and technical research, assessment and advice;
- provide technological and financial resources and assistance in mitigating and adapting to climate change; and
- settle disputes between parties.

With respect to institutional linkages it was noted that the world is not perfect. Many institutions that are created duplicate, in part, the mandates and work programmes of other institutions. An example is the United Nations Commission on Sustainable Development (CSD) and United Nations Environment Programme (UNEP). The main problem is that there is very little effort put into evolving institutional mandates or even terminating institutions. Is there a mechanism for reviewing institutions? Are there objective criteria to be used in such reviews?

### *Discussion*

In response, a participant noted that the main problem of duplication is the waste of time, financial and other resources by institutions with overlapping mandates, but countries see certain institutions as representing their individual and collective interests hence they hold on dearly to such institutions. The best approach may therefore be to retain and evolve existing institutions, rather than adding to them. If there is a need to terminate an institution, the only effective mechanism is to “pull the budgetary plug”.

**The financial mechanism of the UNFCCC: the Global Environment Facility (GEF)** (*Ambassador John Ashe, Antigua and Barbuda*)

In his paper, Ambassador Ashe provided background to the establishment of the Global Environment

Facility (GEF) and went on to discuss its membership, governance, mandate, the sources and allocation of funds, the roles of the implementing agencies (the World Bank, the United Nations Development Programme and the United Nations Environment Programme), the operational strategy and programmes of GEF and the project development cycle.

### *Discussion*

In response to a question whether GEF provides funding for adaptation costs, Ambassador Ashe commented that GEF was now funding projects that met a broad definition of Stage 1 activities.

A participant observed that within the Pacific, many Non-governmental organisations (NGOs), governments and other parties would benefit from assistance with the development of proposals. Are there any mechanisms for providing such assistance? It was noted that implementing agencies, through the use of block grants, will assist with the development of proposals. Experience in the Pacific was increasing, with PNG gaining several small and larger grants. There were also the regional Pacific Islands Climate Change Assistance Programme (PICCAP) and Biodiversity projects. GEF is now considering an additional category of medium sized grants.

Another participant commented that “science drives the concerns about climate change, but economics drives the policy responses.” There was widespread agreement with this comment. It was further noted that while IPCC is good at defining the science, it is not as successful in addressing economic considerations. There is a need to encourage GEF to provide funds for studies on the economic implications of climate change and the response options. It is inappropriate to simply rely on the precautionary principle to bring about action. The economic imperatives must be documented.

**PICCAP and the SPREP Climate Change Programme** (*Mr Neville Koop, SPREP*)

Mr Koop presented a paper describing the SPREP Pacific Islands Climate Change Assistance Programme (PICCAP). This regional project has been formulated by ten of the Pacific island countries which are Parties to the UNFCCC, with assistance from SPREP. Two Parties are not included: Papua New Guinea, as it was felt that its size and national priorities required a separate programme to address the country’s concerns; and Niue, which became a Party to the Convention in the interim period since the initial project proposal was prepared. Tonga and Palau are not yet Parties to the Convention.

PICCAP was prepared to assist the participating Pacific island countries to meet their obligations contained in the Convention. It contains a focused programme of activities to undertake national greenhouse inventories and the initial national communications of Pacific island countries. The proposal has been approved for funding by GEF Council and is expected to commence at the beginning 1997.

The specific components of the proposal are:

- preparing greenhouse gas inventories;
- identifying mitigation strategies;
- reporting on vulnerability and resilience to climate change;
- identifying adaptation options;
- developing national implementation plans for climate change policy; and
- preparing initial national communications as required under the UNFCCC.

#### *Discussion*

It was noted that developing countries are obligated to submit national communications within three years, or after funding is allocated. The exact timing is not clear, but the general understanding is that a submission should be made in a timely manner upon receipt of funding.

## **The IPCC Second Assessment Report**

### **The IPCC Second Assessment Report** (*Dr Narasimhan Sundararaman, IPCC*)

Dr Sundararaman summarised the comprehensive results of the IPCC Second Assessment report. He demonstrated how greenhouse gas concentrations are increasing, and quantified the radiative forcing. He went on to discuss aerosols, noted their contributions relative to greenhouse gases, and noted the implications for climate change. Changes in past climate were described and attribution to human activity was considered. Projections of future climate change were described and uncertainties reviewed. In terms of impacts, he stressed that the rate of climate change as well as its magnitude, was important for impacts on ecosystems. Quantitative assessment of impacts was difficult for a variety of reasons. Impacts of climate change were considered for sea-level rise, forests, water resources, food security and human health. Adaptation options and stabilisation of greenhouse gas concentrations were also reviewed.

Given the current levels of additional equivalent CO<sub>2</sub> in the atmosphere (420-430 ppmv), it is more realistic to consider scenarios for tripling of CO<sub>2</sub>. We are already very close to an effective doubling of CO<sub>2</sub>. The challenge is not to find the best policy today for the next 100 years, but to select a prudent strategy and to adjust it in light of new information as it is gathered over the next 100 years.

#### *Discussion*

A participant noted an apparent contradiction between the decreased rates of temperature and sea-level and the attribution to sulphate aerosols. He also questioned some of the conclusions with respect to impacts beyond a doubling of CO<sub>2</sub>. It was argued that food production will begin to decline rapidly, due to effects on mid-latitude crops. These are currently growing below their optimum temperature, but with more than a doubling of CO<sub>2</sub> temperatures will have increased to such an extent that their productivity will be adversely affected.

In response to an observation that malaria is now occurring in the highland areas of PNG where it had not previously existed, it was noted that such changes might be attributable to the effects of changes in precipitation as well as to an increase in global temperatures.

### **Coastal zones and small islands** (*Dr Leonard Nurse, Barbados*)

Dr Nurse reviewed the contents of the "Coastal Zones and Small Islands" chapter of the IPCC Second Assessment Report. He reminded participants that coastal zones and small islands contain some of the world's most diverse and productive resources and have important functions including providing "essential services" to mankind. These include regulation functions (e.g. flood prevention), user and production functions (e.g. aquaculture) and information functions (e.g. storehouse of genetic information). He reviewed biogeophysical impacts and socio-economic impacts of climate change and sea-level rise and provided comment on adaptation. Finally, future considerations, such as research and monitoring, were discussed.

#### *Discussion*

A participant asked whether there had been any relevant studies into the potential for sea-level rise to reduce the dampening effect of coral reefs on storm surges and waves. He noted that the amount of water clearing the reef is of critical importance. In response it was noted that there is a limited number of studies. They show the influence of additional factors including the width of the continental shelf, the effect

of atmospheric pressure and the effect of the astronomical tide.

Another participant noted that coastal zone impacts are very site specific, which highlight the shortage of adequate local data. Costs would be very high if a thorough study is undertaken.

It was pointed out that there are a series of processes going on at the present time which are degrading all coastal areas, for both small islands and the coasts of continental areas. There are, for example natural coastal erosion processes; the issue is how to separate these from the processes and effects that should be attributed to global warming.

### **Coastal vulnerability assessment: an Australian perspective** (*Professor Roger McLean, Australia*)

Professor McLean discussed the relevance to Pacific island countries of Australian experience and plans regarding coastal vulnerability assessment and monitoring. He described the network of eleven tide gauges now operating in the South Pacific as part of the Australian funded Sea-Level and Climate Monitoring Project. The Australian Government has recently committed AUD\$6.8 million for the period 1996-2001. He noted that Pacific island countries now need site specific information on sea-level rise. He reported that shortcomings in IPCC methodologies for vulnerability assessment led to the Australian Coastal Vulnerability Assessment Case Study Project. The challenge for the project is to improve the assessment methodology. A report on the case studies and findings is now in draft form and will be available soon.

The speaker went on to describe the Commonwealth of Australia Coastal Policy (1995). It is relevant to a federal system and has been supported by all states. The policy includes provision to assist Pacific island countries in vulnerability assessments with respect to climate change. Professor McLean suggested that interested countries should contact the Australian Government.

#### *Discussion*

A concern was expressed regarding the withdrawal of National Oceanic and Atmospheric Administration (NOAA) from the tide gauge monitoring programme in the Pacific. Who will take responsibility for these gauges, especially the Suva gauge which has the longest tide record in the Pacific? The data from this gauge especially is of global as well as regional importance. It was suggested that the cost of maintaining the gauges be included in the PICCAP project. There was already a precedent for this in the Caribbean. Such a strategy was questioned, as it would

not provide a long term solution. In response, it was noted that in all GEF funded projects, countries assume responsibility for continuing activities once GEF funding ceases.

The comment was made that the "Wyrтки network" of tide gauges (University of Hawaii) should not be confused with the Global Oceans Observing System (GOOS) network used for monitoring global sea-level changes.

## **Vulnerability and Impacts of Climate Change in the Pacific**

**Trends, deficiencies and acquisition of data relating to climate change in the Pacific islands** (*Dr Mahendra Kumar and Dr Patrick Nunn, The University of the South Pacific*) - presented by Dr Kumar.

The presentation discussed recent temporal trends in selected climatic and related variables and showed that the interpretations and extrapolations of this data are potentially flawed due to the lack of particular data. Dr Kumar also reviewed strategies for the acquisition of certain data, and highlighted the need for a concerted effort by regional organisations to help overcome this void.

A recently funded project aimed at monitoring ultraviolet radiation in the region was used as a case study to illustrate how the data acquisition process can also be used as an effective education and awareness raising tool.

#### *Discussion*

The meeting concurred that the lack of data on all aspects of climate change was a major hindrance to the advancement of climate change plans and policies. Participants urged that greater effort be made to ensure that effective on-going monitoring of climate change indicators is a high priority.

**Environmental effects of using cold-pressed coconut oil as an alternative to diesel and kerosene in the South Pacific** (*Jon Roberts, The University of the South Pacific*)

Jon Roberts described how a traditional Tuvalu oil extraction process has been optimised to produce fresh, high quality coconut oil. One of the interesting applications of this oil is that it can be used as a direct replacement for diesel in engines and as a kerosene alternative in modified pressure lamps and stoves. The use of a new direct micro-expelling process makes the economics favourable. There are many reasons why the use of coconut oil as a diesel and kerosene

alternative is important, including many environmental benefits. All CO<sub>2</sub> released in combustion is resequenced when new fuel is grown. There are no SO<sub>2</sub> emissions.

In the presentation, the output from a computer model was used to show the environmental effects, including air pollutants, greenhouse gases, and internal and external costs. The environmental impacts of upstream extraction and transportation processes are included in the model. Modelled case studies based on Fiji and the South Pacific were used to quantify the economic, environmental and social costs and benefits.

#### *Discussion*

A participant asked if the coconut oil needed to be used exclusively, or can it be mixed with other fuels? The response was that the oil can be mixed with other appropriate fuels (e.g. ethanol or methanol). While the coconut does not have to be freshly pressed, the quality is better if the oil is prepared in this way. It is less likely to be contaminated with grit etc.

Attention of the speaker was drawn to a South Pacific Commission (SPC) project dealing with coconut oil as a fuel. This includes developing appropriate engines. French organisations are also involved. There is an oil producing plant on Majuro, but it may work on a different process. The speaker was asked if he had looked at coconut oil produced from copra. He replied that the study has not yet looked at this aspect, but it will.

A participant also drew attention to the existence of the Coconut Research Group at USP. The study described at the meeting was part of a wider research programme, which also involved teaching an energy course. The Group is looking for more substantial funding. It was suggested that the Group contact UNDP and the World Bank, and assistance was offered with respect to seeking funding.

The speaker was asked to elaborate on his comment that emissions of CO<sub>2</sub> were sequestered, thus meaning there was zero net emission. In doing so, the speaker pointed out that the zero net emission was achieved on a long term average.

#### **Vulnerability to impacts of climate change and sea-level rise: the human dimension** (*Dr Graham Sem, The University of Papua New Guinea*)

Dr Sem placed the human dimensions of climate change including sea-level rise, in a broader biophysical context. He noted several difficulties in addressing the topic of human dimensions in the South Pacific and went on to remind participants that traditional societies were adjusted to their changing environments by a sophisticated system of environmental management

and societal organisation. These measures enable survival in their usually resource-poor environments, even when extreme events such as tropical cyclones and drought pushes their marginality to the limits.

While Pacific islanders are minute contributors to pollution on a global scale, they do have the problems of land and ecosystem degradation, as well as deforestation. For larger Pacific countries these problems are probably manageable for the next 50 years, but for the majority of island nations, coastal erosion and inundation are likely to challenge all facets of human survival. Although some progress (albeit very little) has been made in understanding the impacts of climate change, vulnerability and sea-level rise in the Pacific islands, large uncertainties still remain. Human induced climate change and sea-level rise represent additional stress on systems that are already threatened by other changes which include population growth, intensification of land use, habitat fragmentation and contamination of waterways and marine systems. Therefore, it is extremely difficult to attribute ecological and social impacts solely to climate change.

Dr Sem related an experience to illustrate the challenge for Pacific island countries. At the last Ad Hoc Group on the Berlin Mandate (AGBM) meeting the valuation of impacts in dollar terms dominated the proceedings, but the representative of the Marshall Islands reminded the meeting that a large portion of Majuro would disappear if the anticipated rise in sea-level did occur. It was impossible to place a dollar value on the disappearance of tradition and culture.

Dr Sem proposed that future research priorities include:

- vulnerability assessments and adaptive responses, particularly on agriculture, fisheries, tourism, settlements, society and culture, government services and on infrastructure;
- traditional knowledge systems need to be incorporated into further assessments and also in mitigation, innovation and adaptation; and
- studies of socio-cultural systems such as land tenure, kinship and social organisation, leadership, value orientation and goal aspirations.

#### *Discussion*

A participant pointed out that the projected rise in sea-level occurring on top of El Nino Southern Oscillation (ENSO) will take us beyond the range of sea-level change that is within current or previous human experience.

**Current and planned environmental re-search at the University of Guam** (*Dr Charles Guard, University of Guam*)

The presentation by Dr Guard focused on current and planned studies into how the Pacific high islands and atolls will be affected by the impacts of climate change and sea-level rise. Included in the presentation were long lead time forecasts and synoptic climatology studies of Micronesian islands and American Samoa. Research into the interannual variability of tropical cyclone frequency, genesis, movement and intensity and into monsoon activity and rainfall variability were also discussed. Some research is also being conducted into the impact of global warming on tropical cyclone behaviour.

The University of Guam is involved in the development of two unique databases: a high-confidence tropical cyclone intensity data base and a “totally integrated” rainfall database for Micronesia and American Samoa.

*Discussion*

ENSO involves changes in sea-level that are similar to those predicted for the next 100 years. For example, at Christmas Island, ENSO involves a 35 cm change in sea-level. While the change is relatively short lived, it is possible to use these changes as analogues. What effect do they have on current systems? In fact, questioning revealed that the people in Christmas Island did not even realise that a significant event had happened.

**ENSO and the results of environmental monitoring in the Pacific** (*Jacques Merle, French Institute for Scientific Research for Development through Cooperation (ORSTOM)*)

In his presentation, Dr Merle noted that ENSO is a partially predictable climate signal with important economic and human consequences. Monitoring of phenomenon such as ENSO and its effects is a necessary but very expensive task that requires international cooperation. He asked if SPREP has a role in this cooperation.

Since ENSO has a sea-level signature of the order of 50 cm, forecasting ENSO could help prevent catastrophic events associated with sea-level rise. Also, knowledge of ENSO and its effects on sea-level would help in the early detection of the global rise in sea-level.

*Discussion*

The Pacific experiences a high magnitude, lower frequency signal associated with ENSO. From a climate change point of view this is of extreme importance; it is unique to this part of the world.

Furthermore, the socio-economic effects of ENSO are far more important, complex and widespread than we read about in the popular media. In fact, we do not know the socio-economic impact of ENSO for places such as Kiribati, Tokelau and Samoa islands.

**ENSO, erosion and sea-level change in Tarawa** (*Graham Shorten, South Pacific Applied Geosciences Commission*)

Small island states of the Pacific face management challenges that are heightened by climate change, including ENSO driven interannual variation and long-term trends in storm characteristics and sea levels. It has already been established that the ENSO phenomenon has a direct effect on weather patterns in Tarawa, and that weather patterns affect the distribution of lagoon sediments. Comparisons between variations in the Southern Oscillation Index (SOI), the wind observed at Tarawa atoll and observations from aerial photographs of North Tarawa suggest that the accumulated effects of climate change might be used to predict whether the beaches and spits of Tarawa will be in either a dominant constructional or erosional phase at a given time.

Erosion of the ocean shore in South Tarawa is attributed to limited sand supply and to cessation of ENSO-driven episodic renourishment following construction of the Bonriki causeway. Erosion of beaches along the lagoon shore has been linked to ENSO warm events in which sediment is redistributed alongshore. Tidal levels in South Tarawa appear to have risen progressively, in accordance with current estimates of eustatic sea-level rise due to global warming. However evidence indicates that Tarawa atoll has continued to tilt westward throughout the Holocene to the present day, resulting in net emergence in the east and net subsidence in the west.

*Discussion*

A participant noted that the presentation had dealt with processes and effects which were reversible and asked if a longer term perspective would have shown that these were irreversible. The speaker replied that this was indeed so, and that in some instances even the short term effects were irreversible. He cited the movement of sediment out of the lagoon and offshore in Majuro. The sediment was deposited some 40 m below the surface due to a steep drop off from the reef.

**Climate change: economic development and energy policy issues** (*Iulai Lavea, Forum Secretariat*)

The presentation dealt with the relationship between climate change and economic development in the Pacific region. A rigorous analysis of the impact of



climate change on economic development possibilities for Pacific island economies would require a reliable and as yet largely unavailable set of baseline data. Work currently underway at SPREP, the South Pacific office of the UN Department of Humanitarian Affairs and other regional and international organisations will ultimately result in a clearer picture of the likely effects and costs of climate change in the region. But even a simple analysis makes it clear that global warming could have a severe impact on the main productive sectors of Pacific island countries, including commercial and subsistence agriculture, forestry, fisheries and tourism. The quality of life of Pacific islanders may also be significantly diminished by deteriorating health status and increasing population pressure or forced resettlement.

The speaker also noted that world-wide action is required if amelioration of climate change is to be effected. For the energy sector such action includes increasing energy efficiency, increased use of renewable technologies and use of pricing and regulatory policies. While Pacific island countries' action in this area as "good international citizens", will make almost no impact on a global scale and will not influence climate change in the region, there are a number of sound reasons why Pacific island countries should be at the forefront of the development of sound energy policy. These include immediate positive effects on the economy which would result from more efficient energy production and pricing. There is also an immediate impact on the local environment. Such action would also allow Pacific island states to retain the high moral ground for pursuing climate change issues in the international arena.

### **Climate change vulnerability, adaptation and impacts study for Kiribati** (*Tererei Abete, Kiribati*)

Ms Abete reviewed the various studies undertaken in Kiribati and outlined their findings. A United States Country Study Programme for Kiribati is now being implemented. It involves:

- an inventory of greenhouse gas sources and sinks;
- a system for analysing climate and related trends for Kiribati, including baseline climate data for the country; and
- a study of coastal and water resources, including assessing their vulnerability to climate change.

The studies will include consideration of administrative and institutional procedures. Vulnerability assessment will be undertaken using an appropriate methodology. At present, methodologies have several shortcomings including imposition of an

inland boundary where none exists for atolls such as those in Kiribati. Other shortcomings are:

- attempts to indicate zones, when the islet is too narrow for zones to be identified;
- lack of data and other information;
- the difficulty of assessing the adaptation of managed systems to climate change and sea-level rise, though natural systems are less difficult; and
- the need for economic and social analyses.

There needs to be in-country training on the usage of appropriate methodologies.

### *Discussion*

A participant noted that there was an important need for regional models of the response to the enhanced greenhouse effect. It was becoming possible to derive such information given the increased resolution of some global models and the existence of nested models. For example, there is a need to model the responses of living marine resources to changes in oceanic conditions.

The speaker was advised that UNEP is carrying out a global vulnerability assessment study based on four countries, and an island country is included. It is hoped this project will assist in developing an appropriate methodology and address the concerns the speaker raised with respect to IPCC Common Methodology.

There was general agreement that national expertise needs to be developed in-country.

Another participant made the following comments:

- he was in full agreement with the speaker's view that the Common Methodology that was used between 1990 and 1995 was inappropriate for countries such as Kiribati;
- in the context of Kiribati it is difficult to integrate vulnerability assessments within the Coastal Zone Management (CZM) system; how is it possible to conduct such specialised exercises within the CZM context?
- global models are unreliable for planning purposes.

### **Challenges facing a Pacific island country as a result of climate change: a personal view** (*Tibon Jorelik, Republic of the Marshall Islands*)

Mr Jorelik presented his personal views on the challenges facing Pacific island countries as a consequence of climate change and sea-level rise. He noted the importance of identifying the significant problems to be addressed and then being able to recognise the range of options to achieve a solution.

In many cases, implementation of the appropriate responses may be beyond the capacity of the country. Often this is tackled by bringing in external consultants, but when their work is done no capacity is left in the country to tackle further related problems.

#### *Discussion*

A speaker commented that misinformation about climate change is critically damaging. Public perception is important in addressing environmental change. For these reasons there is a need for information to be as accurate and as reliable as possible.

In response to a question regarding the potential to have successful integrated Coastal Zone Management in Majuro given that there is such fragmented ownership of land, the speaker noted that he did not really see this as a problem, compared to the current lack of understanding about the issue of climate change.

#### **Progress towards climate change scenario and impact studies for the South West Pacific** (*Dr Barrie Pittock, Australia*)

Dr Pittock reviewed recent progress in climate modelling and impact studies. He assessed the regional performance of global climate models, including regional variations in sea-level. The performance of different categories of climate models was also examined. The presentation also included discussion of the results of recent studies of ENSO, tropical cyclones, extreme rainfall and temperature patterns. Progress towards the use of models with finer resolution was also assessed. Storm surge and coastal inundation studies were described. Finally, Dr Pittock emphasised the need to look beyond the time of doubled CO<sub>2</sub>.

#### *Discussion*

The meeting was reminded that the IPCC representative had said that for the third assessment there would be a move from global to regional scenarios. He asked whether this would produce information compatible with the capacity to use it and with information needs. In response, it was noted that the 1990 IPCC produced some regional scenarios, for areas selected partly for their vulnerability to climate change. Due to the uncertainties in the model outputs, there was no real improvement over global scenarios. However, there have been recent improvements and later this year (September, in England) there will be a workshop to define the requirements for regional scenarios and to consider how these needs will be met by the modelling community.

A participant noted that requirements for the regional scenarios depend, in part, on what studies they are trying to support. For adaptation studies there is a need for high resolution; if the need is to support vulnerability assessments to determine economic costs in order to justify mitigation then it is possible to work with lower resolution, such as for the Pacific region.

It was also pointed out that the needs were not only defined in terms of the spatial scale for which the information would be provided. The importance of additional parameters should be provided. In addition to the obvious ones, are variables such as soil moisture important?

Participants suggested such parameters may include sea-level, extreme events (frequency and magnitude and spatial variation) including tropical cyclones, rainfall, droughts and ENSO, water balance parameters, monsoon characteristics, positions of jet stream, Inter-tropical Convergence Zone (ITCZ) and the South Pacific Convergence Zone (SPCZ), solar radiation (direct, diffuse, global), net radiation, humidity, concentration of selected atmospheric gases and wave climate.

The meeting agreed to prepare a prioritised grouping of parameters.

Countries and those studying the climate change issue were urged to foster links with international and national science groups active in the region. Linkages should be made between the "big" scientific research programmes and the needs of small island countries. IPCC is collecting the results of research, but there is a need to link with those doing the research so they can ascertain the needs of small island states.

It was noted that the IPCC conducted information exchange seminars after the First Assessment. Target groups were politicians, government officials, industry and the public. The seminars were very cost effective, but highly labour intensive. There was also the problem of organising compatible timetables, yet the seminars enhanced participation in subsequent IPCC activities.

There are at least two occasions this year when leaders of Pacific island countries come together. One example is the SPREP meeting later this year. It might be possible to brief the meeting on the results of the IPCC Second Assessment.

Another participant noted that it is counter-productive to work with higher resolution modelled data which is wrong or lacked validation.

The question was raised as to whether it is possible to determine potential inundation if the modelled ocean currents are incorrect. In response it was noted that the study was not designed to provide that type of

information, it was intended to show the sensitivity of the system to short term meteorological forcing.

**Climate change and Pacific island countries: synthesis, assessment and implications** (*Prof. John Hay, NZ*)

Professor Hay reported on the findings of a recent assessment undertaken by SPREP. He noted that interannual variability in the climate of the Pacific region is large relative to most other regions. Extreme events are frequent and intense relative to most other regions. In the past, island countries have survived these variations and extremes, but short-term effects are sometimes catastrophic. Predicted changes in temperature for the region are small compared to the global average, but they may be underestimated due to shortcomings in the models. Changes in other climate variables may be large, but there is great uncertainty.

The study found that natural and human systems are already under great stress, often beyond the intrinsic adaptive capacity of the system. Climate change adds the existing stress, even if it is seen only as a potential threat. He noted that it is possible to summarise the position of Pacific island countries with respect to climate change: they are highly vulnerable, rarely culpable and have a low capacity to respond.

Professor Hay went on to review the diverse methods used to assess climate change in the region including the IPCC Common Methodology, the SPREP/Japan Stress-Response Methodology and the IPCC Guidelines for Assessing Impacts and Adaptation Options. The study concluded that there is a need to develop, test and apply a consistent methodology suited to the nature and needs of Pacific island countries.

The presentation ended with the identification of a number of policy responses and of a number of regional action strategies of high priority. These will provide regional support for actions that must ultimately be developed at local and national levels.

*Discussion*

A participant noted that the experience of the Forum Secretariat was that if the national planners and decision-makers (including politicians) were well aware of the issues, it was possible to successfully integrate these concerns into national plans and activities.

## Next Steps

**Pacific islands input to the Third Assessment Report** (*Dr Narasimhan Sunderaraman, IPCC*)

Earlier in the meeting, Dr Sunderaraman had presented his thoughts on the way technical and other experts in the Pacific islands could make an input to the Third Assessment by the IPCC. The first step was for countries and individuals to be informed on IPCC conclusions. The region could also increase its involvement in IPCC activities by establishing region-wide lists of experts for consideration to serve in IPCC writing teams and, more importantly, in the peer-review process. Individuals could actively participate in the technical government reviews and become involved in election of the members of the IPCC Bureau.

**Linking scientific understanding and the negotiation process** (*Ambassador Tuiloma Slade, Samoa*)

Ambassador Slade noted that the key requirement in enabling negotiators to negotiate is the ability of foreign ministries to give instructions. He identified main problems as communication breakdown and imbalances in knowledge and understanding. Therefore, there is a need for information to flow both ways, for technical reports to be synthesised and to have the findings incorporated into the negotiating process.

While negotiations with respect to climate change are science driven, they are political at all levels. Moreover, solutions and responses are all economic, leading to an economic defensiveness by some parties. Typically the seven Pacific island representatives at the United Nations have small delegations and most of the negotiators are not technically qualified, with little background in the sciences or economics. Foreign ministries in the capitals are also poorly equipped in the scientific and technical sense.

Options by which negotiators can overcome these difficulties are self help and making arrangements for enhanced cooperation with the sharing of knowledge and resources. AOSIS is one such response. With a membership of 36 countries out of the 185 at the United Nations, AOSIS has some 17 to 18 percent of the voting power. AOSIS has a higher proportion in the UNFCCC.

Regarding the flow of information from the capital to the negotiators, there is a definite need for quality and complete basic scientific and economic information such as ENSO impacts. Research work to provide this information needs to be further

advanced and perfected. The research results should be shared with all Pacific island countries.

Negotiators should be advised by technical experts, both as to the content of their brief and the manner of presentation. Typically there is a need to rely on regional organisations and NGOs for this type of support. With respect to the NGOs, there is reliance on both their technical and moral authority as some NGOs operate more from the heart than by reasoned technical research.

Immediate efforts at capacity building must include personnel as well as other systems. There is also a need to encourage universities and other teaching institutions to focus on the climate change issue. This would involve teachers and students in science, economics, social science and technology.

There is a need to formalise systems by which negotiators can draw advice from national and regional experts. We should consider what institutional mechanisms are needed to give support to the negotiation process. One option is a regional Technical Advisory Panel, though this initiative is not widely supported within the Subsidiary Body for Scientific and Technical Advice. It is however, more the form of such a body, than its content, which is important. SPREP could coordinate the panel. Such an arrangement would ensure institutional involvement. The Panel could identify research needed, collect available information and prioritise and synthesise the information. An example of the work a panel such as this could do is to consider how the developing countries might be disadvantaged by any measures proposed under the UNFCCC. The panel could also arrange for experts to undertake regular reviews of major climate change issues and use the results to advise negotiators and other interested parties.

Of critical importance is the need to make the results of research and other investigations widely known to the international community. There is a need to publish papers, including those from the present meeting.

In conclusion, Ambassador Slade noted that the Pacific region, including Australia and New Zealand, typifies the parameters of the climate change debate science, impacts and the range of available response options. This underlines the need for research and for more information to come from the region. The region is vulnerable, but rarely is it culpable with respect to climate change. There is a need to fully understand and to respond to what is happening, and make a conscious effort to register our views and provide input to international negotiations.

### **The UNFCCC beyond the Year 2000** (*Mr Jake Werksman, Foundation for International Environmental Law and Development, England*)

Mr Werksman provided a timeline to 2100 for activities related to the UNFCCC. These include the ending of the activities implemented jointly (AIJ) pilot phase and the IPCC Third Assessment in 2000. He noted that the activities were all dependent on scientific, economic, social and political uncertainties. In comparison to the biophysical sciences, economists are struggling with the science of economic uncertainty. They are dealing with components which are behaving in a far less rational way.

The speaker reported on a workshop which discussed targets and timetables. One economist, using a "top-down" approach to estimating the net costs and benefits of a 20 to 30 percent reduction in greenhouse gas emissions, reported a cost of USD\$8 trillion dollars. Another economist, using a "bottom-up approach", found that there would be a small economic benefit. In such studies the economic variables which must be predicted into the future include estimates of economic growth, the price of fossil fuels (including the environmental costs), the costs of alternatives to fossil fuels and the role of the private sector. The latter is growing more powerful with time, while institutional systems are of declining importance. For example, private sector sources of funding are now 3 to 4 times those of the World Bank, while the latter used to dominate. An important question is the future interaction of science and economics and how this will influence policy. There are large uncertainties in trying to answer this question.

There is a need for policy responses under the UNFCCC to follow two tracks:

- the track followed by the series of Conferences of the Parties (COP); and
- the track which involves looking further ahead. The latter may well involve the use of mandates which set out targets to be adopted in another legal instrument some time into the future.

Immediate issues are those which relate to proceeding from COP2 to COP3. These involve considerable economic, political and scientific uncertainties. Another issue is the reasonableness of the target in the AOSIS protocol. Given that the target is based on the Toronto Target set in 1988, and given the lack of progress to date, is the 20 percent target by 2005 reasonable? This can only be assessed in light of scientific and economic findings since 1988. There is pressure to either reduce the target or extend the date. An alternative approach is to take an environmental target (such as a temperature increase or a given rise

in sea-level) and then relate that to atmospheric concentrations and then even further back to emissions. This approach is used in a recent report which defines a “safe emissions corridor”, the AOSIS target is well within the corridor.

Another issue is how to overcome the objections of industrialised countries and those which are major oil producers. The latter are indirectly affected by steps to reduce emissions. The issue raises the question of equity. For example, 90 percent of the energy used in Iceland comes from renewable sources, but they are still being asked to cut emissions by 20 percent. Another example is Australia - its economy is dependent on exporting large amounts of fossil fuel. Cuts would have huge impacts. AOSIS is putting the equity issue off until some time in the future.

The period beyond COP3 may well be defined by the Kyoto Mandate, a likely outcome of COP3. The Kyoto Mandate will probably address how to extend the application of targets and timetables from developed countries to developing countries. In this respect, AOSIS will at some time have to confront the rapidly growing emissions in India and China. Science shows that at some time in the future, developing countries will have to limit their emissions. AOSIS will have to advocate a non-fossil fuel future for developing countries.

With respect to joint implementation, the current pilot phase will end in 2000. The pilot phase is also related to the development of a tradeable emissions permit scheme.

In conclusion, Mr Werksman made two points:

- climate change is only one of the issues but a priority one that AOSIS deals with. With respect to climate change, AOSIS has a role to feed back scientific and other information into the climate change negotiating process. There is a need to coordinate this process so that scientific information takes on a political momentum. This can be achieved by highlighting to policy makers the reality of the threat of climate change; and
- despite all the uncertainties, there is one certainty: people who are living today will never know whether they were right or wrong about the climate change issue. The answers will come only after our lifetime.

### **Developing a climate change policy for Pacific island countries** (*Mr Pene Lefale, Canada*)

Mr Lefale noted that the “Pacific Way” and Forum Communiqués between 1988 and 1995 stressed the seriousness of climate change to Pacific island countries and confirmed that these countries would contribute to international efforts to limit the adverse

effects of climate change by controlling their own emissions of greenhouse gases. He identified several issues to consider when developing a Pacific island country climate change policy:

- is climate change indeed a national (regional) priority?
- if so, how can climate change policy fit into other national (regional) policies?
- what institutional set-ups and linkages are required?
- climate change policy in the context of sustainable development;
- technical, financial and human resource considerations;
- time frame, noting that dealing with responses is a policy decision involving costs; and
- uncertainties associated with the science and social and economic impacts.

Mr Lefale went on to describe the “National Regional International (NRI) Domino Effect” the linkages between national, regional and international factors. He then went on to describe a climate change policy model that linked impacts and the development of policy responses for limitation and adaptation.

### *Discussion*

A participant noted that the development of a climate change policy would benefit from a mechanism to bring together the issues raised at the present meeting. While he was unsure of the actual structure that might be created, he considered that a technical advisory panel within an AOSIS framework, in coordination with SPREP, might be appropriate. The concept was supported by other participants. One pointed out that it was currently difficult to obtain information despite the existence of various responsible organisation and despite the existence of considerable information. With respect to information dissemination there is a major problem at all levels. There is a need for wider advertisement of information sharing activities.

Another participant pointed out that it was important that any regional initiative does not replace in-country efforts. In-country awareness raising makes the process more sustainable.

It was noted that there is little likelihood of formulating a regional policy on climate change. At COP1 Australia and New Zealand adopted a position that was substantially different to that adopted by the island countries. Thus there may be benefit in having a small island states policy rather than one for the Pacific. All island states have signed up to the AOSIS protocol.

With respect to education and training, a participant pointed out that there is a need for government and other officials to have an understanding of the broad issues. Training in environmental science would appear to be most appropriate.

A participant commented that priority should be given to determining the costs and benefits of various limitation scenarios. Only then is it possible to work through the other stages such as allocating emissions, including splitting allocations between developed and developing countries.

It was pointed out that the Pacific island countries have come a long way since 1987 when the issue was first considered in a comprehensive way. In Kiribati there was no Environment Department when the first vulnerability assessment was undertaken. The fact that there is now a Department, is due to climate change. The same applies to the Maldives. While there has been plenty of resistance to taking action related to climate change, there have also been numerous positive developments, which appears to relate to the activities of the IPCC. Countries see this as an influential body. It helps to establish their international obligations, and appears to dominate over factors such as economics. The participant went on to ask if the uncertainty which affects the setting of climate change policy is any greater than that involved in setting health policy or defence policy, etc. How is the climate change issue different in terms of policy development? He argued that the difference was more related to the following: interdisciplinary, multi-sectoral, and the time frame, as opposed to uncertainty. The latter was, of course, a factor.

Uncertainty is a substantive negotiating position adopted principally by the developed and oil exporting countries. They demand a response to this issue. The more vulnerable countries argue that urgent action is needed despite the uncertainty. The oil exporting countries argue that we are experiencing natural variability and not global warming and that we need more study of the economic implications. Perhaps the most important distinguishing factors with respect to setting climate change policy as opposed to defence policy are:

- the size of the vested interests involved (oil producers, multinational industry etc); and
- the interests of arms producers in providing national security.

With respect to regional versus national approaches to setting policy, one problem is the top down approach with respect to methodologies. In addition to the issue of applicability, there are the issues of non-participation in establishing the methods and of

lack of ownership at the local level. In the Federated States of Micronesia the issue of climate change has come via the political negotiation process rather than through an approach to government at the scientific level. Moreover, it is not a question of ownership of the policy, but more one of the resources a country can draw upon to assist its development policy. In this respect AOSIS and SPREP are important.

Another participant suggested that there are in fact two processes—science proceeding on one side and negotiations proceeding on the other. These must be brought together, and there is a need for science involvement in the negotiating process. Negotiating teams should have both negotiators and technical experts. A strong signal should go to Ministries of Foreign Affairs that the composition of delegations should include technical experts - currently there is little participation of small island IPCC experts in the negotiating process. Governments appear to be reluctant to make use of technical expertise available in-country. Often they either have no direct technical input or they use overseas consultants.

There are two reasons for bringing negotiators and technical experts closer together. Not only do the negotiators benefit from greater technical input, but scientists also benefit from knowing how their work is ultimately applied as well as observing emerging issues. Thus there is a need for a two way interaction.

It was pointed out that SPREP is working to establish national focal groups with technical expertise in climate change. This is within national meteorological organisations, using them as centres of expertise to advise policy makers. In some cases, national meteorological organisations already provide the international negotiator.

One way around the communication problem is to ensure that information from international and regional bodies is sent to both the Foreign Affairs and the focal point at the science level.

The focus of AOSIS at COP2 will be testing its reasonableness and its achievability. This led to a plea for scientific input to AOSIS to support their call for the implementation of the Toronto Target.

## **Adaptation Strategies**

A discussion paper prepared by SPREP addressing the topic of adaptation strategies was presented to the meeting by Mr Neville Koop. A wide ranging discussion followed, covering such topics as GEF funding of adaptation measures, the definition of the three stages of adaptation strategies and the

relationship to activities under PICCAP. Other aspects covered included the restrictive nature of vulnerability assessments and the contributions that could be made by hazard studies already under way in the region. The importance of knowing the tectonic stability of tide gauge monitoring sites was highlighted. Also of importance is the need to have data held within the region, with clearly defined responsibilities for maintaining data repositories. Databases should include more than just information on greenhouse gas emissions and atmospheric concentrations.

The session ended with an informal discussion of the value of the present meeting and the purpose, frequency and location of any future meetings. The consensus was that the meetings were most productive and should be followed up, with more country representation at future meetings being highly desirable. Also considered were mechanisms for making the findings of research in the region more

widely available and known. Participants expressed their appreciation to the Government and people of Denmark for their generous financial assistance, without which the meeting would not have been possible.

## **Concluding Session**

The meeting reviewed and revised a draft set of conclusions and recommendations prepared by the SPREP Secretariat.

The meeting was closed by Mr Don Stewart, the Acting Director of SPREP who noted the value of the outcomes of the meeting. He also thanked the Chairman for his able management of the meeting and the participants for their conscientious efforts in fulfilling the objectives of the meeting.

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## **Annex 2 Opening address by Dr Vili Fuavao, Director of SPREP**

Vice Chairman of the Alliance of Small Island States, His Excellency Ambassador Slade;  
Secretary of the Intergovernmental Panel on Climate Change, Dr Sundararaman;  
Representatives of the Diplomatic Corps;  
Representatives of the Government of Samoa;  
Participants, and Distinguished Guests;  
Ladies and Gentlemen.

It is my pleasure to welcome you, ladies and gentlemen, to Apia, capital of Samoa and home of the SPREP secretariat. It is an honour for me to be able to speak to you today on the occasion of this meeting on the Science and Impacts of Climate Change.

Pacific island governments have long recognised the serious threat that climate change and accelerated sea-level rise poses to their island countries. As a result, Pacific Island countries have been active and vocal in the international debate generated by this global phenomenon.

The recent second assessment report of the Intergovernmental Panel on Climate Change (IPCC) attributes observed changes in various climate indicators to human influence on the climate system.

This human influence is due to the increased concentration of carbon dioxide and other greenhouse gases released into the atmosphere through agricultural and industrial development. While only a relatively few countries are responsible for these emissions, the entire global community is threatened by changes in the global climate system brought about by this human influence.

The IPCC tell us also that only substantial reductions in emissions of greenhouse gases will stabilise atmospheric concentrations at levels that will not harm the earth's natural biosystem. Further, the IPCC concludes that even if such emission reductions are achievable in the next few years we will still see increased air and sea temperatures and rising sea-level for the next few decades due to the natural time lag inherent in the ocean-atmosphere system.

Overcoming the threat of climate change involves a cooperative international effort to both limit or halt the root cause of the problem, and to adapt to likely changes which we will have to live with for the next few decades at least.

Viewed from an island perspective, the situation might well appear bleak; after all, island countries are negligible emitters of greenhouse gases, and thus unable to influence the cause of the problem on our own.

Further, it is recognised that small islands are among those to be most severely impacted by climate change.

To their credit, island countries have adopted a very positive approach to addressing their concerns in defiance of the overwhelming obstacles they face. By entering into constructive dialogue with the international community, island countries, through the Alliance of Small Island States (AOSIS) were influential in the establishment of the United Nations Framework Convention on Climate Change (UNFCCC). This convention contains legally binding targets and timetables for reducing greenhouse gas emissions of developed countries.

Since the convention entered into force, AOSIS has continued to demonstrate its leadership in the international arena. Leading up to and during the first conference of the parties of

UNFCCC in Berlin last April, AOSIS and other like-minded parties successfully lobbied for international recognition that the commitments in the convention are inadequate to meet their ultimate goal, and need to be strengthened.

As a result, the ad hoc group on the Berlin Mandate was established to further strengthen the commitment to reduce greenhouse gas emissions from developing countries. In this new forum AOSIS is again ensuring the voice of island countries is heard loud and clear.

Adapting to climate change impacts poses a huge challenge to island countries. The resources and technology required are enormously expensive and in many cases difficult to access. A number of mechanisms have been established to assist each country determine their own vulnerability, and prepare and implement adaptation strategies.

While this sounds relatively straight forward, in practise successful adaptation to climate change is not a simple exercise. It requires considerable long term commitment of governments, a sound understanding of the complex and often lengthy processes required to access international donor funding sources, the ability to identify optimum strategies for adaptation, and a willingness to take on board new ideas and new technologies.

However the consequences of not meeting this challenge would be disastrous for all islanders, and this ought to provide us with the necessary motivation, if indeed such motivation is needed, to take up the challenge of carefully planning a sustainable and healthy future for our children.

The future success of islands in both limiting the cause of climate change and addressing adaptation will require a sound scientific and technical foundation. In recent years some of the uncertainty surrounding climate change has been removed, however much remains to be learned. In particular, the regional impacts of climate change are poorly understood, and this includes the Pacific islands region.

This meeting has been convened in recognition of this fact. Over the course of the next week we will hear of studies being undertaken to unravel the mysteries of climate change in the Pacific. We will also hear of activities being undertaken in this region, and internationally, to identify appropriate future directions for island countries.

In this room we have a cross-section of expertise including senior representatives of the Intergovernmental Panel on Climate Change (IPCC), scientific researchers, technical advisers, policy makers, and environmental law experts. Not only are Pacific islanders interested in the outcomes of this meeting, your deliberations will be of interest to everyone involved in climate change issues, in particular the international organisations such as the IPCC and the Climate Convention Secretariat.

This meeting has been generously sponsored by the Government and people of Denmark. Their support to the Pacific region, and to small islands in general, has been exemplary, and I would wish to thank them sincerely for their contribution to this and other activities of SPREP, and hope that we can continue to work closely and cooperatively with the Danish Government.

I would also wish to thank the Government of Samoa for their assistance in convening this meeting, and the Secretary of the IPCC for his interest in this meeting and for taking the time and effort in his busy schedule to be here with us this week.

Finally, opening this meeting represents one of my last official duties as director of SPREP. However, in my new capacity I will be following your work closely, as they will be of great importance in my new role as head of the Food and Agriculture Organization (FAO) in the Pacific Islands. It gives me considerable comfort to enter into this new career knowing that we have such knowledgeable and talented people working for our future. I am sure that your endeavours will “bear fruit”, a phrase often used in FAO, and bring about a better future for all island people.

I wish you a productive and successful meeting.

Faafetai and soifua.

### **Annex 3 Statement by His Excellency Ambassador Erik Fiil, Ambassador for Environment and Sustainable Development, on behalf of the Government of Denmark**

Ladies and Gentlemen, dear participants,

The Government of Denmark welcomes the organisers and the participants to this meeting. We are happy to be able to contribute financially to the realisation of this event, and we hope that the meeting will help strengthen the scientific understanding in the South Pacific region on the issues of climate change.

The vulnerability of small island states to climate change has been highlighted in several recent international meetings. Let me just mention the UN Conference on Environment and Development (UNCED) in Rio in 1992, the Barbados Conference in 1994 on the sustainable development of small island states and the various meetings within the UN Framework Convention on Climate Change.

Climate Change poses many challenges to the Pacific island states and threatens the very survival of several societies. Coastal erosion, coral bleaching and the increased number and intensity of tropical cyclones are just a few of the impacts that are now visible. The economic, environmental and social problems related to these developments are severe, and we may even expect them to accelerate in the years to come.

The Pacific island states have contributed very little to the global problem of climate change. They have never been major users of fossil fuels, they have never undertaken intensive agricultural practices nor have they been large users of industrial products which contribute to the build-up of greenhouse gases in the atmosphere. And yet they are among the first potential victims.

The major reasons for climate change are to be found in our part of the world, in the industrialised countries. The widespread use of fossil fuels in industrialised countries is the most important reason for the increased CO<sub>2</sub> concentration in the atmosphere and consequently for the greenhouse effect. The Danish Government is fully aware of the responsibility of the industrialised countries to take the lead in solving the problem.

Denmark has for several years had a CO<sub>2</sub>-reduction target of 20 percent by 2005. This target is confirmed in "Energy 21", the new Danish energy plan, presented by the Government on April 16 this year. Energy 21 furthermore commits Denmark to work internationally for a target of 50 percent CO<sub>2</sub> -reduction by 2030, thus following the recommendations of the Intergovernmental Panel on Climate Change (IPCC).

In the context of the Climate negotiations, Denmark consequently is very much in agreement with the positions of the small island states, as these are channelled through AOSIS. And Denmark being itself a small country, is fully aware of the need for like-minded countries to collaborate internationally, even if we geographically are not neighbours.

Denmark, as a country with many small islands, shares many experiences with small islands states. And Denmark has several low-lying areas that are prone to flooding with increased sea-levels. The severe impacts of global warming that are now being experienced by island states in the South Pacific, indicate to us what we can expect in the future, if the emissions of greenhouse gases are not reduced significantly.

We see this week's meeting as an opportunity for the Pacific island states to be updated on scientific knowledge presented in the latest reports from IPCC. In addition, we hope the meeting will contribute to the formation of a scientific climate change platform in the region. The small island states have both a need and an obligation to be in the forefront of international negotiations on climate change issues. In order to do so, close cooperation and up to date scientific knowledge are prerequisites.

We trust that the small island states will continue, through the Alliance of Small Island States, to play an important role in the climate negotiations. We have common interests, we have common positions and we have a common goal in this respect.

The Government of Denmark sends its best wishes to the participants in this meeting and will be looking forward to future contacts and collaboration in the interest of our common future.

## Annex 4 Meeting agenda

1. Opening Session
2. Keynote Speakers
  - (i) Climate change and Pacific island development (Professor Bill Pattie, University of the South Pacific, Alafua Campus)
  - (ii) Climate change negotiations, a brief history (Mr James Stovall III, Federated States of Micronesia)
  - (iii) The Intergovernmental Panel on Climate Change (IPCC); its role and function, and opportunities for Pacific island input (Dr Narasimhan Sundararaman, Secretary, IPCC)
  - (iv) Strengthening commitments to reduce greenhouse gas emissions; the Berlin Mandate process (Ambassador Tuiloma Neroni Slade, Samoa)
3. Implementing the UNFCCC
  - (i) Institutional linkages (Mr Jake Werksman, FIELD)
  - (ii) The financial mechanism of the UNFCCC; the Global Environment Facility (GEF) (Ambassador John Ashe, Antigua and Barbuda)
  - (iii) Pacific Islands Climate Change Assistance Programme and the SPREP Climate Change Programme (Mr Neville Koop, SPREP)
4. The IPCC Second Assessment Report
  - (i) The IPCC Second Assessment Report (Dr Narasimhan Sundararaman, IPCC)
  - (ii) Coastal zones and small islands (Dr Leonard Nurse, Barbados)
  - (iii) Coastal vulnerability assessment: a way ahead; the Australian experience (Professor Roger MacLean, Australia)
5. Vulnerability and Impacts of Climate Change in the Pacific

A series of presentations on present knowledge and effort to understand and reduce the impacts of climate change and sea-level rise. Presentations by:

  - (i) The University of the South Pacific (USP, Department of Geography)
  - (ii) The University of the South Pacific (USP, Physics Department)
  - (iii) The University of Papua New Guinea
  - (vi) The University of Guam
  - (v) French Institute for Scientific Research for Development through Cooperation (ORSTOM)
  - (vi) South Pacific Applied Geoscience Commission (SOPAC)
  - (vii) Forum Secretariat
  - (viii) Ministry of the Environment, Kiribati
  - (ix) Environmental Protection Agency, Marshall Islands
  - (x) CSIRO Australia
  - (xi) University of Auckland



6. Next Steps

Linking Scientific understanding and the negotiation process (Ambassador Tuiloma Neroni Slade, Samoa)

The UNFCCC beyond the year 2000 (Mr Jake Werksman, FIELD)

Developing climate change policy for Pacific island governments (Mr Pene Lefale)

7. Adaptation Strategies

Round table discussions on island adaptation strategies, including:

- identification and interpretation of Stage 1 Adaptation Projects as defined by GEF; how these might lead to Stage II and Stage III projects; and
- how the IPCC can help in providing methodologies and identifying relevant technologies that could lead to a common concept of adaptation activities.

A Working Paper for this session will be prepared by the SPREP Secretariat to provide a starting point for the discussions.

8. Conclusions

Discussion and agreement on the Executive Summary of the meeting.

