

# Oceanic Waves



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START is the acronym for Global Change SysTEm for Analysis Research and Training. It was launched by international scientists to build indigenous capacity world-wide to cope with scientific and policy aspects of environment change and development. The International START Secretariat was established in Washington DC, in 1992. START website address is: [www.start.org](http://www.start.org)



START-Oceania is one of six START regional networks. START is sponsored by the International Geosphere-Biosphere Programme (IGBP), International Human Dimensions Programme on Global Environmental Change (IHDP) and World Climate Change Research Programme (WCRP). The START programme assistant is also the Liaison Officer for the Asia-Pacific Network for Global Change Research (APN). START-Oceania website is at: [www.usp.ac.fj/start](http://www.usp.ac.fj/start)

## Climate change threatens Kiribati

Kiribati as a nation has been threatened by climate change; the people, their vital natural resources like underground water, food crops, and even infrastructure and their livelihoods have been threatened.

Kiribati people are afraid that the sea level surrounding their low-lying atoll islands country has been rising. Their fears were highlighted in the above comments in a keynote address by Hon. Natan Teewe, Minister for Communications, Transport and Tourism Development in Kiribati, while opening the Kiribati Training Institute on Climate and Extreme Events (KTICEE) held from July 21-August 2 2006 at the Otintai Hotel and Teuanete Conference Centre in Tarawa, Kiribati.

"Our people have been complaining about accelerated erosion to our shores caused by frequent high tides. Questions have been raised in our Parliament asking for positive Government action to control the erosion problem. There is also a general feeling that the sea level has been rising and the analysis of the available data seems to confirm that feeling. It is very sad indeed, but what can we do?" Hon. Teewe questioned.



Hon. Natan Teewe, speaking at the KTICEE workshop held in Tarawa, Kiribati.

Hon. Teewe asked workshop participants and trainers, what role Kiribati could play to address and respond to the problems of climate change, if the privileged and bigger countries didn't care? "How many more times do we have to make noises at the UN and other international forums to put sense into the thinking process of our bigger brothers?" he questioned.

Global warming, climate change and sea

level rise are realistic issues facing the whole world but for low-lying island nations like Kiribati, their long-term sustainability as nations are questionable, Hon. Teewe commented.

"Our contribution to the problem of global warming is very minimal. But despite that we have no choice, we are faced with the realities of climate change. If one goes around our shores, the extent of environment degradation is very noticeable. Coastal erosion has been extensive, even on the outer islands where there has been less man made structural changes," Hon. Teewe complained.

Hon. Teewe was optimistic that the KTICEE training will provide local participants with tools to review and evaluate existing practices on climate change, and to develop and formulate informed policies and strategies to achieve changes to existing practices. For this to happen successfully, he said contributions from every government and non-government sector were required. Further information on the KTICEE is in a special feature on pages 4-5.

## Climate change message sent via theatre

Creating knowledge about weather, understanding the climate system, and climate forecasting skills will be a classical example of implementing education for sustainable development (ESD) in a non-formal way, according to Prof Kanayathu Koshy, Director of USP's Pacific Centre for Environment and Sustainable Development (PACE-SD) and START-Oceania Secretariat.

Prof Koshy made these comments when opening a workshop on 'Climate Change and Variability Implication on Biodiversity - Youth Scenario Simulations' on 18 September 2006 at the Media Centre Conference Room, University of the South Pacific (USP), Laucala Campus, Suva, Fiji.

The one-week workshop held from 18-23 September 2006, is part of a two-year

project conducted by USP's Institute of Applied Science (IAS) in collaboration with START-Oceania Secretariat, through a grant awarded early this year by the Asia Pacific Network for Global Change Research (APN). The project aims to raise Pacific Islanders alertness on the impacts of climate variability and change.

"In this APN adaptation project, Pacific youth groups are going to be involved in community awareness building programs through acting, singing and other forms of dramatisation of climate impacts and adaptation," Prof Koshy said.

"Knowledge can be created on perspectives of climate change through its history, present and future effects and the value systems through which climate change is contextualised as a problem so

as to find solutions. This includes issues for climate adaptation created by the impact of climate change on socio-economic and culturally important sectors, which can be implemented as part of ESD in a non-formal way," Prof Koshy further said.

Prof Koshy explained that creating public understanding and awareness on sustainable development issues though both formal and non-formal education is an important objective of the UN Decade of Education for Sustainable Development (UNDESD). Using flexible learning contexts and engaging multiple stakeholders are also an integral part of the UNDESD decadal activities.

The project will be implemented as a pilot in Fiji in the first year. Lessons learnt

>> continued on page 8

## From the Secretariat desk

Greetings from the START-Oceania Secretariat.

This is the third issue of *Oceanic Waves* for 2006, which is again being produced through the assistance of Daiana Taoba, research assistant with the START-Oceania Secretariat and Mosmi Bhim.

A major event on climate change was the Kiribati Training Institute on Climate and Extreme Events, held from July 21 - 2 August 2006 in Tarawa, Kiribati. This was funded under APN CAPaBLE, and is featured on pages 1, 4-5.

Another major event was the 'Climate Change and Variability Implication on Biodiversity - Youth Scenario Simulations' workshop held from 18-23 September 2006 at the University of the South Pacific, Laucala Campus, Suva, Fiji. This project also received funding from APN and is featured on page 1 and 8.

The Young Scientists Conference organised through START has been highlighted on page 3.

Page 3 also has an article on collaboration on sustainable development between USP and IGES and an article on improving coral reef management in the north Pacific.

The Young Scientist Column on page 6 features an article by Mr David Boseto from the Solomon Islands on unheralded freshwater fish diversity of Pacific Island countries.

An article on mainstreaming adaptation to climate change is also featured on page 6.

A regionally coordinated research program on the Southwest Pacific ocean circulation and Climate Experiment (SPICE) implemented through the Pacific Islands Global Ocean Observing System (PI-GOOS) is featured on page 7.

On the last page is an article on Ozone Week activities by the Ministry of Environment in Fiji.

We hope you enjoy reading this issue of *Oceanic Waves* and we welcome your feedback.



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## Call for abstracts for IPCC expert meeting on climate

The IPCC Task Group on Data and Scenario Support for Impact and Climate Analysis (TGICA) is organizing an expert meeting on climate-society-environment interactions that are important to understanding climate change and its potential implications.

The purpose of the meeting on "Integrating Analysis of Regional Climate Change and Response Options" is to explore and stimulate innovative research on connections and feedbacks across space, time and systems at scales appropriate to mitigation and adaptation decision-making.

The 3-day expert meeting will be held June 20-22 2007 in Nadi, Fiji.

Interested participants are invited to submit paper abstract by 30 November 2006. A form for submission of paper abstracts can be obtained from the email

address: ipcc-wg1@al.noaa.gov

Abstracts are invited that address the challenges of: integrating socio-economic and environmental datasets; exploring feedbacks and couplings among different systems; assessing issues associated with rapid changes; addressing methodological constraints; identifying spatial teleconnections among different systems; and identifying repercussions and consequences of cascading effects.

Approximately 40 persons will be selected from the submitted abstracts and invited to participate in the conference.

Financial support will be available for invited participants from developing and transition economy countries.

For further information about the conference, email: ipcc-wg1@al.noaa.gov

## Talks progress to establish an ESD Centre of Excellence

Talks on establishing a regional Education for Sustainable Development (ESD) Centre of Excellence (COE) at the University of the South Pacific (USP), progressed further with the visit of a team from the Asia/Pacific Cultural Centre for UNESCO (ACCU) to USP's Laucala Campus, Suva, Fiji, from 4-8 September 2006.

Team members Ms Kaoru Suzuki and Dr Yoshiyuki Nagata met with USP Vice-Chancellor Prof Anthony Tarr, as well as PACE-SD Prof Kanayathu Koshy.

They visited the faculties and institutes on campus and personally met several staff, heads of faculties, schools and departments.

The team members are from the ACCU-UNESCO Asia-Pacific ESD Programme, located at the ACCU Secretariat in Tokyo, Japan.

Prior to their visit, a workshop for COE Candidates was held from 21-22 August 2006 in Tokyo, Japan, whereby a Selection Committee examined the appropriateness of provisionally-selected candidate organizations as COE of the ACCU-UNESCO Asia-Pacific ESD Programme.

The final selection will be endorsed by the Steering Committee of the Programme.

Twenty-nine organizations formally expressed interest in becoming a COE candidate by submitting pre-applications which were reviewed on 20-21 June 2006. Of those, five organizations were provisionally selected as strong candidates for COE.

After further review at the August 2006 meeting, the Selection Committee will

confirm the appropriateness of these organizations, which are expected to serve as good models to promote ESD at national/sub-regional/regional levels in Asia and the Pacific.

Meanwhile, a Pacific Education for Sustainable Development (ESD) workshop was held from 21-22 September 2006, at the Tanoa International Hotel, Nadi, Fiji.

The meeting was organised by the UNESCO-Apia office to further develop an ESD Framework for the Pacific.

The draft Framework for Collaboration in ESD in the Pacific was developed by an ESD regional, multi-sectoral Working Group established through support from UNESCO.

The draft framework was presented to officials from the region's Education Ministries at the workshop.

Further development of the Framework and potential regional project concepts were explored prior to presentation to the 2006 Forum Education Ministers Meeting, held in Nadi on 26-27 September.

Members of the Working Group, national and regional representatives, and donor agencies attended the workshop.

Through working group and plenary discussions, a refined version of the earlier draft Framework was developed which was considered by Pacific leaders. Following the outcomes of this workshop and the Ministers meeting, consultations will continue at the regional and national levels.

## Local school visits SOPAC

More than 70 form seven students from the all-girls Jasper Williams High School in Lautoka, Fiji, visited the South Pacific Applied Geoscience Commission (SOPAC) on September 14 2006.

The students were at the SOPAC, Suva, Fiji office to learn about career opportunities and the significance of managing ocean resources and natural disaster management.

Jasper High School geography teacher, Mrs Vinesh Lata Prasad commented that the visit was a good experience for her students as they learnt more about natural disasters and geoscience issues.

SOPAC and Fiji's Mineral Resources Department (MRD) disaster risk management specialists, water experts and ocean research officers hosted the



SOPAC project officer, Emily Artack (right) talking to Jasper High School students. (Photo source: SOPAC)

students providing information on their practice areas.

"Youths are interested in what is happening around them and how to respect our natural environment particularly in countries like Fiji where the land and ocean are so connected to our way of life", SOPAC Oceans and Islands Project Officer Emily Artack said.

## Young scientists conference to be held in Beijing

The second International Young Scientists' Global Change Conference is being held from 7-8 November 2006 in Beijing, China

The conference is endorsed by the Earth System Science Partnership (ESSP) and is being organized by START, the global change SysTem for Analysis, Research and Training. The conference offers a prestigious platform for young scientists to present their research findings to leading scientists in the field. It is intended to stimulate competition, encourage excellence, reward outstanding performance and foster the development of personal and institutional networks.

The conference will be held at the Beijing International Convention Center in conjunction with the ESSP's Open Science Conference on the theme 'Global Environmental Change: Regional Challenges', being held from November 9-12 2006 at the Beijing International Conference Center.

Institute for Global Change Research (IGER) is co-sponsoring this conference, the Chinese Meteorological Administration is serving as local host and the START Temperate East Asia Regional Center is assisting with local organization. The United States Climate Change Research Program is supporting initial conference coordination and planning.

All young scientists are expected to participate in the Open Science Conference. Awardees for most outstanding contributions will be invited to present their research to the Open Science Conference.

Inquiries can be directed to Ms Amy Freise on email: [ysc@agu.org](mailto:ysc@agu.org). Conference information is available on the START website: [www.start.org](http://www.start.org). Information on the Open Science Conference is available on the website: <http://www.essp.org/essp/ESSP2006/>.

## USP signs MOU with IGES on environmental sustainability



The Japanese Minister for Environment Hon. Yuriko Koike (third from left) is pictured here at the Faculty of Islands and Oceans (FIO) at USP with Prof Koshy (second from left), Director of Institute of Applied Studies (IAS) Prof Bill Aalbersberg, Dean of FIO Dr Pao Luteru (second from right), and fellow guests from Japan. (Photo Source: USP Marketing & Communications).

A Memorandum of Understanding was signed between the University of the South Pacific and the Institute for Global Environmental Strategies (IGES) of Japan as part of the phase II activities of the Asia-Pacific Forum on Environment and Development (APFED), aimed at promoting environmentally sustainable development.

In signing the MOU, USP Vice-Chancellor Professor Anthony Tarr stated that the University was fully committed to building the necessary capacity in the region to enable the

countries to manage their natural and human resources in the most sustainable manner.

Through a network of campuses and proactive programs, USP plays a pivotal role in promoting sustainable development through culturally sensitive and regionally relevant education.

The establishment of a Regional Centre of Expertise at USP under the United Nations Decade of Education for Sustainable Development is a demonstration of the University's commitment in this area, Professor Tarr added.

In witnessing the MOU signing, the Japanese Minister of Environment, Hon Yuriko Koike said her country was committed to supporting the efforts of USP in the area of environment and development.

The Minister added that she was very pleased to be associated with the establishment of a research network (NetRes) at USP as a vehicle for the promotion of the goals of APFED II.

The Minister and her team visited the Faculty of Islands and Oceans Campus for further discussions before leaving USP.

Under the MOU, USP and APFED Secretariat agreed to work closely to enhance Policy Dialogue with government and natural resource managers, to promote the Knowledge Initiative that is aimed mainly at the documentation and recognition of Good Practices, and to support the Innovation Showcase Programme which is designed to develop and refine prospective project proposals for funding under APFED II, according to Prof Kanayathu Koshy, Director of the Pacific Centre for Environment and Sustainable Development and START-Oceania Secretariat.

Dr Biman Prasad, Head of the School of Economics at the Faculty of Business and Economics and a member of the APFED NetRes team said that APFED promoted a new way of viewing economy, society and the environment where the overall quality of life and not just material wealth would be a prime concern for all.

## Improving coral reef management in the north Pacific

**This article was compiled by Prof Mike Hamnett (Director for Social Science Research) and Dr Robert Richmond (Kewalo Marine Lab) from the University of Hawaii.**

Coral reef scientists have become increasingly concerned with the potential impacts of long-term climate change on coral reefs. Widespread coral bleaching has resulted from elevated water temperatures in many parts of the Pacific over the last decade.

Scientists are also concerned about the impact of increasing acidity from higher concentrations of dissolved carbon dioxide (CO<sub>2</sub>) in ocean waters that are expected in the future. These will likely reduce the ability of corals to secrete their hard skeletal structure. Many coral reef resource managers have concluded that they can do little to reduce greenhouse gas emissions and prevent global climate change, and their only recourse is to try and reduce land-based sources of pollution and other anthropogenic stressors.

At the local level, the role of science insuring

the survival of coral reefs often includes providing accurate and adequate data and analytical tools to develop appropriate policies and regulations to reduce local human impacts on coral reef ecosystems.

The integration of the social, biological and physical sciences and local communities in coral reef management is critical and has resulted in several notable successes in Micronesia, largely due to the cultural landscape.

Researchers from the Universities of Guam and Hawaii, the Palau International Research Center and the Australian Institute of Marine Science have been involved in a series of coral reef research and resource



A community meeting with members of the Babulthup Village in Palau, held in March 2006. (Photo source: Prof Mike Hamnett)

management efforts on Guam, Palau, and Pohnpei.

The studies have been aimed at identifying the biological and physical processes degrading coral reef ecosystems, and communities and governments have used the results to mitigate damage to local ecosystems. At all three sites, the local communities were involved in the project scope, design

and application of the research results.

In Guam, Fouha Bay research and planning was initiated at the request of the Mayor of Umatac Village. The Bay, which is adjacent to the village, is surrounded by steeply sloping hills that are often burned to clear vegetation by deer and pig hunters, resulting in erosion. Village residents were asked for input at every step of the social and biological

and physical science work and developed a plan to reduce the degradation of coral reef resources through participatory planning workshops.

In Palau, Airai Bay is bordered by a substantial mangrove forest impacted by sedimentation from upland clearing for a road, farms and a housing development.

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# Training assists Kiribati to understand, antici-

Kiribati is a group of 33 coral atolls located very near to the equator in the northern Pacific Ocean. It comprises of three groups of islands - the Gilbert, Line and Phoenix Islands. 21 of these islands are inhabited and recent population was estimated at a little over 100,000 people. Being situated near the equator, Kiribati is in the 'doldrums' - meaning that (theoretically) it can never be affected by cyclones and hurricanes. The proximity to the equator also means that Kiribati does not experience summer and winter and has hot weather throughout the year. Their weather is distinguished by dry and rainy conditions.

The I-Kiribati people haven't ever experienced a tropical cyclone. Majority of the population still live in small open huts made from pandanus and coconut leaves, with no walls on the four sides. Some may regard their lifestyle as idyllic, in the calm, bright heat of the equator. However, Kiribati people are now getting very worried because it has been predicted that sea-level rise caused by global warming, may eventually submerge the atoll islands country - which raised about a metre above sea level, is their home. The Kiribati Training Institute on



Ms Reei Tioti receives her certificate from Ms Katarina Tofinga, wife of Hon. Martin Puta Tofinga (seated on right).

Climate and Extreme Events (KTICEE) held from 21 July to 2 August 2006 in Tarawa, Kiribati, sought to prepare the relevant sectors by educating them to understand the impacts of climate change, in order that the population could anticipate problems and prepare to respond. The level of awareness about climate change was very high among participants and the determination was very strong to prepare. As one participant aptly put it, "When the sea level rises in Kiribati, we will have to face it, because Kiribati has no mountains to climb" (to escape climate change).

"There is no need to justify the occurrence of Climate Change and Extreme Events in the Pacific because Small Island Developing States (SIDS) are among the most vulnerable states in the world," said Professor Kanayathu Koshy, co-convenor of the Training Institute in his opening remarks.

"This training institute is one of the

projects within the Type II initiative - CAPaBLE, developed through partnerships after the World Summit in Johannesburg. It is a capacity building activity developed by University of the South Pacific (USP), East-West Center (EWC) and New Zealand National Institute of Water and Atmospheric Research (NIWA)," Prof Koshy explained. "Representatives of International Global Change Institute (IGCI), Secretariat for the Pacific Regional Environment Programme (SPREP) and Australian Bureau of Meteorology (BOM) were also present at this multi-disciplinary type of training which needed participants from various backgrounds. This type of workshop could build capacity in dealing with climate change and extreme events in Kiribati." In his keynote address, Hon. Natan Teewe, Minister for Communications, Transport and Tourism Development in Kiribati, reiterated that government has the obligation to review, and where necessary, change the policies and strategies if it extends the problems related to climate change. However, Hon. Teewe was sceptical of the usefulness of these changes if the developed,

industrialized countries did not want to cooperate. "The bulk of the causes for climate change and global warming come from the industrialized countries. That is of grave concern to the United Nations Framework Convention on Climate Change (UNFCCC) and

the Kyoto Protocol who are challenging those countries to become more reasonable and considered. That is a major step in the effort to moderate and control the accelerated increase in concentrations of the major greenhouse gases in the atmosphere, which have already caused global warming and climate change," Hon. Teewe said.

"We fully accept that for low lying island nations, the problem of climate change and variability must be addressed in a comprehensive manner, with all sectors of government and the communities contributing, as we strive to adapt to adverse impacts," Hon. Teewe said.

"The Government of Kiribati is taking this adaptation agenda seriously, and the adaptation measures have been integrated into the Government National Plan. The Kiribati Adaptation Project is taking the leading role in the long term planning, and supplementing it with shorter planning periods, through the National Adaptation



The flat, coral landscape, together with coconut and pandanus trees form a typical part of the surroundings in Kiribati communities.

Programme of Action. We appreciate the contributions of the World Bank and the UNDP to this important project," Hon. Teewe concluded.

Participants questioned scientists present on what were the uncertainties regarding climate change or sea level rise. It was explained to participants that sea level rise was not isolated from climate change. Sea level rise was an effect of global warming which is impacting climate change.

Participants revealed that the social and psychological effect of climate change was real in Kiribati. "Global warming is very serious. People would have built houses and settled down. But they move around because they feel their environment is vulnerable. This is the psychological and social impact on Kiribati people, which is very real," Tebebeku said.

Participants demanded from scientists to be given the exact time by when sea level could rise so they could use those factors for planning. "For Kiribati people, it is important to understand. For 100 years, we should have data on sea-level rise, on how it will move. The challenge is if scientists could use uncertainties to predict climate change variability for Kiribati so we can prepare for the future," Batoromaio Kiritian commented.

Prof Murari Lal, a climate change scientist, reiterated that, there was no uncertainty that temperature and sea level will rise. "It is certain that it will rise but we only don't know by how much. Because of this uncertainty, we say what range

will the temperature increase. The exact amount cannot be determined because we do not know if more fossil fuels will be burned, because human behaviour is unpredictable. For instance during Cyclone Katrina, it was not predicted that millions of dollars will be lost," Prof Lal explained.

"It is important to build capacity of young people on how climate will change and its implications. Countries can start taking action such as relocate, safeguard our property and elevate to higher ground floor. The best prediction for climate change is for 100 years. But now even that is not certain. Countries need to have trend in their climate change data so it can be used to make predictions. But small countries lack capacity to do that. Changes have taken place all over the globe. This year, the Arctic region did not freeze enough and animals could not move to do their food-hunting business. More glaciers are retreating and much faster. There is also a possibility of abrupt sea-level rise due to climate change," Prof Lal explained.

## Background

The Kiribati Training Institute represented the third and final phase of a three-year training and capacity-building project being undertaken jointly by USP, EWC and NIWA. Principal support for the overall project - the Pacific Islands Training Institute on Climate and Extreme Events



Participants ponder the challenges of climate change impacts for Kiribati.

# prepare and respond to climate change impacts

- was provided by the Asia-Pacific Network for Global Change Research (APN), the U.S. National Oceanic and Atmospheric Administration (NOAA) and the three partner institutions. Additional contributions to the Kiribati Training Institute were provided by SPREP and the Ministry of Environment, Lands and Agriculture of the Government of Kiribati with participation and contributions from the risk management programs of the South Pacific Applied Geosciences Commission (SOPAC), BOM, the Pacific ENSO Applications Center (PEAC) and other collaborators in the Asia-Pacific region.

The Training Institute on Climate and Extreme Events represents a three-year project designed to create a regional network of scientists, decision makers and institutions skilled in the use of climate information and services to support practical decision-making in key sectors such as agriculture, water resource management, public health and safety, tourism and community planning and resource development. In this context, the Training Institute contributed directly to two of the three objectives of the APN CAPaBLE program:

- Capacity building through sharing of knowledge, experience, scientific information on climate change impacts, vulnerabilities, adaptation and mitigation; and, through the dialogue initiated at the Training Institute,
- Improvement of informed decision-making in developing countries by dissemination of the outcomes of research activities to policy-makers and civil society.

The first phase of the Training Institute project comprised an intensive, two-week Training Institute conducted on the campus of the University of the South Pacific in Suva, Fiji held in June 2004. Phase two of the project involved the development and testing of a modular, in-country training program that could be implemented throughout Oceania. The Samoa Training Institute, held in May 2005, provided the first in-country demonstration of the Pacific Islands Training Institute learning objectives, approach, methodology and materials.

The Kiribati Training Institute on Climate and Extreme Events represented a significant step towards enhancing both national and regional capacity to enhance their resilience to climate-related extreme events.

The seven major thematic areas covered during the training in Kiribati were: understanding the science of climate change and climate variability; forecasting climate; climate change impacts and vulnerability and assessment (V&A) tools: the TrainClim model; climate V&A methodologies and traditional knowledge; mainstreaming adaptation; awareness and

the role of media in disseminating climate information; and practical training on application and use of climate change information through a role play simulation exercise.

The immediate impacts on Kiribati from climate change were through EL Nino and La Nina climate phenomena. During El Nino, Kiribati tends to receive higher than normal rainfall (heavy rains) and during La Nina, Kiribati tends to receive lower than normal rainfall (dry weather conditions, possibility of drought).

The Kiribati training, in addition to sessions on the science of climate change and the use of tools and models, also had practical hands-on sessions whereby climate change impacts on the four major sectors - water, agriculture, fisheries and coasts - were discussed, and adaptation and mitigation measures were compiled.

## Issues

Participants raised concerns in the area



Participants discuss strategies to deal with climate change.

of language, traditional knowledge, use of models, and disseminating information through the media. Concern was raised that there were no correct terms in the Kiribati language to explain climate and weather phenomena. It was regarded that as a matter of priority, correct local language for weather and climate

terminology should be established.

It was felt that traditional knowledge could be utilised to explain weather patterns, and traditional terms for weather and climate should be researched to find existing Kiribati terminology for climate and weather

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## How much time before sea level rises?

Developing countries are responsible for global warming and because the Kyoto Protocol targets are not being met to reduce Green House Gas (GHG) emissions, it means they are not doing enough to decrease GHG emissions, Prof Murari Lal commented at a public seminar on the causes, impacts and adaptation measures for climate change, held at the USP Centre in Kiribati on Saturday, 22 July 2006.

"Climate change is real. Scientists are convinced that temperatures will rise and consequently, sea levels will rise. Even if global warming is stopped today, sea level will continue to rise but not at such accelerated rate," said Prof Lal, climate change expert on the Intergovernmental Panel for Climate Change (IPCC).

A critical issue discussed was how much time was there before sea level rose to an extent that it would hinder survival, and Prof Lal gave an estimation that from the time livelihoods became affected to the time survival was at risk, there could be a time gap of 15-20 years.

These comments were made to answer questions raised by local Kiribati on the effectiveness of adaptation to avoid the impacts of rising sea levels. The public seminar was organised by the USP Centre and the Ministry of Environment in Kiribati, to give an opportunity for local Kiribati people to discuss climate change issues with experts. A presentation on GHG emissions was made by PACE-SD Director, Prof Kanayathu Koshy, on Climate Change Adaptation by Project Manager at PACE-SD Mr Melchior Matakai, and a presentation on Impacts of Climate Change by Mr Dean Solofa from SPREP. About twenty young Kiribati

students, as well as some elderly citizens and staff from USP Centre, Kiribati, attended the public seminar.

"We can only do so much adaptation and if the trend is for sea level to continue rising, is it realistic for continued adaptation? Is there any future for us small atoll countries?" an elderly Kiribati man asked.

"Adaptation is a measure for small helpless countries who did not cause it

recommendations and it is the governments themselves who have to make the decisions to adapt, mitigate or relocate through policies.

The helplessness of small countries was again raised by concerned Kiribati people who felt that big countries such as US, Australia, China and India are not doing enough to address the problem. Concern was raised that scientists' warning that sea



The audience at the seminar at USP Centre, Kiribati. Looking on is Prof Murari Lal (second from left).

but cannot do anything to stop developed countries. Even if bigger countries took action, the effects won't be reversed for small island countries," Prof Lal said. "After seeing the islands here - the width and the depth - I agree that yes, people here need to be relocated. Adaptation is only near-term solution and long-term solution is relocation as developing countries are not willing to reduce their life-style. However, many countries are looking towards energy efficiency." Prof Koshy agreed that there were limits to adaptation and there needs to be mitigation. He reiterated that more dialogue was being engaged with bigger countries for more action from them.

However, the experts stressed that scientists can only make

levels will continue to rise meant they don't have a future as they are helpless to influence the behaviour of the main players.

Adaptation measures such as building raised houses were discussed, however, concern was expressed that once the quality of drinking water became affected, they will lose ability to survive.

Mr Matakai gave an example of a village in Vanuatu that was re-located by SPREP and raised the difficulties in coping associated with such a move. However, he agreed that adaptation could only be done to an extent and if conditions became drastic, appropriate action would be needed.

## Unheralded freshwater fish diversity in Pacific Islands

**This article was written by Mr David Boseto a Solomon Islander working as a freshwater biologist with the Institute of Applied Science, USP.**

Most of the Pacific Island countries have environment management acts and are signatory to international conventions that aim to protect biodiversity. Decision makers must recognize the importance of flora and fauna of the rivers, streams, creeks and lakes and protect them. Once care is given to the aquatic system, the whole ecosystem will experience the same care.

The number of freshwater fish species recorded from different Pacific Island countries is likely to be under-reported because of the lack of freshwater fish surveys. However, the regional trend in fish diversity shows it generally declines from west to east.

Unfortunately, conservation attention in the region mainly focuses on terrestrial species and on the destruction of rainforest, and coral reef habitats. Many freshwater fish species are vulnerable or endangered because of land-use practices, urbanization, high human populations, and general habitat alteration.

Furthermore, freshwater ecosystems are increasingly under threat from global warming. The warmer climate could

drive many freshwater species to extinction due to warmer temperatures and habitat destruction caused by rising sea levels which will flood the lower freshwater system.

In addition, increase in freshwater temperature will reduce the food supply and the level of oxygen for the freshwater fish populations.

Loss of habitat through development can cause a major loss to biodiversity. The increased pace of development in many islands of the tropical Pacific has resulted in an increased threat to the fauna of the inland, aquatic habitats; therefore, there is an urgent need for ecological information of these ecosystems.

It is important to survey the freshwater resources of the Pacific countries now before they are destroyed by the effects of land development, deforestation, mining and introduced or exotic species.

Most of the freshwater biota of the Pacific Islands represents secondary freshwater species which are those derived from marine ancestors. A high proportion of the Pacific Islands fish species also are *amphidromous*. This term explains the condition of adults living and breeding in fresh water and their embryo being washed into the sea. In the sea, they remain in a planktonic phase before returning back into the rivers and continuing upstream where they complete their life cycles.



**David Boseto holds an eel - *Anguilla marmorata* - at the Wabu Forest Reserve, Fiji for a Biodiversity Inventory. (photo source: D. Boseto)**

Pacific countries are made up of many isolated volcanic and atoll islands. The large distances between these islands limit larval fish dispersal, and variations in sea level during palaeohistorical periods has led to fish species evolving in some of these islands. Such is the case of Fiji where seven new, endemic fish species and a new genus have been found recently.

In the Indo-Pacific region, Indonesia has the highest recorded freshwater fish diversity with Papua New Guinea recording the second-highest species diversity.

Freshwater fish species diversity is much lower in neighboring Pacific countries, including Palau - 40 species, Guam - 17 species, Solomon Islands - 84 species, New Caledonia - 64 species, Vanuatu - 62 species, Fiji - 89 species, Samoa - 31 species, Cook Islands - 7 species, Hawaii - 59 species, and French Polynesia - 46 species.

The pattern of distribution of freshwater fishes in the eastern Indian Ocean and Pacific Ocean is due to either freshwater fish with marine larvae moving through ocean currents, geological processes such as the movement of tectonic plates, intolerance of species to different climatic events and vicariance.

The freshwater system is one of the most productive ecosystems in the world and it can maintain large fisheries. Freshwaters provide habitats for an estimated 4,500 species of amphibians, approximately 75,000 species of aquatic insects, 5,000 species of freshwater snails, more than 10,000 species of freshwater crustaceans, about 94 reptile species, and 10,000 fish species - or 40 per cent of the world's 25,000 fish species.

Ichthyologists believe that at least 5,000 more species await collecting universally, and a large amount of these are to be found in freshwater. For more information contact David Boseto on email: [dboseto@soon.com](mailto:dboseto@soon.com).

## Mainstreaming adaptation is needed at all levels in PICs

The responsibility to adapt to climate change has to be shared, although certain adaptation processes and activities that require substantial resources and policy adjustments should be driven by national government and their agencies, according to Mr Melchior Mataki, Programme Manager at the Pacific Centre for Environment and Sustainable Development (PACE-SD).

"Mainstreaming must be done at all levels including individual, family, community, district, provincial and national government, to sustaining and optimize climate change adaptation efforts," Mr Mataki says.

"Mainstreaming climate change adaptation is often perceived as the transfer of the costs of adaptation to Pacific Island Countries (PICs) who contribute a minute fraction to the global greenhouse gas emissions responsible for global warming and subsequently climate change. This perception resonates with the 'polluter pays principle', however, its application to a global issue such as climate change will only delay their needful response to the impacts of climate change," Mr Mataki further said.

Mr Mataki made these comments to highlight issues relating to mainstreaming adaptation, revealed through several climate change awareness and adaptation projects that PACE-SD has been involved in, at local and regional levels.



**Coastal Erosion due to climate change on an island in Kiribati. (Photo source: M. Mataki)**

Mainstreaming climate change adaptation refers to the processes and activities implemented at various governance levels to integrate adaptation into development planning and on-going decision-making. It needs to take place at the policy and technical levels of the formal and non-formal governance structures, Mr Mataki explained.

"Processes refer to enabling instruments such as legislation and policies to facilitate adaptation, whilst activities refer to actions taken by stakeholders to mainstream and implement adaptation. Mainstreaming at the national and regional levels tend to have a policy focus, whilst mainstreaming at ministerial to individual levels has a technical emphasis," Mr Mataki said.

As an example, he said Fiji was currently finalizing a national climate change policy, at the regional level and the region endorsed the Pacific Islands Framework on Climate Change in 2005. However, mainstreaming at the community level may entail factoring adaptation measures into coastal resources management plans and village development plans.

Mainstreaming adaptation needs: (a) factoring into national and individual development plans, (b) instilling and maintenance of proactive approaches to reduce the impacts of climate change, and (c) availing resources for adaptation. "These are underpinned by the need to strategically deal with climate change, and to clearly demarcate the roles and responsibilities of key stakeholders. Recent mainstreaming efforts in PICs had been largely driven through activities such as the Kiribati Adaptation Project (KAP), the SPREP project on Capacity Building for the Development of Adaptation Measures in Pacific Island Countries (CBDAMPIC) and the ADB Climate Change Adaptation in the Pacific

(CLIMAP) project. However, mainstreaming need not to be dependent on projects alone if it is to be made sustainable in PICs," he said.

The allocation of resources is strongly influenced by the factors: governance, fiscal policies, tradition and culture, poverty and hardship, and prevailing socioeconomic and environmental conditions.

The loss of traditional coping mechanisms in PICs such as food storage, cropping practices, and house-designs contribute to its susceptibility to climate change.

The Pacific region in the 1990s bore up to US \$1 Billion in costs associated with extreme weather events such as tropical cyclones, flash floods, and droughts. The World Bank has stated that with a "do-nothing" option, a small island such as Viti Levu in Fiji could incur costs equivalent to 2-4 per cent of Fiji's GDP (US \$23-52 million) by 2050 in damages associated with climate-related extremes.

"Although, there are conflicting views on the interaction between climate variability, extreme weather events, sea level rise, and climate change, a "do-nothing" option will be detrimental to the economies and livelihood of Pacific islanders. As such, climate change adaptation needs to be taken seriously within the development policies and plans of the national governments and their agencies," Mr Mataki concluded.

# SPICE: Birth of an international program on Southwest Pacific Ocean Circulation and Climate

**This article was written by Dr Alexandre Ganachaud from the Institute of Research & Development and Dr Sarah Grimes from SOPAC.**

An original oceanic pathway has been recently discovered in the Southwestern Pacific Ocean. The potential influence of the implied oceanic currents on decadal climate changes has attracted a strong interest to study the oceanic circulation in and around the Coral Sea.

Oceanographers from New Caledonia, Australia, New Zealand, USA and Fiji are setting the roots of a regionally coordinated research program, the Southwest Pacific ocean circulation and Climate Experiment (SPICE). This is one of the first key activities implemented within the Pacific Islands Global Ocean Observing System (PI-GOOS).

Though variability of this (ENSO) circulation has profound consequences for both regional and basin-scale climate, the structure of its currents and the mechanisms that cause its variations remain poorly sampled. The broad-scale observational network (ARGO, Voluntary Observing Ships XBT sampling, and satellite winds and altimetry) is beginning to provide a large-scale picture, but the complex island jets and western boundary currents require dedicated study. The SPICE Program ([www.ird.nc/UR65/SPICE](http://www.ird.nc/UR65/SPICE)) is a first step in planning such an effort under the auspices of CLIVAR (CLimate VARIability and predictability, [www.clivar.org](http://www.clivar.org)).

An initial 3-day workshop held in Cairns, Australia, last year reviewed ongoing work and identified the possibilities for advancement of SPICE. Workshop participants are presently contributing to the creation of the SPICE science plan, in which there is an integration of both observational and modeling analysis to provide a more complete description of the mean and variable circulation in the

Southwest Pacific Ocean and its importance to the climate system. Attention is devoted to downscaling to coastal island oceanography and local climate impacts.

A series of oceanographic cruises - SECALIS cruises, 2003-2004-2005-2006 - dedicated to the study of strong currents formation near the islands allowed measurements for the first time of suspected currents north and south of the New Caledonian reef. An important aspect of those cruises was the deployment of a glider, or steered oceanic

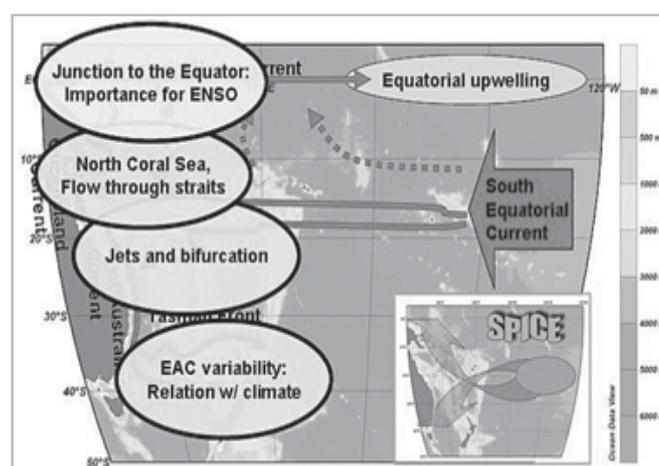
efficient repeated sampling of strong currents near islands, with quasi real time transmission of their temperature, salinity and oceanic current data to public data servers.

Along with ARGO, the SPICE project is one of the key activities implemented as part of the Pacific Islands Global Ocean Observing System (PI-GOOS): an Intergovernmental Oceanographic Commission (IOC) program in which oceanographic data is being acquired and analyzed to provide information useful for regional and local marine and climate

climate. Ultimately, this aids decision-making, especially in issues relating to climate change and variability and associated management and maintenance of healthy seafood stocks in both coral reef ecosystems and deep ocean.

## The Original Oceanic Pathway

Climate in the Southwest Pacific region varies due to superimposed effects of El Niño/Southern Oscillation (ENSO) and other signals including seasonal variations, global warming and natural decadal-scale variability. Ocean transport changes, driven by basin-scale winds, are the principal cause of temperature and salinity variability. Theory, numerical simulations and the few existing large-scale observational datasets suggest a complex regional ocean circulation. Surface flow is eastward as far north as 15°S, occurring partly as concentrated filaments emerging from the East Australia Current (EAC) recirculation, at thermocline level and below the South Equatorial Current (SEC) transports more than  $30 \times 10^6$  m<sup>3</sup>/s westward. Encountering the southwest Pacific islands, the SEC divides into strong and narrow zonal jets that cross the Coral Sea. It bifurcates at the east coast of Australia, feeding both the EAC and the New Guinea Coastal Current system. The latter supplies most of the water of the Equatorial Undercurrent, which emerges finally as the east Pacific cold tongue. Variations of both transport and water properties propagate into the flow of both current systems and its tidal eddies, these can influence the modulation of the ENSO cycle, which then reverberates through the climate of the entire basin. The ENSO events then influence the winds and water characteristics of South Pacific, closing a large scale 'climate loop' on decadal time scales. For more information, email Dr Ganachaud: [Alexandre.Ganachaud@noumea.ird.nc](mailto:Alexandre.Ganachaud@noumea.ird.nc), or Dr Grimes: [sarahg@sopac.org](mailto:sarahg@sopac.org)



Variable southwest circulation in the southwest Pacific ocean.

profiler, capable of providing repeated measurements of strong boundary currents. A similar prospect study is planned to understand the inflows at the southern limit of the Solomon Sea through the cruise FLUSEC in 2007.

These preliminary cruises are prototypes for emerging ocean sampling technology, the gliders, which efficiently complement the ARGO observing system ([www.argo.ucsd.edu](http://www.argo.ucsd.edu)). Gliders will be a major component of the SPICE observational experiment as they permit

management issues and services ([www.sopac.org/](http://www.sopac.org/); [www.ioc-goos.org/](http://www.ioc-goos.org/)). Under the framework of PI-GOOS, the information derived from the SPICE program will benefit Pacific Island Countries via an improved understanding of local and regional climate, local coastal circulation and its impacts on coral reef ecology and the coastal and oceanic fisheries industries. In the longer term, this assists sustainable development through improved continuous forecasts of the future conditions of the ocean and

in the U.S. Compliance is also a distinguishing feature of the tradition-based islands.

The initial outcome of policy development efforts has demonstrated the islands with intact traditional leadership and/or ownership of resources have been able to quickly and effectively apply scientific data, much of which simply validated what the community members already knew, by providing a foundation for discussion and action. The short-term successes, while modest, came about through the participation and leadership of culturally connected researchers, traditional leaders and community-based organizations rather than from government legislation.

## Improving coral reef management in the North Pacific

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The buffering mangroves were being cut down and the wetlands filled to make room for houses. The local community, including fishers and traditional leaders, was engaged throughout the project and the findings resulted in a moratorium on mangrove cutting and filling.

The Enipein watershed on Pohnpei Island was being degraded by the clearing of the upland rainforest for sakau (kava) farming, which resulted in extensive slumping and sedimentation. Local chiefs and community members participated in the data collection and application of the results.

In Guam, the most westernized island, the community expressed their

willingness to work to stop the fires and restore vegetation. They were also considering a temporary ban on catching herbivorous fishes within the affected bay to reduce benthic algal cover. After 5 years, overall progress is occurring, but at a slow pace and with limited results.

In Palau, following presentations by the Palauan researchers from the Palau International Coral Reef Center and the staff of the Palau Conservation Society, in a traditional village meeting setting, traditional leaders and fishers worked with the state legislature and governor to stop leasing, clearing and grading of the protective mangroves. This moratorium, initiated approximately 6 weeks following the meeting, has been in effect for nearly

three years in the absence of any formal legislation, while national legislation for watershed protection is pending.

In Pohnpei, The Conservation Society of Pohnpei has been able to use the data from this and other studies to get local Chiefs to agree to continuous natural resource protection from upland rainforest through the mangroves and to the reef.

Local leaders requested candid and complete analyses of the data from the researchers, but clarified that they did not need others to make decisions on resource management as these are decisions made within their own cultural context. Such decisions by traditional leaders in Palau and Pohnpei can be implemented far more rapidly than laws

## Conferences Fiji commemorates international ozone day

**Workshop on capacity building for sustainable development** will be held from the 10th-13th October 2006 in Trieste, Italy. For more information visit the website: <http://www.scidev.net/events/>.

**Fifth International Human Dimensions Workshop - Institutional Dimensions of Global Environmental Change: Water, Trade, and the Environment** will be held from 13th - 26th October in Chiang Mai, Thailand. For more information, visit the website: <http://www.ihdp.org>

**3rd APHW Conference on Wise Water Resource Management Towards Sustainable Growth and Poverty Reduction** will be held from 16th - 18th October 2006 in Bangkok, Thailand.

**13th PhD workshop on international climate policy** will be held in Leeds, United Kingdom from the 27-28th October, 2006. For further details visit the website <http://www.scidev.net/events/>

**2nd Young Scientists' Conference 2006** will be held from 7th - 8th November 2006 in Beijing China. The conference offers a prestigious platform for young scientists to present their research findings to leading scientists. For more information, please visit the website: <http://www.essp.org/essp/ESSP2006/> or contact the Conference Secretariat, Ms Catherine Michaut on email Catherine.michaut@jpsl.jussieu.fr

**Science and Technology Policy Research and Statistical Indicators: International Conference** will be held from the 8th - 10th November, 2006 in Colombo, Sri Lanka. For further details you can visit the website <http://www.scidev.net/events/>

**The Earth System Science Partnership (ESSP) Global Environmental Change Open Science Conference** will be held from 9th - 12th November 2006 in Beijing, China. For more information contact Martin Rice on email: [mrice@essp.org](mailto:mrice@essp.org) or visit website: <http://www.essp.org/ESSP2006>

**Integrating Analysis of Regional Climate Change and Response Options:** expert meeting organised by the Intergovernmental Panel on Climate Change (IPCC) to be held from 20-22 June 2007 in Nadi, Fiji. Deadline for submission of abstracts is 30 November 2006. Forms for submitting abstracts and further information can be obtained from the email: [ipcc-wg1@al.noaa.gov](mailto:ipcc-wg1@al.noaa.gov)

**APN Climate Change Adaptation Regional Workshop** will be held from 23-24 November 2006 at the University of the South Pacific (USP) Laucala Campus, Suva, Fiji. For further information, email Prof K. Koshy on the address: [koshy\\_k@usp.ac.fj](mailto:koshy_k@usp.ac.fj)

The International Day for the Preservation of the Ozone Layer (IDOPL) was commemorated with activities organised by the National Ozone Unit (NOU) of Fiji's Ministry of Environment on the theme "Protect the Ozone Layer, Save Life on Earth".

The Ministry facilitated its first workshop on "Alternatives to Methyl Bromide" at the Tanoa Plaza, Suva, Fiji from 4-7 September 2006, to phase-out the use of methyl bromide for non-quarantine and preshipment application.

The workshop had 42 participants from Amalgamated Pest Control, Fumigation Services Limited, Pestkil Limited, Quality Pest and Healthcare, Rentokil Initial, TQM Environmental Services, Ministry of Environment, Ministry of Health, Department of Forestry, Department of Quarantine, Koronivia Research station, Fiji Islands Maritime Safety Administration and Flour Mills of Fiji.

"The workshop raised awareness about alternatives to stakeholders and allowed development of codes of practice for the alternatives adapted to local Fijian constraints and environment," said Ozone Depleting Substances (ODS) National Coordinator, Mr Shakil Kumar.

A workshop on "Good Practices in Refrigeration (GPR)" was held in Lautoka, Fiji, from 11-12 September 2006 at the Training and Productivity



Nadi Muslim Primary School taking part in the ozone drama competition. (Source: Ministry of Environment)

Authority of Fiji (TPAF) campus.

"It's objective was to improve uniform code of practice with industries and institutions Fiji-wide through free flow of shared information, proper record keeping and documentation for better refrigerant management. It is a requirement under ODS legislation that companies submit their records to the Director of Environment before 1st November each year," Mr Kumar further stated.

28 technicians from various refrigeration and air-conditioning companies participated in this workshop and rated the course as very informative in their evaluation and feedback.

The workshop covered three areas: environmental issues of ozone depletion and global warming; dissemination of must know areas in legislations; and thirdly, codes of practices and live demonstrations on how to recover refrigeration.

During the week, an exhibition on ozone friendly products, a primary school drama

competition, and a secondary schools quiz competition was held in Nadi.

Ten schools participated in the Nadi district Primary School Drama competition which was won by Namaka Public School with Nadi Muslim Primary school declared runner up.

In the Nadi District Secondary School Ozone Quiz Competition, all 11 secondary schools in Nadi participated in the two

categories, Form 3 and 5. Votualevu College won the Form 3 category and Nadi Muslim College won the Form 5 category.

The event ended with the launch of a documentary "Ozone Care Fiji: A Success Story" by Mr Yati Prasad of Mechanical Services and Mr Epeli Nasome, Director of Environment, Fiji. September 16 was observed worldwide as International Day for the Preservation of the Ozone Layer for the 12th consecutive year after the declaration by the United Nations in 1995 to commemorate the date when countries signed the Montreal Protocol in 1987 on substances that deplete the ozone layer. 2006 is the 19th anniversary of the Montreal Protocol which mandates countries to phase out ODS within a specified time frame.

For more information, contact Shakil Kumar on email: [ozonefiji@connect.com.fj](mailto:ozonefiji@connect.com.fj) or [shaqkumar@yahoo.com](mailto:shaqkumar@yahoo.com)

## Climate message sent via theatre

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will be replicated in Solomon Islands, Vanuatu and Tuvalu in the second year.

Key partners include IAS, PACE-SD, and the Foundation for the Peoples of the South Pacific International (FSPPI). The project will work through the Locally Managed Marine Area Network.

The project recognizes youth as the future custodians of the South Pacific Islands' natural resources. It recognizes that climate variability and change are direct threats to the sustainable development of the Pacific's small island nations because it threatens the islanders' food security and source of livelihood which is dependent on their natural resources.

The project targets youth as carriers of the message through lively means such as theatre to raise alertness on climate change and variability impacts on the Pacific's biodiversity and adaptation to imminent threats, through establishment of provincial community theatre groups.

## Kiribati training on climate change

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events. It was also felt that traditional knowledge about preserving food and water resources should be revived and used during times of climate disaster.

A lot of appreciation was expressed by participants for being introduced to climate and weather impact tools, whereby models could be utilised to simulate weather situations and generate scenarios for impact on vital sectors of the economy, such as water, agriculture, fisheries and coasts. The importance of collating accurate data was emphasised to generate accurate results. A major concern raised was that some of these models could not be made available to Kiribati for local use.

The media was regarded as important in communicating information, however, concern was raised that sometimes the media did not publish the right information and were a nuisance. The local media raised its concerns on the lack of availability of information on climate and weather events. Importance of govern-

ment and weather departments to work with the media to disseminate climate change information in a user-friendly way to the public, was established.

### Closing

The KTICEE workshop closed with a keynote address by Hon. Martin Puta Tofinga, Minister for Environment, Lands and Agriculture Development, who was accompanied by his wife Mrs Katarina Tofinga. Hon. Puta highlighted the problems Kiribati faced due to climate change impacts and the efforts by their ministry to raise the plight of Kiribati at international environmental meetings. Hon Tofinga had been visiting his home island during the workshop, however, came back in time for the closing.

Hon. Tofinga thanked workshop implementers for the training which would assist various departments in preparing to deal with the impacts of climate change. Mrs Katarina Tofinga presented certificates to the 24 participants that successfully completed the training.