

Workshop on Climate Variability and Change in the Republic of the Marshall Islands (RMI) April 12-13, 2006

On April 12 and 13, 2006, representatives from government agencies and private organizations met for two days to explore changing climate conditions and their impacts in the Marshall Islands. The East-West Center, the University of Hawaii, the US NOAA National Weather Service, the Pacific ENSO Applications Center, and the Marshall Islands Weather Service Office convened the workshop with support from the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center and Climate Program Office.

Through lectures, panel presentations and facilitated discussions, participants discussed a variety of topics including:

- The *nature and impacts of climate variability and change* for the Republic of the Marshall Islands (RMI) including current patterns of rainfall, temperature and tropical cyclones and how those patterns might be altered by climate change;
- Improving *understanding of RMI's vulnerability* to climate variability and change in key sectors including: water resources and power utilities; disaster management; fisheries; coastal resource management including coral reefs, agriculture and tourism;
- Exploring opportunities to *enhance RMI's resilience* in the face of climate variability and change; and,
- Identification of *critical information needs and priorities* including the role of marine protected areas, hazard mitigation, education and requirements for enhanced climate and ocean observations.

In the opening note, Chief Secretary Robert Muller emphasized the importance of understanding climate in the Marshall Islands where the topic had both global significance and local consequences for an island community. "There is no question that these issues have significant relevance to a country like ours...small low-lying atolls in an open ocean." He encouraged participation because climate affects all sectors and all citizens in the RMI.

During the first day, the workshop focused on climate variability and short-term climate issues. Reggie White, the Meteorologist-in-Charge at the RMI Weather Service Office, provided a solid overview of climate in the RMI and issues with extreme events ranging from tropical storms to drought. Lieutenant Nicole Colasacco followed with a review of the historic effects of El Niño-Southern Oscillation and La Niña periods in the Marshall Islands, where the severity of the event can produce either wetter than normal or drier than normal conditions. Its geographic location in the Pacific Ocean makes it a little more difficult to determine the impacts from extreme events, and can therefore make it harder to plan for extremes.

Participants reviewed the impacts from the 1997-1998 ENSO warm event. Memories were surprisingly fresh because RMI experienced such severe drought that water was only available for one hour every fourteen days during the peak of the drought. The biggest problem that the low atoll islands face is the lack of large storage capacity. The majority of RMI's population lives in the district center of Majuro where a greater burden is placed on water availability. For Majuro, a prediction of 80% of normal rainfall in 2006 means that they need to begin water conservation measures to maintain their supply of water primarily from the airport water catchment tank, supplemented with groundwater from pumping the Laura lens wells. The severity of the 1997-1998 event necessitated the import of costly desalination units and distribution of water from these sources by ship to neighboring atoll islands. In addition, Typhoon Paka, which originated just east of RMI, provided the last rainfall, but the strong winds and storm surge caused contamination in their catchment tanks just prior to the drought. The cumulative impacts of climate events stressed water resource availability.

During the 1997-1998 ENSO warm event, the RMI government provided \$500,000 to supplement the assistance provided through the Federal Emergency Management Agency (FEMA), which totaled about \$1.2 million. The severe drought had added impacts on the economy by reducing the production of copra, an important cash-crop for the atoll islanders. The copra was affected by saltwater inundation, possibly more than the lack of water, due to surges and extreme tidal variations. Breadfruit trees and other local crops produced fewer, smaller fruits than normal. Following the ENSO event, the government received positive feedback from their water supply program and relief assistance. The individual household catchment tanks that were distributed during the ENSO event had the added benefit of providing a clean water resource that has received positive feedback because of the reduction in waterborne gastrointestinal illnesses. The household tanks continue to be used to supplement water resources, which is important in areas such as Majuro where water demand from increased population pressure in an urban area exceeds water supply during times when rainfall decreases to 80% of normal precipitation.

One positive aspect of the severe ENSO concerns fisheries. As pelagic fish migrated into their exclusive economic zone (EEZ), the RMI captured additional revenues from fishing license fees. The increased use of the ports and facilities has implications for planning from a wide variety of sectors, including: 1) businesses having goods and services available for fishing fleets; 2) increasing personnel for security and for inspections; 3) increasing conscientiousness about invasive species or diseases that may be aboard ship; and 4) increasing supplies of medications and public awareness campaigns on protecting public health from publicly and socially transmitted infections and diseases.

During the afternoon of the first day, participants went through an exercise designed to understand and use forecast information better. The exercise walked participants through an ENSO event similar to the 1997-1998 event. Participants thought about the timing of the information and used this to make decisions based on best practices in the early stages of the event. One outcome of the exercise was that government leaders

considered the timing for contingency budgeting for disaster and conservation measures. Ultimately, participants identified a need for more water storage. They also realized that all agencies would benefit from reviewing data from the 1997-1998 event to determine what additional resources they needed.

The second day of the workshop focused on longer-term climate change issues. Participants developed a greater appreciation for the potential vulnerability of communities, infrastructure, key economic sectors (pelagic fisheries), resources (forests and coral reefs), and government agencies in the face of the anticipated consequences of longer-term changes in climate, such as sea level rise, changes in hurricane intensity and the possibility of prolonged droughts. An overview of potential impacts of climate change for the Marshall Islands and other Pacific Islands cited the work of the United Nations Intergovernmental Panel on Climate Change (IPCC) when summarizing some key impacts of climate change in the Pacific:

- An increase in global average temperatures (1.4-5.8°C) with important regional differences including the likelihood of more “El Niño-like conditions” in the tropical Pacific with an eastward shift in rainfall;
- Larger year-to-year variations in rainfall, including an increased risk of droughts and floods associated with ENSO (El Niño-Southern Oscillation);
- Likely changes in extreme events including the possibility of an increased risk of droughts and floods and changes in hurricane (tropical cyclone tracks) associated with El Niño (as noted above), more intense rainfall events, a possible increase in tropical cyclone peak wind intensity as well as mean and peak rainfall intensities in some areas; and,
- A projected rise in sea level of .09 to 0.88 meters by 2100.

The Republic of the Marshall Islands has initiated a number of projects and programs that will help to build resilience to changes in climate. The Office of Environmental, Planning & Policy Coordination (OEPPC) has taken the lead in local climate change assessments and climate negotiations in international forums to improve global warming trends on a global scale and to fund climate adaptation initiatives for Small Island Developing States (SIDS).

The Marshall Islands are showing signs of erosion and flooding similar to Tuvalu. At a local level, the Environmental Protection Agency (EPA) monitors shoreline changes and erosion, although it is unclear what changes occur from human activity and what may be attributed to climate change. The South Pacific Applied Geoscience Commission (SOPAC) conducted a study to determine areas that were more vulnerable to erosion, habitat alterations, and wave action from dredging. Sea level variability seems to be more problematic than any of the dredging activities. RMI has worked with the Federal Emergency Management Agency (FEMA) to protect shorelines near public facilities, such as schools, and have found positive results from their efforts following storm systems.

Dialogue with local landowners has been initiated to help citizens understand environmental regulations that have been enacted to protect land. Local citizens have

become more cooperative in working with the government to protect life and property. This has decreased some of the human impacts on the environment.

There are a number of research needs and information gaps in developing programs to deal with climate-related issues. The information from the Weather Service Office (WSO) is trusted and provides a reliable resource. Some of the navigational aids, buoys, and gauges required for monitoring waves, water levels, and winds have been broken or have not been put in place to provide necessary information. There is a need to understand extreme wave heights and how this interacts with the characteristics of the local environment. RMI health programs do not have the resources to study and monitor potential new diseases and to understand the climate links, such as migration patterns from birds who may transfer avian flu. In order to acquire the equipment and research to develop climate adaptation plans, the RMI realizes that they need to establish strategic partnerships with regional and international organizations.

Recognizing the importance of enhancing the resilience of Republic of the Marshall Islands communities, businesses and natural resources, the participants recommended:

- With available data, conduct an impact study of the 1997-1998 ENSO event to determine how to improve agency actions and reactions in the future.
- Enhanced public awareness and climate education campaigns in government, communities, and key economic sectors.
- Recognition that effective adaptation to climate change will require a partnership between government and communities and a commitment to a participatory program of community-based vulnerability assessment and adaptation (using guidelines similar to those recently developed by SPREP).

Since the emerging Pacific Islands Integrated Ocean Observing System (PacIOOS) provides an opportunity for government, resource managers, businesses and local partners to help get access to new ocean data products and information services, the participants encourages a PacIOOS liaison be appointed to serve as a local focal point for input on national and regional ocean observation priorities and the coordination of local PacIOOS planning and educational activities. Participants felt that to be most effective, the PacIOOS liaison should be in a position to address needs and priorities in all three PacIOOS themes (weather and climate forecasting and adaptation, hazards risk management and marine and coastal ecosystems) in the context of the Marshall Island's sustainable development programs.