

## **PACIFIC RISA:**

### **CLIMATE ADAPTATION PARTNERSHIP FOR THE PACIFIC (CAPP)**

#### **Introduction to the Team, Sectoral Focus, and Geographic Footprint**

Climate variability and change pose unique challenges for small islands and local adaptation strategies must meet these challenges. Island vulnerability stems from limited size, proneness to natural hazards, physical isolation, low adaptive capacity for some, and high adaptation costs relative to gross domestic product. Climate-related disasters can have domino effects causing one vulnerable sector to influence others. Fresh water is critical for all islands. When supplies are affected by climatic events, food security, livelihoods, and public health are threatened. The water supply on low-lying atolls is particularly sensitive to changes in rainfall and fluctuation in the water table. Surface water is limited, if it exists at all. Aquifers are small and fragile—threatened by increasing demand as well as salt-water intrusion. Even on the “high” volcanic islands there are considerable demands on water resources due to tourism and the US military.

The major goal of Pacific RISA is to integrate flexible processes for building adaptive capacity to climate variability and change in diverse island settings. Our main foci are (1) ground water resource management and (2) multi-hazard mitigation planning. Our region includes Hawaii and the US-Affiliated Pacific Islands: American Samoa, Guam, Commonwealth of the Northern Mariana Islands (CNMI), Federated States of Micronesia (FSM), Republic of the Marshall Islands (RMI), Republic of Palau. Pacific RISA activities occur under the umbrella of the Pacific Climate Information System (PaCIS), which facilitates the development and use of climate information to support decision making in the Pacific region.

Pacific RISA is a partnership among the East-West Center (EWC) and multiple institutions including: the University of Hawaii’s (UH) International Pacific Research Center (IPRC), Water Resources Research Center (WRRC), Social Science Research Institute (SSRI), and Center for Island Climate Adaptation and Policy (ICAP); Pacific ENSO Applications Center; National Weather Service; NOAA Integrated Data and Environmental Applications (IDEA) Center; Hawaii Drought Council; Hawaii Climate Change Task Force; USGS; US Fish and Wildlife’s Landscape Conservation Cooperative (Pacific Islands Climate Change Cooperative, PICCC); Office of Environmental and Emergency Management, Office of the President, Federated States of Micronesia; and the Office of Environmental Response and Coordination, Office of the President, Palau.

The core team includes the following people:

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## **Core RISA Activities/Structure for FY10-11**

Pacific RISA has three interrelated research, assessment, and outreach objectives, with prototype projects planned to address each objective in FY10-11.

***Objective 1: Conduct Place-based Assessment of Risk and Vulnerabilities and Development of Adaptation Strategies.*** Our first objective is to assess vulnerabilities and develop adaptation strategies at the society-environment interface for specific locations via integration of downscaled climate models with hydrological models, socio-economic assessments, and cultural knowledge. In the first project addressing this objective, IPRC will conduct model-based studies to produce the best guidance possible on long-term climate changes expected in Hawaii via statistical downscaling and limited-area model simulations. Climate-change projections will allow very fine resolution over the individual islands, via application of multiply-nested grid models. A detailed mapping of surface temperature, surface wind and rainfall statistics for the island of Maui will be conducted to provide input to the hydrological model described below. It is anticipated that the final integrations will be performed with ~30 km horizontal grid spacing in an outer domain of several thousands of km extent and then using triply or quadruply nested-grids go down to ~0.5-1 km grid spacing covering individual islands. The second project under Objective 1, conducted by WRRRC and USGS, will use the projections of climatic conditions together with stochastic hydrologic models to assess the sustainability of ground water resources on Maui (and elsewhere in the region in subsequent years). The ground water models will be used to assess ground water resources and to define appropriate management practices that set aquifer sustainable yield. This research is expected to enhance decision processes by including climate uncertainty in assessments of the sustainability of ground water resources. The third project under Objective 1, led by the East-West Center, will pursue a comprehensive assessment of drought vulnerabilities in the Pacific region to inform island drought planning activities with an understanding of the human dimensions of drought. We will develop qualitative analyses of the social and cultural impacts of drought, societal adaptation to drought, characterization of water users, and factors affecting water-use decisions. Synergizing our efforts with those described to forecast water availability, we will first focus on stakeholders on the island of Maui and later extend this work to other islands in the Pacific region. The results will aid the development of drought plans and tools. Our fourth project, conducted by SSRI will focus on helping communities to incorporate climate risk assessments into multi-hazard risk assessments. Hazard risk and vulnerability assessments will involve reviewing and updating disaster risk reduction plans for Hawaii, American Samoa, and Guam (and for CNMI, FSM, and RMI in subsequent years). We will also inventory adaptive capacities and conduct a gender analysis. We will assist island governments in updating these multi-sectoral plans with the best available climate-related data for understanding hazard risks.

***Objective 2: Support the Implementation of Adaptation Strategies for Pacific Island Communities.*** Our second objective is to support the implementation of climate-change adaptation strategies in the Pacific region through integration and delivery of climate information and ongoing outreach and education activities. The first project under this objective, led by SSRI, will build capacity in the development, analysis, and delivery of climate information tailored to the needs of disaster management communities. The Climate Information Delivery and Decision Support System (CLIDDSS) will be used as the technical platform for data portfolio management to support the distribution of information via newsletters to multi-sector disaster managers concerning their climate-related disaster risks. The newsletter will provide data analysis and briefings to propose mitigation actions to reduce hazard risks in Hawaii at first and later in Guam and CNMI. Our second activity under this objective, led jointly by SSRI and EWC, is to convene a workshop of key stakeholders from Hawaii and the USAPI to bring together key stakeholders from across the region to ensure an understanding of climate risk reduction planning and establish mechanisms and protocols for engaging in the risk and vulnerability assessment

process. Additional stakeholder outreach and education will be ongoing, including climate information and products training (via on-site workshops, webinars, and videoconferencing), facts sheets, and our interactive website.

***Objective 3: Evaluate adaptation plans and policy making in the Pacific region.*** Our third objective is to evaluate (1) adaptation plans and policy making and (2) Pacific RISA performance. The first project involves ICAP conducting legal analyses that survey the capacity and the quality of laws that control the allocation, supply, infrastructure, maintenance and monitoring of water use. ICAP affiliates from both the Law School and Hawaiian Studies will conduct analysis of the extant laws and procedures with a particular mind to perceptions among water users of their legal and traditional access and use rights. This work will assist governments in preparing and adopting laws and policies that facilitate cost-effective, efficient, and equitable adaptation strategies. The second project, led by the EWC, will develop measurement tools and evaluate the role of Pacific RISA in advancing adaptation planning in the Pacific region and thus contribute to assessing the value of the Pacific RISA program overall. We will develop internal performance metrics and a consultant will conduct an external evaluation of Pacific RISA.

### **Assessment Services Activities for FY10**

Our Assessment Services activities extend our initial work on the sustainability of ground water resources on Maui to the Pearl Harbor aquifer on Oahu, which serves most of the 905,034 people who reside on the island of Oahu and the 6.4 million tourists who visit annually. Most sources agree that existing permit allocations for Pearl Harbor are close to the aquifer's sustainable yield. Demand for water is expected to increase with population growth and new construction and military uses. In a freshwater-lens system like the Pearl Harbor aquifer, increased withdrawals will, in the long term, result in a decline in water levels, an increase in the size of the transition zone between freshwater and saltwater, and a reduction of natural ground-water discharge to the ocean. The extent to which water levels decline and the transition zone grows is dependent on several factors including the distribution and rates of withdrawals, the hydraulic characteristics of the aquifer system, and future changes in climate. Maximizing the effective use of the water resources plays a critical role in sustaining population growth, food security, public health, and environmental resources. Expanding Pacific RISA activities to areas such as Pearl Harbor first requires us to build and sustain stakeholder networks that can be engaged to identify the decisions being faced and the appropriate research, tools, and information needed for decision support.

We will use the FY10 Assessment Services funding for activities aimed answering the following questions.

1. Who are the key stakeholders in decisions about the sustainability of ground water resources under changing climatic conditions in the Pearl Harbor aquifer?
2. What climate adaptation decisions are stakeholders currently facing or likely to be facing in the future related to ground water resources from the Pearl Harbor aquifer?
3. What research, tools, and information are needed to support and sustain stakeholders' climate-sensitive assessments, decision-making processes, and use of climate information?
4. What capacity do stakeholders have to use climate information to support their adaptation decisions?
5. Who are the key intermediaries and what roles do they play in analyzing, communicating, and disseminating information about impacts of climate variability and change on the Pearl Harbor aquifer?

Our work will bring together researchers at EWC and UH, agency partners, private enterprise, non-profit organizations, community groups, and other stakeholders identified by the core group. We will adopt

deliberative methods for stakeholder engagement, including in-depth interviews that explore the following dimensions.

1. Decision problems and discussions: What climate-sensitive water resource decisions or discussions are government agencies and other stakeholders involved in or likely to be involved in related to water resources from the Pearl Harbor aquifer? What agencies and individuals do they work with during these decisions and discussions?
2. Use of climate information: To what extent do government agencies and other stakeholders incorporate climate information, such as that developed by CAPP partners, in their planning discussions and decisions? What information do they use and find most helpful?
3. Value of information: To what extent do government agencies and other stakeholders evaluate the importance of climate information to help support decisions related to water resources from Pearl Harbor? What are the metrics of value? How do they make decisions under conditions of uncertainty? What types of information are needed for long-term adaptation planning? What are the relative risks of false assurance (adequate water supply) or false alarms (inadequate water supply)?
4. Responses and adaptations: Have climate adaptation plans been developed? If not, how do stakeholders take climate variability and change into account? If adaptation plans have been developed, are they useful for decision making? What are the tradeoffs between short term adjustments and long-term adaptation planning? What is water resource sustainability planning? To what extent are these plans the same as or a part of climate adaptation planning? Do government agencies coordinate with each other in their planning activities? How well do agency and organization plans agree with each other?
5. Vulnerable populations and gender analysis: Do government agency adaptation planning activities provide specific interactions with vulnerable populations (e.g., Native Hawaiians, women, special needs)? What access to climate information and services do these populations have? What decisions do they make with regard to water resources?
6. Existing legal and regulatory barriers and effectiveness of emerging climate laws and policies: Are there plans, policies, and/or regulations based on historic rather than projected water availability? Are there other legal and regulatory limits that constrain appropriate responses to the impacts of climate variability and change? How effective are climate laws and policies in promoting sustainable water resource management plans? What are the metrics of effectiveness?
7. Lessons: What broader lessons have been learned? What is still needed?

Information obtained from the interviews will be used to design workshops comprised of stakeholders in four sector groupings: (1) agriculture and fisheries, (2) community planning, (3) infrastructure and facilities, and (4) environmental resources. The main goal of the workshops is to engage stakeholders in a collaborative deliberation on key questions related to ground water sustainability and how these questions need to be answered. Based on responses from the interviews and workshops, we will develop a readily accessible inventory of key agents and organizations and the nature of their decisions and discussions related to ground water resources from the Pearl Harbor aquifer. Based on the inventory, we will develop a capability map for efficiently locating researchers, government agencies, private enterprises, nonprofit organizations, and local community groups with expertise in identifying and addressing key physical, social, and economic dimensions of decision problems related to the sustainability of ground water resources in Pearl Harbor. To examine the transferability of this work, researchers from WRRC will review literature to contrast the Pacific Islands with other regions and to compare similar studies done elsewhere on ground water sensitivity to climate change.

## **Long-range Planning Decisions that Pacific RISA Supports**

Sustainable Island Development. Assessing the sustainability of reliable potable water resources under changing climate conditions is a fundamental element in sustainable island development over the long term. The Hawaii Commission on Water Resource Management currently assesses the sustainability of ground water resources using simplified models. The new research is expected to enhance decisions about water budgets of many aquifer sectors by including climate uncertainty. The results will inform Pacific RISA education and outreach activities targeted towards water and other resource managers. Example management decisions include determining whether additional wells can be drilled in an area, estimating pumping rates, and redistributing pumpage. The Boards of Water Supply for each county can use this information to evaluate options for sustainable use of water for residential, agricultural, industrial, tourism, and other purposes.

Multihazard Mitigation Planning. We will assist island governments in updating multi-sectoral disaster risk-reduction plans with the best available climate-related data for understanding hazard risks. This involves integrating assessment data from collaborators, such as the localized effects of ENSO (PEAC), sea level rise (NOAA IDEA Center, UH Sea Level Center), water resources/hydrology and downscaled rainfall projections (USGS, NWS, IPRC, UOG), and ecosystem impacts (USDA NRCS). The latest data on climate hazards identification, risks, and vulnerability will be incorporated into plans in stages coinciding with hazard mitigation planning cycles (Hawaii 2010 and 2013, American Samoa and Guam 2011 and 2014, and CNMI 2012 and 2015). We are already in discussions with Palau as they have begun their update. In FSM, the climate office has merged with the Office of Environmental and Emergency Management and they request similar assistance. RMI is also updating its hazard plans.

Building Capacity. We will help island communities determine how to build adaptive capacity in diverse island settings several ways. For instance, in partnership with specific disaster management communities, we will develop, analyze, and deliver climate information tailored to their needs and propose mitigation actions to reduce hazard risks. Intermediaries (e.g., extension agents) and decision makers will be assisted in “connecting the dots” among information products from diverse, distributed sources. RISA-Agency-Stakeholder collaborations will also facilitate the integration of flexible processes for building adaptive capacity by working under the umbrella of the PaCIS and in partnership with PICCC.

Adaptation Planning. We will assist island governments in preparing and adopting laws, policies, and administration rules that facilitate cost-effective, efficient, and equitable climate adaptation strategies. For instance, legal analyses will survey the capacity and the quality of laws that control the allocation, supply, infrastructure, maintenance and monitoring of water use. Analyses will support law makers by determining if existing laws and policies support the adaptive measures recommended. Further, analyses of the extant laws and procedures will determine the consistency of perceptions among water users of their legal as well as traditional access and use rights. Use of existing national, state and/or local laws and policies can help to avoid opposition and ensure successful integration of adaptive measures.

Drought Planning and Management. We will provide information about the human dimensions of drought to aid the agricultural sector (farmers, ranchers, and service providers) in the development of drought plans and tools. For instance, drought plans may be seen as more relevant and useful by stakeholders if they address the qualitative dimensions of drought impacts (and thresholds) that motivate drought-management responses. We will examine whether the information in water budgets and the US Drought Monitor is integrated more fully in decision processes when it is packaged in a way that corrects misconceptions (errors) and/or informs poorly differentiated conceptualizations of drought.

## **Most Common Local Decisions that Scale Up to Regional Significance**

Although the islands in the Pacific RISA region are distributed across a large geographic area, have

diverse ecosystems, and include many specialized and unique species, several island-level decisions scale up to regional significance. Many island economies are now based heavily on tourism, tuna processing, and agricultural production for export, making them highly responsive to external economic forces. The stability of these economies thus depends on the health of their unique natural resources, all of which are sensitive to climate. In addition, many islands are facing the stresses of rapid human population growth, increasing vulnerability to natural disasters, degradation of natural resources, and threats to infrastructure and ground water supplies from sea-level rise. Decisions about public safety in the face of natural hazards, energy and water supply, sustainable population development, the protection of coastal infrastructure, and the expansion or relocation of military installations have potential to for significant economic and environmental impacts at a regional level.