



# **CLIMATE CHANGE ADAPTATION PLANNING** *in the* **U.S. AFFILIATED PACIFIC ISLANDS**

*Assessment of Current Capacity  
and Recommendations for Future Opportunities*



**PACIFIC ISLANDS  
CLIMATE CHANGE  
COOPERATIVE**

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This report was prepared for the U.S. Department of the Interior's Office of Insular Affairs (OIA) for the project "Climate Change Planning Technical Assistance in the U.S. Pacific Territories and Freely Associated States" in support of an Inter-Agency Agreement between OIA and the U.S. Fish and Wildlife Service (USFWS).

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The Pacific Islands Climate Change Cooperative (PICCC) was established in 2009 to assist those who manage native species, island ecosystems and key cultural resources in adapting their management to climate change for the continuing benefit of the Pacific. As part of the international Landscape Conservation Cooperative Network, the PICCC consists of Federal, State, private, indigenous, and non-governmental conservation organizations and academic institutions forming a cooperative partnership that determines the overall organizational vision, mission, and goals.

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# List of Acronyms

ALC	Guam Ancestral Lands Commission
ASDOC	American Sāmoa Department of Commerce
ASDOE	American Sāmoa Department of Education
ASDPR	American Sāmoa Department of Parks and Recreation
ASEPA	American Sāmoa Environmental Protection Agency
ASHPO	American Sāmoa Historic Preservation Office
ASNRC	American Sāmoa Natural Resources Commission
ASPA	American Sāmoa Power Authority
BECQ	CNMI Bureau of Environmental and Coastal Quality
BLS	Palau Bureau of Lands and Survey
BMR	Palau Bureau of Marine Resources
BPW	Palau Bureau of Public Works
BSP	Guam Bureau of Statistics and Plans
CCA	CNMI Department of Community and Cultural Affairs
CLTC	Chamorro Land Trust Commission
CNMI	Commonwealth of the Northern Mariana Islands
CNMI DFW	CNMI Division of Fish and Wildlife
CNMI DNAR	CNMI Department of Lands and Natural Resources
CNMI DPW	CNMI Department of Public Works
CO <sub>2</sub>	Carbon dioxide
CPA	CNMI Commonwealth Ports Authority
CRM	CNMI Division of Coastal Resources Management Office
CUC	CNMI Commonwealth Utilities Corporation
CZB	CNMI Commonwealth Zoning Board
DAWR	Guam Division of Aquatic and Wildlife Resources
DCA	Department of Chamorro Affairs
DEA	FSM Department of External Affairs
DEQ	CNMI Division of Environmental Quality
DFSR	Guam Division of Forestry and Soil Resources
DHR	FSM Department of Human Resources
DHSA	FSM Department of Health and Social Affairs
DMWR	American Sāmoa Department of Marine and Wildlife Resources
DoAG	Guam Department of Agriculture
DOC	CNMI Department of Commerce
DOI	United States Department of Interior
DPL	CNMI Department of Public Lands
DPW	Guam Department of Public Works
EPPSO	RMI Economic Policy, Planning and Statistics Office
EQPB	Palau Environmental Quality Protection Board
FAS	Freely Associated States, referring to RMI, FSM, and Palau
FSM	Federated States of Micronesia

GHG	Greenhouse Gas. GHG refers to atmospheric gases that absorb or emit infrared radiation, including water vapor (H <sub>2</sub> O). The main GHGs of concern in climate change are: CO <sub>2</sub> (CO <sub>2</sub> ), nitrous oxide (N <sub>2</sub> O), methane (CH <sub>4</sub> ), sulphur hexafluoride (SF <sub>6</sub> ), perfluorocarbon (PFC), and hydrofluorocarbon (HFC).
GHS	Guam Homeland Security and Office of Civil Defense
GIS	Geographical Information System
Guam DLM	Guam Department of Land Management
Guam EPA	Guam Environmental Protection Agency
Guam LUC	Guam Land-Use Commission
HPO	Marshall Islands Historic Preservation Office
KAJUR	Kwajalein Joint Utilities Resources
KUA	Kosrae Utilities Authority
LCC	Landscape Conservation Cooperatives
LUPP	Guam Land-Use Planning Program
MCCA	Palau Ministry of Cultural and Community Affairs
MEC	Marshalls Energy Company
MIMRA	Marshall Islands Marine Resources Authority
MNRET	Palau Ministry of Natural Resources, Environment and Tourism
MPIIC	Palau Ministry of Public Infrastructure, Industry and Commerce
MPW	RMI Ministry of Public Works
MRD	RMI Ministry of Resources and Development
NACH	FSM Office of National Archives, Culture, and Historic Preservation
NCCC	RMI National Climate Change Committee
NEMO	Palau National Emergency Management Office
NOAA	National Oceanic and Atmospheric Administration
OAS	FSM Office of Administrative Services
OEEM	FSM Office of Environment and Emergency Management
OERC	Palau Office of Environmental Response and Coordination
OIA	Office of Insular Affairs
OIPPC	RMI Office of Environmental Planning and Policy Coordination
Pacific RISA	Pacific Regional Integrated Sciences and Assessments
PALARIS	Office of Palau Automated Land and Resources Information System
PAN	Palau Protected Areas Network
PCC	Palau Community College
PICCC	Pacific Islands Climate Change Cooperative
PICSC	Pacific Islands Climate Science Center
PIRCA	Pacific Islands Regional Climate Assessment
PPLA	Palau Public Lands Authority
PPUC	Palau Public Utilities Corporation
PUC	Pohnpei Utilities Corporation
R&D	FSM Department of Resources and Development
RMI	Republic of the Marshall Islands
RMIEPA	RMI National Environmental Protection Authority
SBOC	FSM Office of Statistics, Budget, and Economic Management Overseas Development



TAP	OIA Technical Assistance Program
TCI	FSM Department of Transportation, Communications and Infrastructure
USAPI	United States Affiliated Pacific Islands
USFWS	United States Fish and Wildlife Service
YSPSC	Yap State Public Service Corporation

# Executive Summary

At the request of the Department of the Interior's Office of Insular Affairs (OIA), the Pacific Islands Climate Change Cooperative (PICCC) was asked to provide technical assistance to the Commonwealth of the Northern Mariana Islands, Territory of Guam, Territory of American Samoa, Republic of the Marshall Islands, Federated States of Micronesia, and Republic of Palau in understanding and planning for the localized impacts of global climate change.

OIA requested that the PICCC engage key cross-sector decision makers and stakeholders within each jurisdiction with the objectives to identify and articulate near-term priorities for funding as well as a process for developing long-term climate change adaptation plans. The desired outcomes of this technical assistance project were to increase each jurisdiction's capacity to,

- (1) understand the complexities of climate change adaptation planning, vulnerability assessments, and climate adaptation plan implementation;
- (2) be better prepared to complete a climate change adaptation plan application for funding purposes; and
- (3) be able to prioritize existing climate change initiatives and plan development activities for funding purposes.

It was envisioned that the project's final outputs would aid each jurisdiction additionally in identifying critical gaps to be filled by further technical assistance and funding requests to governmental and non-governmental organizations. The final output of this OIA-funded project is this report, which shares the findings of the climate change adaptation capacity assessments (Chapters 2-7), and recommendations based on these assessments as well as observations and feedback gathered during the workshops (Chapter 8). This report is available for download at the PICCC web site: <http://piccc.net>.

## Assessing Capacity for and Challenges to Adaptation

Climate change adaptation planning and implementation requires an effective constellation of partners to come together around shared goals and activities, backed with the legal authority and funding needed to make substantial and sustained change. This is of course challenging due to the fragmentation of management authorities across government agencies combined with often overlapping mandates between agencies and competition for funding. Furthermore, legal jargon can make statutory authorities difficult to interpret without specialized training. Finding the right funding match can be challenging both for applicants and funders as applicants work to design effective proposals and funders seek to identify the most strategic use of their funds as

well as the appropriate government offices with which to work. To help address these challenges in the context of the U.S. Affiliated Pacific Islands, climate change adaptation capacity assessments were conducted for the Commonwealth of the Mariana Islands, Territory of Guam, and Territory of American Sāmoa (hereafter referred to as the U.S. Pacific Territories); and the Republic of the Marshall Islands, Federated States of Micronesia, and the Republic of Palau (hereafter referred to as the Freely Associated States or FAS).

Each jurisdictional assessment in this report is organized into the following categories:

- **Authorities:** key legal authorities applicable to climate change adaptation;
- **Institutions:** the capacity to utilize such authorities as reflected by the structure of the government executive branches;
- **Actions:** the implementation of their authorities as indicated by recent governmental actions focused on climate change; and
- **Future Needs:** near-future needs that would aid in climate change adaptation efforts.

The report then makes recommendations, organizing these into key sectors: zoning and land-use management, forest and watershed management, coral reef and marine systems management, outreach and education, renewable energy and energy efficiency, and food security. This Executive Summary shares highlights from the report, working backwards from final recommendations to the institutional and legal context in the U.S. Pacific Territories and FAS.

## Key Sectors for Supporting Climate Change Resiliency

Fragmentation of climate change management authorities, as well as overlapping mandates between agencies, is common. This poses a particular challenge when it comes to preparing for climate change. Increasing the integration of adaptation strategies across departments will help climate change preparation work as it goes forward. Key opportunities for engagement on climate change preparations in U.S. Affiliated Pacific Islands are recommended below according to sector. For each opportunity, important government offices for engagement are provided in Chapter 8.

**1. Zoning and Land-Use Management** – The production of spatially based vulnerability assessments, particularly for assets in the coastal zone, will be vital. This involves development or enhancement of centralized GIS capability in order to clearly delineate and visualize the vulnerabilities and some level of authority to implement, or at least recommend, proper zoning and land-use planning so as to minimize future impacts.

**2. Forest and Watershed Management** – One aspect of future climate change that has created significant concern is the potential for changes in precipitation patterns and stream discharges which can in turn lead to impacts on municipal water supplies,

agriculture, and biodiversity conservation. However, at the present time the prediction of future rainfall trends is tenuous at best given the lack of downscaled climate models for parts of the region and first-generation models for the rest of the region. Despite this, it would be prudent to undertake scenario planning so as to more clearly understand potential vulnerabilities and tradeoffs going forward. Scenario planning would then inform watershed management strategies. These strategies will be of more immediate importance in Guam, American Samoa, FSM, and Palau, due to their perennial streams, and somewhat less so in CNMI which has few perennial streams.

**3. Coral Reef and Marine Systems Management** – Coral reefs are among the most vulnerable of ecosystem classes to the near-term effects of climate change. In the Pacific Islands, coral reefs provide vital ecosystem services including coastal protection, nearshore fisheries, and tourism. Monitoring coral bleaching events, assessments of the overall natural resource losses in reefs, and identification of potentially resilient reef areas that may require special protection are important activities for continued funding and collaboration.

**4. Outreach and Education** – Communicating to the greater public the future challenges posed by climate change, and the necessity of pursuing adaptive strategies, is essential for building and retaining popular support for difficult future decisions and for moving adaptation measures forward. Therefore, funding should be directed toward those agencies that have oversight of education at all levels.

In addition to the four sectors highlighted above, the two sectors below present opportunities for collaboration that are of particular importance in the Freely Associated States.

**5. Renewable Energy and Energy Efficiency** – The U.S. Pacific Island jurisdictions have recently completed energy action plans and energy strategies that will help increase their energy independence and overall resiliency when implemented. The FAS nations are almost totally reliant on imported fossil fuels for electricity generation. Adoption of renewable energy technologies has been quite limited, and thus energy efficiency has significant room for improvement. In many cases the local energy offices that would oversee energy efficiency projects in the FAS are understaffed and would benefit from immediate capacity building.

**6. Food Security** – Climate change has the clear potential to affect food security in the FAS by changing rainfall patterns upon which crops depend, creating new climatic conditions to which traditional crops may not adapt, rendering croplands and groundwater unusable by way of saltwater intrusion (via increased storm surge and sea level rise), and by altering oceanographic conditions in such a way that key fisheries are diminished or geographically displaced. As such, there is a need to assess the vulnerability of current food crops and fishery stocks to predicted future climate regimes, and educate local farmers as to potential alternative crops that might be employed if traditional staples begin to fail.

## Climate Change Planning Needs in the U.S. Pacific Territories

Immediate climate change adaptation needs in CNMI, Territory of Guam, and Territory of American Sāmoa are as follows:

### *Commonwealth of the Northern Mariana Islands*

- **Climate Change Adaptation Plan** – The CNMI is in need of both a climate change Executive Order similar to those already promulgated in Guam and American Sāmoa and an overall climate change action plan to provide a guiding document for executive branch agencies. The existing Saipan vulnerability assessment and the coral reef resilience study provide good foundational documents on which to base proposals for further assistance, particularly in regard to islands other than Saipan and sectors other than coastal zone management.
- **Land-Use Management Plan** – Climate change adaptation efforts will need continued coordination across the Commonwealth's agencies. There is a need for climate change vulnerability considerations to be incorporated into the land-use management plans mandated by the Public Lands Act of 2006 and the Saipan Zoning Law of 2013. This could be accomplished through collaborations with the Commonwealth Zoning Board and/or the CNMI Department of Public Lands.

### *Territory of Guam*

- **Vulnerability Assessment** – Guam is in need of a comprehensive vulnerability assessment of the type recently completed for Saipan. Under the terms of Executive Order 2015-08 such assessments were planned with hopes of completion by April 2016.
- **Climate Change Action Plan** – Guam is also in need of an overall plan to guide climate change adaptation. The Governor has already expressed a desire for such a plan but has requested that it be based on priorities that emerge from future climate change vulnerability assessments.

### *Territory of American Sāmoa*

- **Vulnerability Assessment** – The current Territorial Climate Change Action Framework does a good job of outlining climate change vulnerabilities but does not analyze them in detail. A vulnerability assessment similar to that prepared for Saipan, incorporating GIS-based vulnerability mapping, would be extremely useful for climate change adaptation planning across the Territory. Given funding and data limitations, such as assessment be conducted incrementally beginning in Tutuila

and could subsequently be extended to the other islands in the territory, including the atolls which have clear vulnerabilities to inundation.

- **Coastal Hazards Assessment** – Due to the steeply dropping nature of most shorelines on Tutuila, where the majority of American Sāmoa’s population dwells, a significant number of villages, and a large amount of vital infrastructure, are located very close to the mean high water mark. Therefore, a specific assessment of coastal hazards and projected future inundation and erosion trends is important in regard to zoning and land-use planning.

### *Further Climate Change Adaptation Needs in the U.S. Pacific Territories*

The following engagement opportunities were identified as important near-term actions through climate change adaptation workshops in CNMI, Guam, and American Sāmoa.

- **Creating Climate Coordinator Positions** – At present, there is not a centralized office or program overseeing climate change vulnerability assessments and adaptation strategies between all jurisdictional authorities and across multiple sectors in CNMI, Guam, or American Sāmoa. Working around this, individuals have assumed either designated or *de facto* roles as climate change coordinators. Each of the jurisdictions is in need of a permanent, high-level climate coordinator who is not affiliated with a department in order to improve internal coordination and avoid the appearance that climate change activities are being directed by any single department.
- **Mainstreaming of Climate Change into Government Agencies** – While agency employees can be directed to participate in workshops, when they return to their daily routine climate change is not part of their job description (with a few notable exceptions). An approach that mainstreams climate change into agency missions and work plans would remedy this.
- **Building GIS Capacity** – CNMI, Guam, and American Sāmoa all expressed the desire to design and/or improve GIS databases, and funding offered on this could be targeted to support the objectives of both climate change projects as well as those government agencies with lead roles in climate change adaptation.
- **Sustaining ‘Nature’s Infrastructure’** – Some of the most pressing climate change vulnerabilities identified by participants in the U.S. Pacific Territories workshops were related to infrastructure. However, the presence of infrastructure can increase the vulnerability of natural resources, depending on the design, both now and into the future. This is specifically the case with stormwater and wastewater runoff into marine systems and coastal roads that block the natural adaptive capacity of coastal ecosystems. This tension could be addressed by focusing efforts on sustaining and restoring natural infrastructure where feasible (e.g., coastal mangrove forests, wetlands, and natural drainage features).

- ***Designing Environmentally Sound Development and Infrastructure*** – CNMI and American Samoa expressed an interest in bringing in outside contractors (e.g., engineers) to work directly with agencies in adapting their plans and development projects for climate change. The on-island capacity to do this is limited which increases the risk of maladaptation, especially in the case of engineers who need to design projects that are environmentally sound and incorporate considerations of future climate change impacts (e.g., increasingly powerful storms).
- ***“Climatizing” of Existing Programs, Plans, and Projects*** – There is a pervasive need for high level expertise to work directly within Territorial agencies to support incorporating climate change information, strategies, and actions into their existing programs, plans, and projects. This could begin with funding for short-term sit-in positions to help build capacity within and across local agencies. Positions like this already occur in the FAS through the U.S. Embassy Science Fellows and Peace Corps Response programs.
- ***Increasing Climate Change Legal Capacity*** – Support for embedded legal fellows within various executive branch agencies of the U.S. Pacific Territories could be a useful means of incorporating climate change language amendments into existing statutes and administrative rules. The authorizing statutes of most agencies lack specific reference to climate change; therefore the authority to address its effects is implied rather than explicit. By embedding fellows who have both a law degree and appropriate sector expertise into selected agencies for 12 to 18 months, it would be possible to produce appropriately structured language relating to climate change that could then be incorporated into law, either through legislative action or agency rule-making.

## Climate Change Planning Needs in the Freely Associated States

The following adaptation needs of immediate importance for RMI, FSM, and Palau are summarized from the full report (Chapters 5-7).

### *Republic of the Marshall Islands*

- ***Climate Change Adaptation Plan*** – A variety of studies have highlighted the extreme vulnerability of the RMI to impacts from climate change, particularly in regard to inundation from rising sea levels (GFDRL 2011), but there does not appear to be any overall synthesis of these studies into a comprehensive adaptation plan for the country. The need for such a plan is laid out in the RMI National Strategic Plan of 2014, and the National Climate Change Policy Framework of 2011, the latter calling for the development of a Climate Change and Disaster Risk Management National Action Plan for RMI (a.k.a., Joint NAP). As previously noted, is not clear where the development of the latter plan



currently stands. Many of the previously developed strategic documents upon which it is based (relating to overall strategic development, energy policy, disaster risk management, and water resource management) are between 7 and 15 years old and in many cases did not fully anticipate the magnitude of the climate change impacts now facing the country. The agency with statutory authority for development of such a plan is the OEPPC in the Office of the President.

- ***Land-Use Management Plan*** – A detailed, GIS-based assessment of inundation risk needs to be undertaken for all islands in the RMI in order to understand the full extent of vulnerabilities faced by infrastructure and communities and as a basis for scenario planning in the event certain strategic retreats are required. Modelling of inundation risk to date has logically been concentrated at Majuro and Kwajalein Atolls, where the majority of the country's population resides. In addition to these localized case studies, a more comprehensive approach needs to be extended to the remainder of the country. This should include incorporation of wave force models on top of simple projections of sea level rise (Storlazzi et al. 2015). Such an assessment could also address two separate strategic goals – urban planning and infrastructure development, and land and coastal management – set forth in the RMI National Climate Change Policy Framework of 2011. RMIEPA, with its statutory mandates to oversee both land-use planning and impacts from rising sea levels, would be important in such efforts. OEPPC might also have a role to play.
- ***Energy Strategy and Policy Development*** – The RMI currently meets over 99% of its energy needs from imported fossil fuels (SPC 2012a). This is problematic both in terms of foreign exchange and climate change adaptation. Although there has been incipient adoption of solar photovoltaic technologies and initial experiments with coconut-based biofuels, the alternative energy sector is not fully developed. The most recent National Energy Action Plan was adopted in 2009 and is likely becoming dated given recent advances in technology, particularly in the solar PVE sector. Additional needs include development of policies for interconnection of renewable energy sources to the existing power grid, net metering, and power production outside of the two state-owned enterprises at Majuro and Ebeye.

### *Federated States of Micronesia*

- ***Integrated Climate Change Adaptation Strategy*** – The FSM Climate Change Act of 2013 called for most executive branch departments to complete climate change plans. Developing a cohesive synthesis from emerging plans of individual agencies, and then integrating this with the existing FSM 2004-2023 Strategic Development Plan (which already has a significant climate change adaptation component) will be a substantial task. International and OIA funding could be directed toward assisting agencies in completing the plans and subsequent prioritization could in turn form the basis for sequencing future funding proposals for specific climate change adaptation projects.



- ***Land-Use Management Planning and Zoning*** – A detailed, GIS-based assessment of inundation risk needs to be undertaken for all islands in the FSM, particularly the outlying atolls, in order to understand the full extent of vulnerabilities faced by infrastructure and communities and as a basis for scenario planning in the event certain strategic retreats are required. In addition, there is a clear need to update the land cover analysis for the high islands in the FSM in order to assess the magnitude of significant recent losses of primary forest due to clearing for agriculture (e.g., on Pohnpei for kava cultivation in the uplands) and as a baseline by which to assess future climate-driven vegetation shifts. Highlighted as a specific need in the FSM 2004-2023 Strategic Development Plan, there is a distinct lack of GIS capacity in the country with which to implement such analyses, and this is an area where external funding could help to fill a significant gap, possibly working through the College of Micronesia or the Department of Resources and Development.
- ***Energy Policy Implementation*** – Due to its fragmented geography, the power generation sector in the FSM is of necessity highly segmented, with each of the four states having a separate utility company, and fewer than 50% of households having a direct connection to one of these local grids. This would make the country an excellent candidate for deployment of distributed photovoltaic energy systems, which would also reduce carbon emissions and fossil fuel dependence. Assistance would be useful for the development of policies for interconnection of renewable energy sources to the existing power grid, net metering in relation to the four major power companies on Kosrae, Pohnpei, Chuuk, and Yap, and for deployment of renewable energy technologies on the smaller outlying islands.

### *Republic of Palau*

- ***Vulnerability Assessment*** – A climate change vulnerability assessment using GIS-based mapping is needed. Palau does not seem to have a current climate change vulnerability assessment at the national level. A GIS-based study would be extremely useful in visualizing future risks, especially at Kayangel Atoll in the north of the country which is vulnerable to inundation. In addition, because many of the inhabited islands in Palau have steeply dropping limestone hills, with narrow coastal flats backed by cliffs, a significant amount of vital infrastructure is located very close to the mean high water mark. Therefore, a specific assessment of coastal hazards and projected future inundation and erosion trends is important in regard to zoning and land-use planning.
- ***Energy Policy Implementation*** – Palau is similar to the other FAS in that it currently meets over 99% of its energy needs from imported fossil fuels, which is undesirable in terms of both foreign exchange and climate change adaptation. Due to the fact the population is relatively tightly concentrated on a few closely proximal islands in the north of the country, 99% of Palau households are connected to the public electrical grid, and there is only one public power company. This centralization

of population and power infrastructure makes Palau a promising candidate for deployment of alternative energy technologies. Useful steps forward would include promoting deployment of residential rooftop solar photovoltaic capacity, developing policies for interconnection of renewable energy sources to the existing power grid, clarifying a net metering scheme, and generally improving energy efficiency across the country's economy as a whole.

## Key Authorities and Institutions Relevant to Climate Change Resiliency

An analysis of climate change relevant legal authorities, government institutions, and government actions relevant to climate change actions in the U.S. Affiliated Pacific Islands is listed in the following tables and explored in-depth in the full report (Chapters 2-7). This analysis is designed to provide readers with assistance in identifying the resources they currently can access – and the resources they need to obtain – to more effectively design strategies, build partnerships, and write funding applications for climate change resiliency work in the U.S. Affiliated Pacific Islands.

It is our hope that this Executive Summary and the full report will assist in connecting future projects, partners, legal authorities, and funding together, helping to move climate change planning and preparedness forward in the region. For more information on the programs and activities of the Pacific Islands Climate Change Cooperative, please visit our website at <http://piccc.net>.

**Table 1: CNMI's Climate Change Adaptation Authorities, Institutions, and Actions**

<b>Commonwealth of the Northern Mariana Islands</b>	
<b>Legal Authorities Relevant to Climate Change</b>	<p>Governor's Directive No. 2014-01 (2014)</p> <p>Saipan Zoning Law of 2013 (SLL 18-5; codified Title 10 CMC Ch. 5, Art. 1)</p> <p>Public Lands Act of 2006 (PL 15-2)</p> <p>Executive Directive 235 of 2003</p> <p>Public Lands and Natural Resources Administration Act of 1997 (PL 10-57; codified Title 1 CMC Ch. 13)</p> <p>Coastal Resources Management Act of 1983 (PL 3-47; codified Title 1 CMC Ch. 1 &amp; 2)</p> <p>CNMI Historic Preservation Act of 1982 (PL 3-39)</p>
<b>Institutional Structures Applicable to Climate Change Adaptation</b>	<p>CNMI Office of the Governor</p> <ul style="list-style-type: none"> <li>- CNMI Commonwealth Zoning Board (CZB)</li> <li>- CNMI Bureau of Environmental and Coastal Quality (BECQ) <ul style="list-style-type: none"> <li>• CNMI Division of Coastal Resources Management Office (CRM)</li> <li>• CNMI Division of Environmental Quality (DEQ)</li> </ul> </li> </ul> <p>CNMI Department of Public Lands (DPL)</p> <p>CNMI Department of Commerce (DOC)</p> <p>CNMI Department of Lands and Natural Resources (DLNR)</p> <ul style="list-style-type: none"> <li>- CNMI Division of Fish and Wildlife (DFW)</li> </ul> <p>CNMI Department of Public Works (DPW)</p> <p>Commonwealth Ports Authority (CPA)</p> <p>Department of Community and Cultural Affairs (CCA)</p> <p>Commonwealth Utilities Corporation (CUC)</p> <p>Northern Marianas College (NMC)</p>
<b>Government Actions on Climate Change</b>	<p><b>CNMI Initiatives</b></p> <p>Vulnerability and Resilience Assessments of Coral Reef Resources (2015)</p> <p>CNMI State Flood Hazard Mitigation Plan (2015)</p> <p>Rota and Tinian Vulnerability Assessment (2015)</p> <p>Saipan Vulnerability Assessment of Coastal Resources and Infrastructure (2014)</p> <p>Climate Change Task Force and Working Group (2012)</p> <p>Garapan Conservation Action Plan</p> <p><b>International Initiative</b></p> <p>The Micronesia Challenge</p>

**Table 2: Guam's Climate Change Adaptation Authorities, Institutions, and Actions**

Territory of Guam	
<b>Legal Authorities Relevant to Climate Change</b>	<p>Executive Order 2015-08 (2015)  Guam Office of Technology (2013) (Title 2 GCA Ch. 20)  Executive Order 2012-05 (2012)  Executive Order 2010-15 (2010)  Executive Order 1997-10 (1997)  Land Management Act (Title 21 GCA Ch. 60)  Guam Territorial Seashore Protection Act of 1974 (PL 12-108; Title 21 GCA Ch. 63)  Parks and Recreation (PL 20-151; codified as Title 21 GCA Ch. 77)  Guam Environmental Protection Agency Act (Title 10 GCA Ch. 45)  Fish, Game, Forestry and Conservation (Title 5 GCA Ch. 63)</p>
<b>Institutional Structures Applicable to Climate Change Adaptation</b>	<p>Guam Office of the Governor</p> <ul style="list-style-type: none"> <li>- Guam Office of Technology</li> <li>- Guam Bureau of Statistics and Plans (BSP) <ul style="list-style-type: none"> <li>• Guam Coastal Management Program</li> <li>• Land-Use Planning Program (LUPP)</li> </ul> </li> </ul> <p>Guam Environmental Protection Agency (Guam EPA)  Guam Department of Land Management (Guam DLM)</p> <ul style="list-style-type: none"> <li>- Guam Land-Use Commission (Guam LUC)</li> <li>- Guam Seashore Protection Commission</li> <li>- Guam Ancestral Lands Commission (ALC)</li> <li>- Chamorro Land Trust Commission (CLTC)</li> </ul> <p>Guam Department of Agriculture (DoAG)</p> <ul style="list-style-type: none"> <li>- Division of Aquatic and Wildlife Resources (DAWR)</li> <li>- Division of Forestry and Soil Resources (DFSR)</li> </ul> <p>Guam Energy Office  Guam Department of Public Works (DPW)  Guam Homeland Security and Office of Civil Defense (GHS)  Department of Chamorro Affairs (DCA)  Department of Parks and Recreation  University of Guam (UoG)  Water and Environmental Research Institute of the Western Pacific (WERI)</p>
<b>Government Actions on Climate Change</b>	<p><b>Guam Initiatives</b></p> <p>Guam Climate Change Task Force (2015)  Marine Planning and Climate Change Policy (2015)  Adapting to a Changing Climate Workshop (2014)  Guam Strategic Energy Plan (2013)  Coral Reef Resilience Local Action Strategy (2008)</p> <p><b>International Initiative</b></p> <p>The Micronesia Challenge</p>

**Table 3: American Sāmoa's Climate Change Adaptation Authorities, Institutions, and Actions**

<b>Territory of American Sāmoa</b>	
<b>Legal Authorities Relevant to Climate Change</b>	<p>Executive Order 009-2013 (2013)</p> <p>Executive Order 03-2012 (2012)</p> <p>Executive Order 002-2011 (2011)</p> <p>Executive Order 004-2010 (2010)</p> <p>Executive Order 010A-2007 (2007)</p> <p>American Sāmoa Soil and Water Conservation District Act of 1993 (PL 23-8; ASCA Title 24 Ch. 9)</p> <p>American Sāmoa Coastal Management Act of 1990 (PL 21-35; ASCA Title 24 Ch. 5)</p> <p>Department of Marine and Wildlife Resources of 1987 (PL 20-12; ASCA Title 24 Ch. 3)</p> <p>American Sāmoa Natural Resources Commission of 1982 (PL 17-49; ASCA Title 24 Ch. 7)</p> <p>Department of Parks and Recreation of 1980 (PL 16-55; ASCA Title 18 Ch. 2)</p> <p>Planning and Economic Development of 1978 (PL 15-64; ASCA Title 10 Ch. 1)</p> <p>Environmental Quality Act of 1972 (PL 12-45; ASCA Title 24 Ch. 1)</p> <p>Executive Departments, Boards and Agencies of 1962 (PL 7-28; ASCA Title 4 Ch. 3)</p>
<b>Institutional Structures Applicable to Climate Change Adaptation</b>	<p>American Sāmoa Office of the Governor</p> <p>American Sāmoa Department of Marine and Wildlife Resources (DMWR)</p> <p>American Sāmoa Natural Resources Commission (ASNRC)</p> <p>American Sāmoa Environmental Protection Agency (ASEPA)</p> <p>American Sāmoa Department of Parks and Recreation (ASDPR)</p> <p>American Sāmoa Department of Commerce (ASDOC)</p> <p>American Sāmoa Department of Agriculture</p> <p>American Sāmoa Power Authority (ASPA)</p> <p>American Sāmoa Department of Public Works</p> <p>American Sāmoa Department of Health</p> <p>American Sāmoa Department of Education (ASDOE)</p> <p>American Sāmoa Historic Preservation Office (ASHPO)</p> <p>American Sāmoa Community College (ASCC)</p> <p>American Sāmoa Coral Reef Advisory Group (CRAG)</p>
<b>Government Actions on Climate Change</b>	<p><b>American Sāmoa Initiatives</b></p> <p>American Sāmoa Climate Change Task Force (2015)</p> <p>Territorial Climate Change Adaptation Framework (2012)</p> <p>Territorial Climate Change Advisory Group (2012)</p> <p>Climate Change Summit (2011)</p> <p>American Sāmoa Renewable Energy Committee (2010)</p>

	<i>Coral Reef Resilience Local Action Strategy (2008)</i> <b><i>International Initiative</i></b> <i>2 Sāmoas Environmental Collaboration Initiative</i>
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**Table 4: Republic of the Marshall Island's Climate Change Adaptation Authorities, Institutions, and Actions**

<b>Republic of the Marshall Islands</b>	
<b>Legal Authorities Relevant to Climate Change</b>	<p>Office of Environmental Planning &amp; Policy Coordination (OEPPC) Act of 2003 (PL 2003-83; codified Title 35 MIRC Ch. 4)</p> <p>Marshall Islands Marine Resources Act of 1997 (PL 1997-60; codified Title 51 MIRC Ch. 1-5)</p> <p>Alternative Energy Act of 1989 (PL 1989-63; codified Title 11 MIRC Ch. 17)</p> <p>Coast Conservation Act of 1988 (PL 1988-13; codified Title 35 MIRC Ch. 3)</p> <p>National Environmental Protection Act of 1984 (PL 1984-31; codified Title 35 MIRC Ch. 1)</p> <p>Public Lands and Resources Act of 1966 (TCC 1966; PL 2008-2; codified Title 9 MIRC Ch. 1)</p>
<b>Institutional Structures Applicable to Climate Change Adaptation</b>	<p>RMI Office of the President</p> <ul style="list-style-type: none"> <li>- Economic Policy, Planning and Statistics Office (EPPSO)</li> <li>- Office of Environmental Planning and Policy Coordination (OEPPC)</li> <li>- National Climate Change Committee (NCCC)</li> </ul> <p>Ministry of Public Works (MPW)</p> <p>Ministry of Resources and Development (MRD)</p> <p>National Environmental Protection Authority (RMIEPA)</p> <p>Marshall Islands Marine Resources Authority (MIMRA)</p> <p>Ministry of Foreign Affairs (MoF)</p> <p>Ministry of Education</p> <p>Marshalls Energy Company (MEC)</p> <p>Kwajalein Joint Utilities Resources (KAJUR)</p> <p>Marshall Islands Historic Preservation Office (HPO)</p>
<b>Government Actions on Climate Change</b>	<p><b>RMI Initiatives</b></p> <p>National Strategic Plan (2014)</p> <p>Joint National Action Plan for Climate Change and Disaster Risk Management 2014-2018</p> <p>RMI National Energy Policy and Planning Workshop (2012)</p> <p>RMI National Climate Change Policy Framework (2011)</p> <p>RMI Climate Change Roadmap (2010)</p> <p>National Energy Policy and Energy Action Plan (2009)</p> <p>RMI Coastal Management Framework (2009)</p> <p>RMI Disaster Risk Management National Action Plan 2008-2018 (2008)</p> <p>Reimaanlok: National Conservation Area Plan for the Marshall Islands 2007-2012 (2008)</p> <p>Vision 2018. The Strategic Development Plan Framework 2003-2018 (2001)</p>

	<p><b>International Initiatives</b></p> <p>The Micronesia Challenge</p> <p>Majuro Declaration for Climate Leadership</p> <p>2015 United Nations Climate Change Conference, Conference of the Parties 21</p> <p><b>Policy and Analysis Documents Prepared by Third Parties Working with the RMI Government</b></p> <p>Climate Change Finance Assessment (2014)</p> <p>Vulnerability and Adaptation Assessment for the Water Sector in Majuro (2014)</p> <p>Republic of the Marshall Islands Country Energy Security Indicator Profile 2009 (2012)</p> <p>National Integrated Water Resources Management Report (2007)</p>
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**Table 5: Federated States of Micronesia's Climate Change Adaptation Authorities, Institutions, and Actions**

<b>Federated States of Micronesia</b>	
<b>Legal Authorities Relevant to Climate Change</b>	<p>Federated States of Micronesia Climate Change Act of 2014 (PL 18-34)</p> <p>Federated States of Micronesia Environmental Protection Act of 1984 (PL 3-83§1; codified Title 25 FSMC Ch. 5-7)</p> <p>Trust Territory Endangered Species Act of 1975 (PL 6-55§1; codified Title 23 FSMC Ch. 3)</p> <p>Educational System (PL 8-132§4; codified Title 40 FSMC Ch. 1)</p> <p>College of Micronesia (PL 7-29§1; codified Title 40 FSMC Ch. 4)</p>
<b>Institutional Structures Applicable to Climate Change Adaptation</b>	<p>FSM Office of the President</p> <ul style="list-style-type: none"> <li>- Office of Statistics, Budget, and Economic Management Overseas Development (SBOC)</li> <li>- Office of Administrative Services (OAS)</li> </ul> <p>Department of Transportation, Communications and Infrastructure (TCI)</p> <p>Department of Resources and Development (R&amp;D)</p> <p>Office of Environment and Emergency Management (OEEM)</p> <p>Department of Human Resources (DHR)</p> <p>Department of External Affairs (DEA)</p> <p>Department of Foreign Affairs</p> <p>Department of Education</p> <p>Department of Health and Social Affairs (DHSA)</p> <p>Kosrae Utilities Authority (KUA)</p> <p>Pohnpei Utilities Corporation (PUC)</p> <p>Chuuk Public Utilities Corporation</p> <p>Yap State Public Service Corporation (YSPSC)</p> <p>College of Micronesia</p> <p>Office of National Archives, Culture, and Historic Preservation (NACH)</p>
<b>Government Actions on Climate Change</b>	<p><b>FSM Initiatives</b></p> <p>Nation Wide Integrated Disaster Risk Management and Climate Change Policy (2013)</p> <p>FSM Energy Policy (2012)</p> <p>FSM Agriculture Policy 2012-2016 (2012)</p> <p>FSM Framework National Water and Sanitation Policy (2011)</p> <p>FSM National Climate Change and Health Action Plan (2011)</p> <p>FSM State-Wide Assessment and Resource Strategy (2010)</p> <p>FSM Climate Change Policy 2009 (2009)</p> <p>FSM 2004-2023 Strategic Development Plan (2004)</p> <p>FSM Biodiversity Strategy and Action Plan (2002)</p> <p><b>International Initiatives</b></p>

	<p>The Micronesia Challenge  Majuro Declaration for Climate Leadership  2015 United Nations Climate Change Conference, Conference of the Parties 21</p> <p><b>Policy and Analysis Documents Prepared by Third Parties Working with the FSM Government</b>  Climate Change Legislation in the Federated States of Micronesia (2015)  Federated States of Micronesia Country Energy Security Indicator Profile 2009 (2012)</p>
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**Table 6: Palau's Climate Change Adaptation Authorities, Institutions, and Actions**

<b>Republic of Palau</b>	
<b>Legal Authorities Relevant to Climate Change</b>	<p>Palau Public Lands (PNCA Title 35 Ch. 1-2)</p> <p>Palau Environmental Protection Act (PL 1-58§1 modified; PNCA Title 24 Ch. 1)</p> <p>Palau Community College (PL 4.2§3(2) modified; PNCA Title 22 Ch. 3)</p> <p>Historical and Cultural Preservation Act (PL 1-48§1(a) modified; PNCA Title 19 Ch. 1)</p> <p>Aeronautics (PL 7-35 as amended; PNCA Title 8 Ch. 1)</p> <p>Executive Branch Organization Act (PL 7-8-8§1 modified; PNCA Title 2 Ch. 1)</p>
<b>Institutional Structures Applicable to Climate Change Adaptation</b>	<p>Palau Office of the President</p> <ul style="list-style-type: none"> <li>- Palau Environmental Quality Protection Board (EQPB)</li> <li>- Office of Environmental Response and Coordination (OERC)</li> </ul> <p>Ministry of Finance (MOF)</p> <ul style="list-style-type: none"> <li>- Bureau of Budget and Planning <ul style="list-style-type: none"> <li>• Office of Palau Automated Land and Resources Information System (PALARIS)</li> <li>• Office of Climate Change</li> </ul> </li> </ul> <p>Ministry of Natural Resources, Environment and Tourism (MNRET)</p> <ul style="list-style-type: none"> <li>- Bureau of Agriculture</li> <li>- Bureau of Marine Resources (BMR)</li> <li>- Protected Areas Network (PAN)</li> </ul> <p>Ministry of Public Infrastructure, Industry and Commerce (MPIIC)</p> <ul style="list-style-type: none"> <li>- Bureau of Aviation</li> <li>- Bureau of Public Works (BPW)</li> <li>- Bureau of Lands and Survey (BLS)</li> </ul> <p>Palau Public Lands Authority (PPLA)</p> <p>Palau Public Utilities Corporation (PPUC)</p> <p>Ministry of Health (MOH)</p> <p>Ministry of Education (MOE)</p> <p>Palau Community College (PCC)</p> <p>Ministry of Cultural and Community Affairs (MCCA)</p> <p>National Emergency Management Office (NEMO)</p>
<b>Government Actions on Climate Change</b>	<p><b>Palau Initiatives</b></p> <p>Palau Climate Change Policy for Climate &amp; Disaster Resilient Low Emissions Development (2015)</p> <p>National Energy Policy (2010)</p> <p>National Disaster Risk Management Framework (2010)</p> <p>Actions for Palau's Future – The Medium-Term Development Strategy 2009-2014 (2009)</p> <p><b>International Initiatives</b></p>

	<p>The Micronesia Challenge  Majuro Declaration for Climate Leadership  2015 United Nations Climate Change Conference, Conference of the Parties 21  Institutional Strengthening in Pacific Island Countries to Adapt to Climate Change (ISACC) Project (2017)</p> <p><b>Policy and Analysis Documents Prepared by Third Parties Working with the Palau Government</b>  Palau Country Energy Security Indicator Profile 2009 (2012)</p>
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# 1. Introduction

The Pacific Islands possess significant vulnerabilities to the effects of global climate change. This study provides an overview of these vulnerabilities, assesses the institutional framework currently in place for addressing potential adaptation strategies, and provides suggestions for areas in which additional support might enhance such capacity.

This report focuses on the U.S. Affiliated Pacific Islands (USAPI). These include the U.S. Pacific Territories of the Commonwealth of the Northern Mariana Islands, Territory of Guam, and the Territory of American Sāmoa; and the Freely Associated States of the Republic of the Marshall Islands, Federated States of Micronesia, and Republic of Palau. The Freely Associated States are independent nations that were established in the place of United States possessions acquired during World War II, and were previously governed under U.S. trusteeships. Upon attaining independence in the late 20<sup>th</sup> century, each of these nations signed a Compact of Free Association, which mutually terminated the trusteeship arrangement. Under these Compacts, the U.S. government provides annual payments to assist in economic development, with a long-term goal of allowing each country to reach self-reliance. These payments may include grants, lease payments for military uses, and trust fund contributions for use after the current compact agreements expire in the 2020s. Given that each of the FAS is threatened to some degree by the future effects of climate change, determining how such Compact funding can advance adaptation planning and implementation is prudent.

The State of Hawai'i, which has been subject to significantly more previous analysis in regard to climate change impacts and adaptation, is not included in the study, which is restricted to the U.S. Pacific Territories (CNMI, Guam, and American Sāmoa) and Freely Associated States (RMI, FSM, and Palau). Readers are also referred to previous studies specifically assessing coral reef management capacity in the U.S. Pacific Territories (Page et al. 2012; Page et al. 2014a, 2014b), although some of the findings from those studies are now dated due to subsequent political transitions and associated governmental re-organizations, particularly in American Sāmoa and Guam.

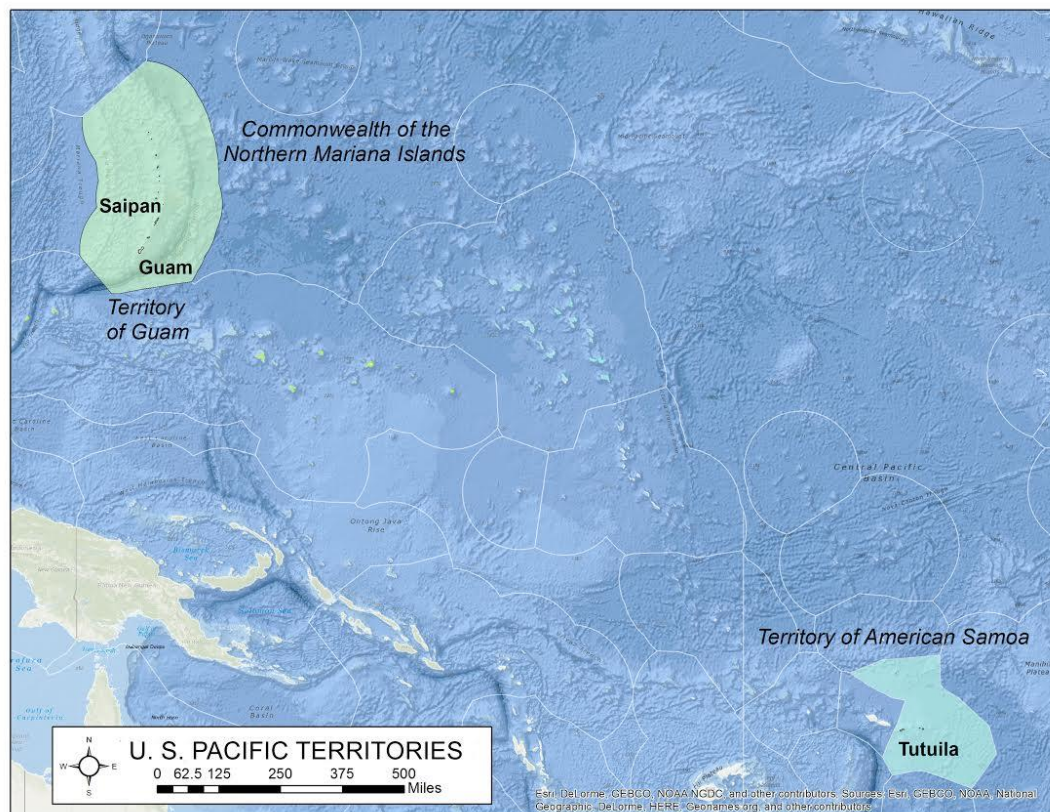
In this introductory chapter, geographical context is provided for each of the U.S. Pacific Territories and FAS nations covered in this report, using information derived from the U.S. Department of the Interior, U.S. Census Bureau, U.S. Department of Defense, U.S. Department of Commerce (particularly the NOAA National Weather Service), and Gressitt (1954). This is followed by an overview of the climate change drivers and impacts anticipated in the region.

In the following chapters, current climate change adaptation capacity is investigated within each of the U.S. Affiliated Pacific Island nations and jurisdictions at the level of existing authorities, current executive branch structure and responsibilities, ongoing implementation and external collaborations, and future needs. The overall goal of this

study is to identify gaps in current adaptive capacity at the institutional level that can be addressed through strategic investments of external funding.

## U.S. Pacific Territories

CNMI, Guam, and American Sāmoa lie in the tropical Central and Western Pacific. In combination, they occupy a wide range of latitude and longitude, from 20° 30' N to 14° 30' S, and 144° 50' E to 168° 10' W, spanning the International Date Line, but share many ecological and meteorological similarities (see Figure 1).



*Figure 1: Map of the U.S. Pacific Territories, showing major islands mentioned in this assessment, and their Exclusive Economic Zone boundaries.*

### *Commonwealth of the Northern Mariana Islands*

The CNMI is the most northerly of the U.S. Pacific Territories, extending from the island of Rota at 14° 10' N, 145° 13' E northward along an arc of progressively smaller islands to Farallon de Pajaros (also known as Uracas) at 20° 32' N, 144° 53' E. The population of approximately 54,000 people is concentrated on the more southerly islands of Rota, Tinian and the administrative center at Saipan, with most of the smaller islands in the northern section of the chain being lightly inhabited, if at all. The islands of the CNMI are



volcanic in origin, having formed along a subduction zone at the Pacific Plate margin, and are generally steep sided, although Saipan does have an extensive reef-bounded lagoon and adjacent coastal plain on its western side. The highest point is Mt. Manira, on Rota, which rises to 1,624 ft. (495 m). There are few perennial streams, except on the island of Rota, and even these latter emerge from caves not far above sea level at the bases of limestone escarpments. Native forest cover has been extensively disturbed on Rota, Tinian and Saipan, but remains relatively intact on some of the northern islands, particularly Pagan. The total land area of all islands in the CNMI combined is 183 miles<sup>2</sup> (475 kilometers<sup>2</sup>), with Rota (33 miles<sup>2</sup>), Tinian (39 miles<sup>2</sup>) and Saipan (44 miles<sup>2</sup>) accounting for the substantial majority.

### *Territory of Guam*

The island of Guam is also part of the Mariana Archipelago, and lies immediately south of the CNMI at 13° 27' N, 144° 47' E. It is the most populous of the Mariana Islands, with 162,000 residents, and as such the most populous U.S. Pacific Territory. Guam is of hybrid geological origin, consisting of volcanic uplands on the southern half and an elevated, cliff-bound limestone plateau in the north. The highest point on the island is Mt. Lamlam, in the southern highlands, which reaches 1,334 ft. (407 m). The coastlines of Guam are for the most part steeply dropping, although there are extensive beach areas on the western side at Tumon and Agana Bays, and a reef-fringed lagoon in the south at Merizo. In contrast to the CNMI, Guam has a large number of perennial streams, although all of these occur in the volcanic southern portion of the island. Native forest cover on Guam was extensively damaged during World War II but has regenerated in many areas of the north, which are under military control, while continuing to suffer regular damage from poorly controlled wildland fires in the south. Despite consisting of only a single island, the Territory of Guam has a total land area of 212 miles<sup>2</sup> (549 kilometers<sup>2</sup>), which is larger than the combined land area of all the islands within the CNMI.

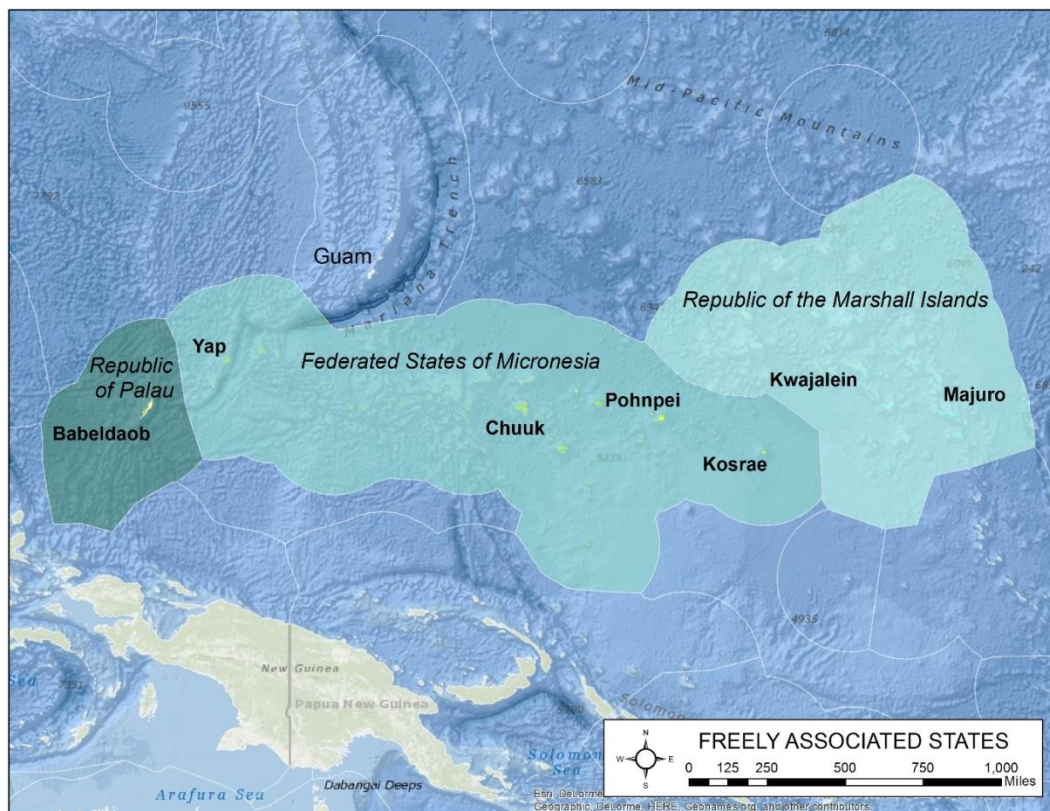
### *Territory of American Sāmoa*

In contrast to the two closely proximal Marianas jurisdictions above, American Sāmoa lies far to the southwest, below the equator. The jurisdiction consists of the eastern portion of the Samoan Archipelago, a hotspot chain that forms a series of progressively younger islands from west to east, although this age pattern has been to some degree confounded by late stage volcanism on the most western islands lying with independent Sāmoa. American Sāmoa extends from the high island of Tutuila at 14° 16' S, 168° 09' W eastward to Rose Atoll, at 14° 32' S, 168° 09' W, the latter being the most southerly point in the United States. The territory has approximately 56,000 residents, most of them on Tutuila, which is also the administrative center. American Sāmoa's highest point is reached on the small but high eastern island of Tau, where Mt. Lata rises to 3,159 ft. (963 m), the highest point in any of the U.S. Pacific Territories considered by this study. The coastlines of the high islands in American Sāmoa, consisting of Tutuila, Ofu, Olosega and Tau, are very steep, with few beaches, whereas Swains and Rose

Atolls, which are jurisdictionally part of the territory but geologically of separate origin, are low-lying, with extensive beaches and reef flats. The island of Tutuila has many perennial streams, whereas the remaining high islands have few, and the atolls none. Native forest cover is still extensive on all of the high islands in American Sāmoa, while the atolls by contrast have a much less diversified vegetative assemblage consisting of widespread Pacific species. The total land area of the all islands in American Sāmoa is only 76 square miles (197 km<sup>2</sup>), the least of the three U.S. Pacific Territories.

## Freely Associated States

The Republic of the Marshall Islands, Federated States of Micronesia, and Republic of Palau all lie in the tropical Pacific west of the International Date Line (Fig. 2). In combination, they occupy a roughly east-west zone between 3° 00' N and 14° 40' N, and span a wide range of longitude, from 171° 56' E to 131° 07' E, an aggregate distance of over 2,700 miles, which exceeds the width of the continental United States. Lying in tropical latitudes immediately above the equator, the three nations possess many ecological and meteorological similarities.



*Figure 2: Map of the Freely Associated States, showing the locations of major islands discussed in this assessment, and their Exclusive Economic Zone boundaries.*



## *Republic of the Marshall Islands*

The Republic of the Marshall Islands is the most easterly of the FAS, lying north of the equator in the Central Pacific Ocean (Fig. 2). The country consists of 29 atolls containing over 1,100 individual islands and islets, extending from Mili Atoll in the east at 6° 08' N, 171° 56' E to Ujelang Atoll in the west at 9° 49' N, 160° 54' E, and from Ebon Atoll in the south at 4° 37' N, 168° 43' E to Bokak Atoll in the north at 14° 40' N, 168° 57' E. The atolls form two groups, the Ralik Chain in the west and the Ratak Chain in the east. Some of these atolls enclose extensive lagoons, including Kwajalein in the Ralik Chain, the largest atoll on the planet, which has a lagoon 70 miles long. The population of approximately 75,000 is concentrated at the administrative center of Majuro on Majuro Atoll (home to 31,000 persons), and on the island of Ebai at Kwajalein Atoll, although all but 5 of the other atolls in the country have some degree of habitation. The islands of the RMI are entirely low-lying, with the highest natural elevation being a 33 foot (10 m) rise on Likeip Atoll, and the average elevation across all islands being 7 ft. (2.1 m). The coastlines are mostly sandy beaches or low limestone platforms topped by alluvium. There are no perennial streams or freshwater lakes in the RMI, although the interiors of some islands do support brackish ponds. Native forest cover consists of closed-canopy stands in the island interiors, often dominated by *Pisonia* and *Pandanus*, although this has been extensively disturbed in many areas. Due to the isolated position of the islands, overall species richness in terrestrial systems is relatively low, while by contrast the marine systems surrounding the atolls support coral reefs with high species diversity. Despite the large expanse of ocean within its national boundaries, which totals 750,000 miles<sup>2</sup> (1.9 million km<sup>2</sup>), the total land area of all islands in the RMI combined is only 70 miles<sup>2</sup> (181 km<sup>2</sup>), which is roughly equivalent to the area of Washington, D.C. Most of the emergent islands in the country are quite small, being at most one or two miles long and perhaps one-quarter mile in width.

## *Federated States of Micronesia*

The Federated States of Micronesia lie immediately to the west of the RMI and occupy a vast expanse of ocean extending across the Central and Western Pacific north of the equator (Fig. 2), from Kosrae in the east at 5° 19' N, 162° 58' E to Ngulu Atoll in the west at 8° 18' N, 137° 39' E, a distance of over 1,600 miles (2,700 km). The 607 islands of the FSM are distributed in an east-west band, partially along the northern margin of the Caroline tectonic plate, and include the high islands of Kosrae, Pohnpei, the four main islands of Yap (which contain metamorphic rocks older than any others in the FAS), and 16 rocky islands rising from the Chuuk Lagoon. In addition, there are over 500 low islets on the outlying atolls of the country. The population of approximately 106,000 is concentrated on the high islands, particularly at Chuuk, with nearly 55,000 inhabitants, and at the administrative center of Pohnpei, with 35,000 persons, although most other islands in the FSM are populated to some degree. The highest elevation in the FSM is Mt. Totolom on Pohnpei, which reaches 2,595 ft. (791 m), with other notable summits being Mt. Fenkol on Kosrae at 2,080 ft. (634 m), Mt. Winipat on Tol Island in the Chuuk Lagoon, which reaches 1,440 ft. (440 m), and Mt. Tabiwol on Yap which

rises to 584 ft. (178 m). There are numerous perennial streams on Pohnpei and Kosrae, as well as others in the Yap group and certain islands in the Chuuk Lagoon. Native forest cover is botanically diverse and still relatively intact at the highest elevations on the more mountainous islands, including upland cloud forests on Pohnpei and Kosrae, but has by contrast been significantly degraded in all lowland areas as well as at intermediate elevations on Pohnpei. Similar to the RMI, the coral reef systems in the FSM are extensive and species-rich. Overall, the FSM contains 750,000 miles<sup>2</sup> (1.9 million km<sup>2</sup>) of ocean within its boundaries, but only 271 miles<sup>2</sup> (702 km<sup>2</sup>) of land, the largest island being Pohnpei at 133 miles<sup>2</sup> (345 km<sup>2</sup>).

## *Republic of Palau*

The Republic of Palau lies in the Western Pacific to the southwest of Yap, being roughly equidistant from both the Philippines to the west and Indonesian New Guinea to the south (Fig. 2). The country contains a diverse mixture of island types including the high island of Babeldaob in the north which contains both volcanic and metamorphic rocks; numerous smaller but steeply elevated limestone islands with some intermixed volcanic rocks including Koror, Peleliu, Ngeruktabel and Mecherchar; as well as many dozens of uninhabited karst pinnacles in the Rock Islands area; the low-lying Kayangel Atoll in the far north; and a set of very isolated islands far to the southwest including Hatohobei Atoll and Tobi, which lie closer to Indonesia than to Babeldaob. These 250 islands are distributed in a roughly northeast to southwest alignment along the western margin of the Caroline tectonic plate, from the small islet on Velasco Reef in the north at 8° 10' N, 134° 28' E to Tobi in the south at 3° 00' N, 131° 07' E. The relatively modest population of approximately 21,000 is largely concentrated on the island of Koror, although the administrative center is at Melekeok on Babeldaob. The population is relatively aggregated, with only 9 of the approximately 200 islands in Palau being permanently inhabited. The highest elevation in Palau is Mt. Ngerchelchauus on Babeldaob, at 794 ft. (242 m). There are also numerous perennial streams on Babeldaob, many of which form attractive waterfalls, while the remaining islands, being porous limestone or sand, have few permanent watercourses, although flowing springs may be present. Native forests are dense and species-rich due to the close proximity to Asian and Melanesian source areas, and although forest cover is now heavily disturbed in many parts of Babeldaob, it remains by contrast relatively intact on the steep, rugged limestone islands. There are also extensive mangrove stands along the western coast of Babeldaob. Palau contains 179 miles<sup>2</sup> (465 km<sup>2</sup>) of land, giving it the largest land area of the three FAS nations, with 75 percent of this total represented by the large island of Babeldaob. Palau's maritime boundaries are still the subject of a dispute with Indonesia in the Tobi sector.

## Overview of Climate Change Drivers and Impacts

All of the U.S. Pacific Territories and FAS nations are generally subject to similar climate variables driven by the larger Pacific Ocean as a whole. Meteorologically, these

areas all lie within tropical latitudes, with consistently warm temperatures and high humidity.

The U.S. Pacific Territories have average annual rainfall exceeding 70 inches per year at all sites. Specifically, average daily air temperature is near 82°F in the Marianas (Johnson 2012), and 81°F at the airport on Tutuila in American Sāmoa (Izuka et al. 2005). Humidity on Guam ranges from 60-85% during the day and 85-100% at night (Johnson 2012), a pattern similar to that also prevailing in CNMI and American Sāmoa. Rainfall varies from 75-90 inches per year on Saipan in the CNMI (USGS 2002), 85-115 inches per year on Guam (Gingerich 2005), and 71-200 inches per year on Tutuila in American Sāmoa (Izuka et al. 2005). Prevailing winds are northeasterly in the CNMI and on Guam, becoming more southeasterly and variable during the wet season from July to December (Johnson 2012), while in American Sāmoa winds are predominantly southeasterly, becoming weaker and more variable from December to early April (Izuka et al. 2005). All three jurisdictions are also subject to periodic strong tropical cyclones, with notable events including Cyclone Val, which hit American Sāmoa in December 1991, destroying 65 percent of the residences in the territory; Typhoon Pongsona, which crossed Guam in December 2002, demolishing 1,300 houses; and Typhoon Soudelor, which moved over Saipan in the CNMI in early August 2015, resulting in widespread damage and the declaration of a federal emergency area by President Barack Obama.

The FAS nations have average annual rainfall exceeding 50 inches per year at all sites. Specifically, average daily air temperatures in all the FAS run between 81 and 83°F with an average relative humidity near 82% based on data from the National Weather Service and Australian Bureau of Meteorology (2011). Daily and annual temperature ranges are small and largely correlated with the temperature of the surrounding ocean. Rainfall averages 90 inches per year at Kwajalein Atoll in the RMI, 139 inches at Chuuk and 120 inches at Yap in the FSM, and 148 inches at Koror in Palau, although there is a distinct north-south gradient of precipitation in the Marshall Islands with the most northerly atolls receiving less than 50 inches per year and the most southerly atolls over 100 inches. Prevailing winds are southeasterly in the Marshall Islands, becoming more northeasterly and variable during the wet season from May to November (Australian Bureau of Meteorology 2011a), and a similar pattern is also seen in the FSM (Australian Bureau of Meteorology 2011b). Further to the west, Palau has predominantly northeasterly winds from December to March, then receives heavy rainfall from the West Pacific Monsoon in July and August when the winds become more southerly (Australian Bureau of Meteorology 2011c). All three FAS nations are also subject to periodic strong tropical cyclones, with notable events including the un-named storm that hit Majuro in 1918, drowning nearly one-fifth of the population (Hess et al. 2015); Cyclone Maysak, which passed through the FSM in March 2015, causing extensive damage on Chuuk and almost total destruction of infrastructure on Ulithi and Fais Atolls in Yap state, from which these islands are still recovering; and Typhoon Haiyan, which passed through Palau in November 2015 as the strongest storm ever recorded to have hit that nation, destroying all housing on Kayangel Atoll in the north of the country.

The islands of the Pacific, despite their remote locations, have long histories of human settlement and have been subject to many direct human impacts including shoreline development and hardening; landscape transformation for urban, agricultural, and recreational uses; the introduction of invasive species in terrestrial, freshwater, and marine environments; and overfishing. Indirectly, the impacts of modern industrial society are now translated to these islands via climate change effects in the form of rising and warming seas, increasing air temperatures, potential changes in precipitation and wave regimes, and changing ocean chemistry. Many of these threats are well delineated on a broad Pacific scale, but determining how they will manifest themselves locally within any given archipelagic or ocean sector is still difficult based on current climate models, and validation is hindered by inadequate local instrumentation networks. Despite these constraints, the overall scientific consensus is that the atmosphere and the ocean will continue to warm over the next 50 – 100 years, sea level will rise due to thermal expansion of water and melting of land-based ice sheets, ocean chemistry will change due to declining pH as more CO<sub>2</sub> is absorbed, and circulation patterns in both the oceans and atmosphere are likely to change at local, regional, and global scales (Bindoff et al. 2007; Gattuso et al. 2015). Storm intensity may also increase, and extreme flood and drought events may become more frequent (IPCC 2014). All of these aspects of climate change will impact the ecological and social systems of the Pacific Islands, including the FAS nations and U.S. Pacific Territories considered here.

In support of the larger National Climate Assessment effort, a Pacific Islands Regional Climate Assessment (PIRCA) was produced in 2012 (Keener et al. 2012). This document incorporated the contributions of nearly 100 independent experts and evaluated the state of knowledge related to climate drivers, impacts, and adaptive capacity within three sub-regions of the Pacific: (1) the Western North Pacific (which includes all of the FAS nations considered here, as well as the Commonwealth of the Northern Mariana Islands and the Territory of Guam); (2) the Central North Pacific (containing Hawai'i); and (3) the Central South Pacific (which includes American Sāmoa). Within each of these sub-regions, three main focal areas were evaluated: (1) fresh water and drought; (2) sea-level rise and coastal inundation; and (3) aquatic and terrestrial ecosystems. The paragraphs below summarize the findings, and readers wishing further detail should consult the PIRCA which treats these subjects in far greater depth (<https://pirca.org/>).

Depending on the resource concentration pathway (RCP) model employed, carbon dioxide (CO<sub>2</sub>) concentrations are predicted to reach levels between 420 – 935 parts per million (ppm) by the end of the century (IPCC 2014). As of March 2017 atmospheric CO<sub>2</sub> stood at 407 ppm, an increase of over 87 ppm from when standardized readings first began to be collected in the late 1950s at the Mauna Loa Observatory in Hawai'i. Over half of this increased carbon in the atmosphere, produced largely by human societies over the past 250 years, is estimated to have been taken up by the oceans (Royal Society 2005; Candell et al. 2007). This additional dissolved CO<sub>2</sub> changes the chemistry of the oceans and is predicted to decrease the average ocean pH by 0.14 – 0.5 points compared with pre-industrial levels (Caldiera & Wickett 2005; Royal Society

2005; Gattuso et al. 2015). If this hypothesis proves correct, the ocean chemistry will trend more acidic than at any time in the past 400,000 years (Feely et al. 2004). As ocean temperature and atmospheric CO<sub>2</sub> concentrations change, there is also an associated change in the amount of carbon sequestered in the ocean in the form of carbonic acids (Feely et al. 2009). A decrease in ocean pH causes a change in the aragonite saturation point, making it more difficult for many organisms, including corals, crustose coralline algae, mollusks, and zooplankton, to incorporate calcium carbonate (CaCO<sub>3</sub>) into their shells and skeletons (Wootton et al. 2008); although there has been recent evidence to suggest that at least some scleractinian corals have the ability to compensate for such changes through pH up-regulation (McCulloch et al. 2012). Current models and observations both indicate that ocean acidification proceeds more rapidly at depth and in colder waters, but its effects will eventually work their way into the upper ocean layers inhabited by shallow-water reef-building corals, a trend that already appears evident in the northern Pacific (Byrne et al. 2010). Overall, the available evidence from the principles of thermodynamics, the geologic record, and the evolutionary pathways of CaCO<sub>3</sub> secreting organisms indicates that as CaCO<sub>3</sub> saturation state decreases, calcification rates will correspondingly decrease, and that carbonate dissolution rates will increase, a trend that presents a clear long-term threat to the integrity of coral reef systems currently providing natural defenses for Pacific Island coastlines, including those of the U.S. Pacific Territories and FAS nations.

The accumulation of CO<sub>2</sub> and other greenhouse gases (GHGs) in the atmosphere is also leading to warming of both the atmosphere and the oceans due to the enhanced greenhouse effect. Temperature projections from both the Intergovernmental Panel on Climate Change's (IPCC) Fourth Assessment Report (Parry et al. 2007) and the second National Climate Assessment (U.S. Global Change Research Program 2014) indicate continued warming into the foreseeable future, with global average surface temperature projected to increase 1.2 – 6.4°C by 2100, with best recent estimates placing the range between 1.2 – 3.2°C (IPCC 2104; Gattuso et al. 2015). Average tropical sea surface temperature (SST) is expected to increase by 50–80% of the average rate of atmospheric change (Lough 2007). Therefore, average sea temperatures in the vicinity of coral reefs will probably increase by several degrees Celsius over the course of this century (Guinotte et al. 2003). Such increases in ocean heat content are key drivers of increasingly frequent coral bleaching events that further threaten to compromise reef integrity (Maynard et al. 2015). Increases in atmospheric heat content are by contrast related to changes in atmospheric circulation patterns that result in more prolonged periods of drought and more acutely episodic precipitation events, a trend already observed in Hawai'i (Chu et al. 2010) where long-term stream and precipitation gauging records depict clear declines in precipitation and stream base flow over the past century (Oki 2004). Such changes have also been noted more anecdotally by residents of the Marianas and Sāmoa.

Increasing ocean and atmospheric heat content is also driving global sea level rise, both through thermal expansion of ocean waters and by melting of polar ice sheets. Average sea level has risen nearly 20 cm since 1870 and is predicted to rise at least another 30 – 60 cm by 2100 (Church & White 2006; IPCC 2104; Ritz et al. 2015; Gattuso et al.

2015). Such estimates are to some degree conservative, and sea level rise will be far greater if melting of ice sheets and glaciers accelerates in a non-linear fashion as has been suggested by some recent studies (Velicogna & Wahr 2006; Bamber & Aspinall 2013). At the present time global sea level is rising steadily at 3 mm/year on average, but this rate is not uniform around the globe (Nicholls & Cazenave 2010). In Hawai'i, the average rate of sea level rise has been 1.46 mm/year since 1900, which is only half the global rate (although similar to or in excess of trends seen on the West Coast of North America). By contrast, there has been a rapid rise in sea level in the Western Tropical Pacific, surrounding the U.S. Pacific Territories, from 1995 onward, in some cases by up to 10 mm/year (Merrifield et al. 2009; Merrifield 2011). This anomalous rise correlates well with the onset of stronger winds and sea surface temperature (SST) cooling in the Eastern Pacific (Firing et al. 2004). These sea level trends have been largely deduced from tide gauge records, which have been recently cross-validated with satellite altimetry. The data from both tide gauges and satellites correlate well, indicating that the tide gauge records are accurate for the pre-satellite time series, with such gauging records covering 69 and 47 year spans respectively at Kwajalein and Majuro in the RMI, 46 years at Malakal in Palau, 41 years at Pohnpei in the FSM, 67 years in American Sāmoa (Pago Pago) and Guam (Apra Harbor), and 37 years in CNMI (Saipan). Given these trends, there is a high likelihood of inundation for lower lying Pacific islands and the near-certainty of increased coastal erosion on all Pacific islands over the next 50 – 100 years (Nicholls et al. 2011). Other impacts of rising sea levels include loss of coastal wetlands; increased inland incursion of storm surge; loss of habitat, property, and cultural resources; and degraded surface and groundwater quality, in particular saline intrusion into the relatively limited freshwater lenses underlying atolls. The numerous low atoll islets of the RMI and FSM are particularly vulnerable to such climate-mediated inundation, and concerns over these steadily escalating impacts have been consistently voiced by their governments and populace in recent years.

Global circulation models also produce the interesting prediction that under a global warming regime fewer tropical storms will form, due to increased propensity for wind shear in high SST environments (Nolan & Rappin 2008), but those storms which do form will be more intense (Bengtsson et al. 2007). Modeling of the hydrological cycle under a regime of warming climate results in a prediction of a 27% increase in atmospheric water vapor in the tropics over the next 100 years. Perhaps counter-intuitively, because this is also coupled with a longer residence time of water in the atmosphere, this increase in atmospheric water vapor does not result in a marked increase in precipitation; instead, the moister atmosphere simply becomes capable of retaining greater heat content thereby spawning stronger storms (Bengtsson et al. 2007). Global circulation models therefore predict an increase in the proportion of extreme weather events in the most severe categories (Webster et al. 2005; IPCC 2014), which may cause significant shoreline loss or damage due to erosion by waves, especially when such effects play out on a steadily rising base sea level. Atolls are particularly vulnerable to such future trends and may be lost to wave action long before sea level rise physically overtops them, because once sea level rises above the level of the carbonate platform on which the atoll is formed, waves are able to directly attack the overlying alluvial cap which is structurally weaker and more vulnerable. The point at

which this transition occurs has been dubbed the “crossover point” (Dickinson 2009) and may be reached at many Pacific atolls as early as 2050. This is a vulnerability that is particularly evident for the RMI, which is composed entirely of atolls, and also for the FSM, which contains over 500 low islands among its far-flung atolls. Even high islands and their infrastructure, however, are acutely vulnerable to damages caused by the high winds, heavy rains, and strong waves associated with strong tropical cyclones, as previously cited examples have illustrated.

In regard to terrestrial systems, the intensity and frequency of days of extreme heat are projected with high confidence to increase over the course of the 21st century for the entire Pacific Islands Region. Based on historic data from 1955-2015, annual average air temperature has risen by 0.22°F per decade at Majuro and by 0.36°F per decade at Kwajalein in the RMI (Australian Bureau of Meteorology 2011a), by 0.22°F per decade at Pohnpei in the FSM (Australian Bureau of Meteorology 2011b), and by 0.20°F per decade at Koror in Palau (Australian Bureau of Meteorology 2011c). CMIP3 models (coupled ocean-atmosphere model simulations of 20th - 22nd century climate) under several GHG emissions scenarios lead to projections that annual surface air temperatures (SATs) for the Central South Pacific sub-region will range from 1.1 to 1.3°F higher than 1971–2000 values by 2030, 1.9 to 2.5°F higher by 2055, and 2.5 to 4.8°F higher by 2090 (Australian Bureau of Meteorology & CSIRO, 2011). Warming trends are similarly projected for the Western North Pacific, with annual SATs for both scenarios ranging from 1.1 to 1.3°F higher by 2030, 1.9 to 2.6°F higher by 2055, and 2.7 to 5.1°F higher by 2090 (Australian Bureau of Meteorology & CSIRO 2011). Global circulation models under several emissions scenarios lead to projections that annual surface air temperatures will range from 1.1 to 1.3°F higher by 2030, 1.9 to 2.6°F higher by 2055, and 2.7 to 5.1°F higher by 2090 (Australian Bureau of Meteorology & CSIRO 2011).

For precipitation, predictions of future trends are less well constrained than those for mean annual temperature. Based on historic data from 1955-2015, annual average rainfall at Majuro in the RMI has gradually decreased, although total wet season rainfall shows no trend, indicating more sharply defined seasonality (Australian Bureau of Meteorology 2011a), a pattern also seen at Pohnpei in the FSM (Australian Bureau of Meteorology 2011b). By contrast, no clear rainfall trends, either increasing or decreasing, can be seen across the same time span in Palau (Australian Bureau of Meteorology 2011c). Initial approaches have been taken to conduct climate model downscaling for the Marianas and American Sāmoa; these efforts are in early stages and will require multiple iterations over time.

No local climate model downscaling has yet been attempted for the FAS nations, and in some cases, such as the RMI, the islands are so low and of such small spatial extent that their climate signatures are not detectable at currently feasible modelling scales. Any projections therefore have considerable uncertainty which can only be reduced by future improvements in regional modelling.

The projected changes in ocean and atmospheric temperature, precipitation patterns,



tropical-storm intensity, ocean chemistry, and sea-level rise over the coming decades all have serious implications for human communities and natural resources in the FAS nations and U.S. Pacific Territories (Gattuso et al. 2015). The warming projected during the next 50 to 100 years will create heat-related stress for human communities, agricultural systems, transportation and other infrastructure, and increase extinction risk for native plant and animal species (Urban 2015). Seasonal changes in precipitation patterns, coupled with increased temperature and evapotranspiration, have the potential for widespread and significant effects on water resources and agriculture, which will create both societal and ecological problems. Based on historical and projected patterns of land-cover change in this region, impacts from invasive species and human development are likely to amplify the adverse effects of climate change on habitats and native species.

Inundation due to rising seas will become a chronic problem, forcing relocation or defense of infrastructure. As noted in the PIRCA (Keener et al. 2012): “In general, the proximity of human settlements and major infrastructure to the ocean increases the vulnerability of all Pacific Islands. Almost without exception, international airports are sited on or within one to two miles of the coast, and the main (and often only) road network runs along the coastline (Walker & Barrie 2006). Because Pacific Islands are almost entirely dependent on imported food, fuel, and material (Austin et al. 2011), the vulnerability of ports and airports to incremental increases in sea level and to extreme events, especially tropical cyclones, is of great concern.” The recent experience with Hurricane Sandy’s impact on New York City has demonstrated that this is not simply a Pacific problem; across the world a considerable amount of current infrastructure lies at elevations that are vulnerable even to current sea states and weather conditions, and these vulnerabilities will increase as the climate trends discussed above play out across the Pacific Islands and the world as a whole. The capacity to adapt to such future conditions is therefore of great importance, and is evaluated below in turn for the CNMI, Guam, American Sāmoa, RMI, FSM, and Palau. An excellent overall review of disaster risk management and climate change adaptation planning in the Pacific as a whole, with discussion of associated policy development, has been produced by the United Nations International Strategy for Disaster Reduction (UNISDR 2012), and provides useful regional context.

## Project and Research Design

This report was developed at the request of the United States Office of Insular Affairs (OIA), which asked the Pacific Islands Climate Change Cooperative to engage key cross-sector decision makers and stakeholders within each U.S. Pacific Islands jurisdiction with the objectives to identify and articulate near-term priorities for funding as well as a process for developing long-term Climate Change Adaptation Plan. The desired outcomes of this technical assistance project were to increase jurisdiction’s capacity to (1) understand the complexities of climate change adaptation planning, vulnerability assessments, and climate adaptation plan implementation; (2) be better prepared to complete a Climate Change Adaptation Plan application for funding



purposes; and (3) be able to prioritize existing climate change initiatives and plan development activities for funding purposes. It was envisioned that the project's final outputs would aid each jurisdiction additionally in identifying critical gaps to be filled by further technical assistance and funding requests to governmental and non-governmental organizations.

In November 2015, the project team was assembled and consisted of: Deanna Spooner, PICCC Coordinator; Stanton Enomoto, PICCC Cultural Adaptation Coordinator; Whitney Peterson, PICCC Communications Manager; Dr. Dan Polhemus, USFWS employee on detail to the PICCC; Meredith Speicher, National Park Service; and Meghan Gombos, owner of Sea Change Consulting LLC. The team (1) designed the framework for the analysis of existing climate-related activities and priorities as well as current institutional frameworks for implementation within each jurisdiction, (2) designed a process for in-person engagement of Territories, and (3) developed a pre-workshop questionnaire. The team also established regular communications with the climate change points of contact in the Territories: Fran Castro, Director, Division of Coastal Resources Management, CNMI Bureau of Environmental and Coastal Quality; Tricee Limtiaco Special Assistant to the Governor, Office of the Governor of Guam; and Dr. Ruth Matagi-Tofiga, Director, Department of Marine and Wildlife Resource, American Sāmoa. At the onset of the project, PICCC staff met with representatives from federally-funded climate programs in the region (e.g., the Pacific Islands Climate Science Center, NOAA, Pacific Regional Integrated Sciences Assessments) and other partners to identify additional technical support capability and/or funding opportunities in addition to OIA grant funding.

Beginning in December 2015, PICCC detailee Dr. Dan Polhemus conducted an assessment of existing climate change policies, strategies, and activities in the U.S. Affiliated Pacific Islands. Meghan Gombos, Deanna Spooner, Stanton Enomoto, and Whitney Peterson conducted phone interviews with key actors to better understand the “planning culture” and potential institutional/political barriers to adaptation planning and implementation. The overall goal of the assessment led and written by Polhemus was to identify gaps in current climate change adaptation capacity at the institutional level, which could be addressed in part through strategic funding opportunities.

In early 2016, workshops were held in CNMI (January 21-22, 2016), Guam (January 25-27, 2016), and American Sāmoa (February 3-5, 2016). The objectives for these workshops were to (1) raise awareness of global climate change, regional climate projections, and potential impacts, (2) identify existing climate change adaptation initiatives that should continue or be expanded by sector or cross sector initiatives, (3) identify and prioritize gaps in adaptation planning and implementation as well as jurisdictional-appropriate ways to progress climate change adaptation (including information/capacity needs), and (4) identify funding needs to fill priority gaps. In each of the jurisdictions, a local climate change point of contact developed the list of participants for the workshops and acted as the liaison between them and the project team in regard to pre- and post-workshop coordination. Workshops in CNMI and Guam were facilitated by Meghan Gombos, Whitney Peterson, and Deanna Spooner; and in American Sāmoa

by Deanna Spooner and Whitney Peterson. At each workshop, participants were asked to identify the social, economic, and natural resource impacts from four climate hazards: (1) changes in precipitation, (2) sea level rise, (3) air temperature increase, and (4) sea surface temperature rise and ocean acidification. Then each participant was asked to prioritize these impacts from an agency and personal perspective. After the agencies' impacts of most concern were identified, each agency was also asked to answer the following questions:

- *What target resources/assets is your agency most concerned about?*
- *What impacts from climate change on these target resources/assets is your agency most concerned about?*
- *Are there any specific areas that you are more concerned about than others? Why?*

Identifying these impacts and target resources/assets of concern laid the foundation for developing long-term climate change adaptation objectives, discussing the current institutional capacity to meet these objectives, and then articulating a list of potential short-term projects that would move the jurisdiction toward the objectives. Both small and large group exercises further refined and prioritized these potential projects, which the project team then entered into a matrix that included the project description, sector or focal area, budget, ranking criteria, and OIA Technical Assistance Program (TAP) grant proposal category.

At the end of each workshop the project team assisted the participants in developing a timeline for drafting of their TAP funding proposal(s). At the conclusion of the workshops, team members generated written reports for each jurisdiction summarizing: (1) priority activities (current) for consideration of continued funding; (2) a process and timeline for developing a cross-sectoral Climate Change Adaptation Plan, with discreet, prioritized activities that funders might support; and (3) scientific and other technical gaps that the PICSC and other research partners may fill in the near-term. The team scheduled follow-up teleconferences with all three Territories and provided feedback on draft proposals for CNMI and American Sāmoa.

All three U.S. Pacific Territories submitted Technical Assistant Program grant proposals to OIA. By the end of the 2016 fiscal year, OIA had announced US\$ 1.5 million in funding to Guam, US\$ 1.4 million in funding to CNMI, and US\$ 1.8 million to American Sāmoa under its technical assistance program (additional grants were made under OIA's infrastructure and energy programs). Large portions of these grants were designated for climate change adaptation planning and implementation projects, many of which were identified during the workshops facilitated as part of this initiative.

## Report Structure

In this report, the climate change adaptation capacity assessments for each of the U.S. Pacific Territories and FAS nations are organized into the following categories,

- **Authorities:** key legal authorities applicable to climate change adaptation;
- **Institutions:** the capacity to utilize such authorities as reflected by the structure of the government executive branches;
- **Actions:** the implementation of their authorities as indicated by recent governmental actions focused on climate change; and
- **Future Needs:** future needs in regard to studies or capacity building that would aid in climate change adaptation efforts.

The reviews of authorities, which are arranged in chronological order with the mostly recently passed laws listed first, should not be considered exhaustive given the complex nature of each jurisdiction's legal code. In particular, this review has been conducted at the level of statute or executive order only, and does not address administrative rules implementing individual statutes.

In the final chapter of this report, major findings from the U.S. Pacific Territories and FAS nations are compared and contrasted, and opportunities for engagement on climate change resiliency work are identified in the fields of zoning and land-use management, forest and watershed management, coral reef and marine systems management, outreach and education, renewable energy and energy efficiency, and food security. It is hoped this report provides useful information on ways to improve collaboration and build increased climate change resiliency in the Pacific.

## 2. Commonwealth of the Northern Mariana Islands

### Authorities<sup>1</sup>

- 1) *Governor's Directive No. 2014-01* (2014) – This directive acknowledges the threats posed by climate change to the CNMI, and instructs all executive branch divisions, offices, government corporations, boards, and commissions to participate in meetings of the Climate Change Working Group. This Directive does not specify any desired outcomes in terms of documents or policies nor provide timelines for action.
- 2) *Saipan Zoning Law of 2013* (SLL 18-5; codified Title 10 CMC Ch. 5, Art. 1) – This law regulates any land development undertaken on Saipan and immediately proximal small islands, with its provisions implemented by the CNMI Commonwealth Zoning Board (CZB). The law notes that “In the absence of an adopted land-use plan for Saipan, the Law shall provide land-use guidance,” but does not discuss climate change impacts or criteria. The law directs the CZB to recognize “Areas of Particular Concern” as designated under the CNMI Coastal Resources Management Act as overlay zones, and gives the Coastal Resources Management Office the authority to determine appropriate shoreline setbacks for new construction within 150 feet of the shoreline, with these restrictions apparently binding on the CMB. The law also gives the CZB regulatory powers over the siting and design of wind power facilities on Saipan.
- 3) *Public Lands Act of 2006* (PL 15-2) – This law transferred oversight of public lands in the CNMI from the formerly autonomous Marianas Public Lands Authority to the Executive Branch of the Commonwealth government, specifically the Department of Public Lands (DPL). It also required the development of a comprehensive land-use plan. Among the specified objectives and components of the plan is the following: “Identify lands that need special handling due to the presence of hazardous materials, dangerous structures, or other special circumstances.” This appears to allow discretion for special zoning in relation to climate change vulnerabilities. The most recent version of the Land-Use Plan thus mandated was completed in January 2007. It does not make specific mention of climate change considerations. A request for proposals (RFP) to update the current plan was issued in July 2015. This RFP sets forth criteria to be considered in recommending uses of public lands, including the language quoted above, but does not make specific reference to climate change impacts.

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<sup>1</sup> Statutory authorities in CNMI are codified under Chapters of the Commonwealth Code (CMC) and are referred to in this report by their CMC numbers. Executive orders have a chronological numbering series.

- 4) *Executive Directive 235 of 2003* – This directive established a CNMI Coral Reef Initiative Program (CRIP) under the Office of the Governor to coordinate interagency activities in regard to coral reef issues. The CRIP was specifically tasked with protecting coral reefs, and implementing activities related to the Local Action Strategies under the NOAA Coral Program. The CRIP was subsequently moved into the Division of Environmental Quality, which now resides in the Bureau of Environmental and Coastal Quality.
- 5) *Public Lands and Natural Resources Administration Act of 1997* (PL 10-57; codified Title 1 CMC Ch. 13) – This law established a Board of Public Lands and a Department of Lands and Natural Resources (DLNR) containing a Division of Fish and Wildlife, a Division of Zoning, a Division of Land Registration, and a Division of Public Lands by repealing and re-enacting provisions of the original Executive Branch Organization Act (PL 1-8). Some of the divisional duties regarding public lands and zoning were subsequently assigned to other Executive Branch entities (see above). The law does not specifically mention climate change but does confer to the DLNR broad authority for protection and enhancement of natural resources, including in the marine environment.
- 6) *Coastal Resources Management Act of 1983* (PL 3-47; codified Title 1 CMC Ch. 1 and 2) – This law created the CNMI Coastal Resources Management Office (CRM) with the power to promulgate regulations in the coastal zone (see capacity discussion below). The purpose of the chapter is to govern implementation of CNMI activities under the NOAA Coastal Resources Management Program, and its provisions are explicitly consistent with the federal Coastal Zone Management Act. Significantly, the law states that CRM regulations shall supersede zoning authority of any other CNMI agency from the median high tide line to 150 feet inland. The CRM office has had a complicated bureaucratic history, being placed within the Office of the Governor under the original Act, and then subsequently transferred in 1994 by Executive Order 94-3 to the Department of Lands and Natural Resources. It was then transferred back to the Office of the Governor once again in 1999 through statute via PL 11-109, before finally being placed within the Bureau of Environmental and Coastal Quality, also within the Office of the Governor, in 2013 through Executive Order 2013-24.
- 7) *CNMI Historic Preservation Act of 1982* (PL 3-39) – This law establishes an Historic Preservation Office (HPO) in the Department of Community and Cultural Affairs, to carry out local implementation of the National Historic Preservation Act of 1966, and to survey, inventory, and manage cultural and historical resources.

## Institutions

The CNMI executive branch departments with responsibilities related to climate change are as follows:

- 1) *CNMI Office of the Governor* – This office has the authority to issue executive orders related to climate change matters, such as setting up working groups or task forces. The Office of the Governor also oversees the following offices that have a nexus to climate change issues:
  - a. *CNMI Commonwealth Zoning Board (CZB)* – This 7-member body is responsible for regulating land-uses and developments on the island of Saipan and the immediately proximal small islands. In its most recent annual report, for 2014, the Board notes that it is actively participating in the CNMI Climate Change Working Group organized by the Bureau of Environmental and Coastal Quality (see further discussion below).
  - b. *CNMI Bureau of Environmental and Coastal Quality (BECQ)* – This Bureau was established in November 2013 by Executive Order 2013-24, with the Division of Environmental Quality (DEQ) and the Division of Coastal Resources Management Office (CRM) placed within it.
    - i. *CNMI Division of Coastal Resources Management Office (CRM)* – The Coastal Resources Management Act vests all local permitting authority for developments in the coastal zone with the CRM. Although climate change is not specifically mentioned in its authorizing statute, the CRM is responsible for determining “...if the proposed project provides adequate space between the project and identified hazardous lands, including floodplains, erosion-prone areas, storm wave inundation areas...” and designating appropriate setbacks, which allows the CRM broad discretion in dealing with future coastal development. The law also allows the CRM to designate Areas of Particular Concern, based on the presence of coral reefs, wetlands, mangroves, sensitive shorelines, or coastal hazards. In regard to the latter, the CRM is directed to take into account vulnerability to the effects of high winds, wave energy, flooding, and storm surge, all of which may come into play under future climate change regimes. These broad authorities, and their skillsets in natural resource management and GIS technologies, make CRM a key local agency in regard to climate change adaptation within the CNMI.
    - ii. *CNMI Division of Environmental Quality (DEQ)* – This division has regulatory oversight of overall water quality issues, including drinking water supplies and wastewater, as well as pesticides and toxic waste management. The division’s Water Quality Surveillance and Non-point Source Branch also houses the CNMI Marine Monitoring and Coral Reef Program, which has responsibility for investigating the extent and severity of coral bleaching events.
- 2) *CNMI Department of Public Lands (DPL)* – This department serves as the trustee for public lands in the CNMI, with a mission to develop and implement a strategic land-use plan. Climate change considerations, particularly vulnerability of coastal areas to

future inundation from rising sea levels, is an element that could be incorporated into such a plan.

- 3) *CNMI Department of Commerce (DOC)* – The mission of this department is to advance economic activity in the CNMI by promoting a favorable business environment, attracting private capital investment and research grants, and promoting job creation. Although the CNMI Department of Commerce does not possess authorities that would give it any direct involvement in climate change adaptation or mitigation, it does regulate insurance businesses and claims in the CNMI and could therefore have future exposure as a regulator or mediator in relation to claims for losses attributed to climate-mediated causes.
- 4) *CNMI Department of Lands and Natural Resources (DLNR)* – This agency was re-authorized and re-organized by statute PL 10-57 in 1997 and has oversight of natural resources in the public domain. Specifically, it is charged with protection and enhancement of natural resources, conservation of forests, and administering agricultural programs, among other duties. With room to grow in staffing and expertise, the DLNR would be a logical place for GIS capacity-building focused on analysis of terrestrial ecosystems and watersheds.
  - a. *CNMI Division of Fish and Wildlife (DFW)* – Also established by PL 10-57, and housed within DLNR, the DFW is the primary steward of native plant and animal diversity in the CNMI and is the successor to a previous Marine Resources Division. It is responsible for enforcement of fish and game laws and oversight of the federal Endangered Species Act.
- 5) *CNMI Department of Public Works (DPW)* – This agency is responsible for road construction and maintenance, and siting of future roads, as approved by the CZB, DPL, and/or CRM where appropriate (see discussions above).
- 6) *Commonwealth Ports Authority (CPA)* – This agency was established by statute PL 2-48, is overseen by a 7-member board appointed by the Governor, and has responsibility for managing and operating all airports and seaports throughout the CNMI. As such, it has oversight responsibility for key infrastructure that could be affected by future climate change impacts, particularly the harbor at Tinian.
- 7) *Department of Community and Cultural Affairs (CCA)* – This agency contains the Division of Historic Preservation (HPO), established by statute in 1982, which is charged with identifying, protecting, and appropriately developing cultural and historic resources and educating the public concerning their value. Among other duties, the HPO is mandated to “protect, preserve, and regulate access to places, artifacts and things of historical significance” which would appear to give it authority to assess and address climate-mediated threats to cultural resources, particularly sites that might lie in the coastal zones and be threatened by rising sea levels. Such authority could interlock with that of the CRM office in the BECQ (see above), which

has authority to designate Areas of Special Concern in the coastal zone based on natural resource criteria.

- 8) *Commonwealth Utilities Corporation (CUC)* – The CUC oversees operation, siting, and maintenance of freshwater and wastewater utility infrastructure, as approved by the CZB, DPL, and/or CRM where appropriate (see discussions above).
- 9) *Northern Marianas College (NMC)* – Established as a land grant institution by congress in 1972, the Northern Marianas College is the only institution of higher learning in the CNMI. The NMC's Cooperative Research Extension and Education Service (CREES) program may be a potential venue to develop climate change adaptation strategies and planning for the agricultural sector.

## Actions

- 1) *Vulnerability and Resilience Assessments of Coral Reef Resources (2015)* – These assessments used funding from NOAA via BECQ to evaluate and rank 78 coral reef sites on Saipan, Tinian, Aguijan, and Rota for vulnerability and resilience to climate change (Maynard et al. 2015). This is the most comprehensive vulnerability assessment of its kind yet undertaken in any of the three U.S. Pacific Territories.
- 2) *CNMI State Flood Hazard Mitigation Plan (2015)* – The CNMI State Flood Hazard Mitigation Plan was recently updated to include climate change vulnerabilities.
- 3) *Rota and Tinian Vulnerability Assessment (2015)* – This study used funding from NOAA via BECQ to match community recollections of past ocean and meteorological events to historical climate and ocean data. This synthesis is being used to identify future research needs.
- 4) *Saipan Vulnerability Assessment of Coastal Resources and Infrastructure (2014)* – This study also used funding from NOAA via BECQ to assess vulnerability of communities and resources to sea level rise, with the results feeding into future adaptation planning for infrastructure, conservation, and tourism. Information on resources of concern was gathered through a community-based assessment, then categorized and mapped. Sea level rise scenarios were then added to these maps to highlight resources at risk (Greene & Skeelee 2014).
- 5) *Climate Change Task Force and Working Group (2012)* – This task force was established in July 2012 to assess climate vulnerability in the CNMI, with representation from 33 agencies, NGOs, and community groups. The group is overseen by a Planning Committee and has technical subgroups dealing with ecological data, socio-economic data, and infrastructure. The Climate Change Working Group has been supported to date primarily through external NOAA Office of Coastal Resources Management funding through BECQ. The group helped to



support a workshop on climate change adaptation in March 2013 in collaboration with Micronesia Conservation Trust and the Pacific Islands Managed and Protected Area Community (PIMPAC).

- 6) *Garapan Conservation Action Plan* – This plan concentrates on the Garapan area, the commercial hub of Saipan. As of 2013 it was in the late draft stage.

In addition to the above local efforts, the CNMI is also a partner in several regional initiatives, including:

- 7) *The Micronesia Challenge* – The CNMI has actively engaged in the Micronesia Challenge through both the DLNR and BECQ at various programmatic levels. In addition, the CNMI has committed to making a \$2 million donation to the Micronesia Challenge endowment.

## Future Needs

- 1) *Climate Change Adaptation Plan* – Local resource managers in CNMI have noted to PICCCC that addressing “adaptation planning” does not engage people in the same way as working towards “resiliency” does, so BECQ has transitioned to talking about resilience. Overall, the CNMI is in need of both a climate change EO (similar to those already promulgated in American Sāmoa or Guam) and an overall climate change action plan to provide a guiding document for executive branch agencies. It is worth noting that CNMI involvement with the federal sphere on climate issues has been almost entirely via NOAA (Office of Ocean and Coastal Resource Management’s Coral Reef Conservation Program and Coastal Zone Management Program). Engagement with DOI-OIA could therefore be a useful expansion of the CNMI portfolio. The existing Saipan vulnerability assessment and the coral reef resilience study provide good foundational documents on which to base proposals for further assistance, particularly in regard to islands other than Saipan and sectors other than coastal zone management.
- 2) *Land-Use Management Plan* – There is a patchwork of oversight agencies for land-use regulation in the CNMI, including the CZB (Saipan), DPL (public lands), and CRM (coastal zone) which have participated in the local Climate Change Task Force. Moving forward, climate change adaptation efforts will continue to need to be coordinated across these agencies. There is a need for climate change vulnerability considerations to be incorporated into the land-use management plans mandated by the Public Lands Act of 2006 and the Saipan Zoning Law of 2013. This could be accomplished through collaborations with the Commonwealth Zoning Board (CZB) and/or the CNMI Department of Public Lands

### 3. Territory of Guam

#### Authorities<sup>2</sup>

- 1) *Executive Order 2015-08* (2015) – Establishes a climate change adaptation policy; directs creation of a Climate Change Task Force; directs each agency on the Task Force to cooperate in a comprehensive vulnerability assessment in relation to the scope of its particular mandates and report on the results within one year (i.e., April 2016). The Executive Order 2015-08 also specifies that the Climate Change Task Force shall identify funding sources, such as federal grants, to support strategic planning, adaptation initiatives, and vulnerability assessments.
- 2) *Guam Office of Technology* (2013) (Title 2 GCA Ch. 20) – Creates an Office of Technology within the Department of Administration (a.k.a., Office of the Governor), in order to “develop an organized approach to information resource management on Guam.” Establishes the position of Chief Technology Officer to lead this office, whose duties include recommending to the Governor “transfers of equipment and human resources from any executive agency and the most efficient uses of the fiscal resources of executive agencies, to consolidate or centralize information-processing operation.” The authorities granted would appear to allow consolidated control of governmental GIS capability on Guam.
- 3) *Executive Order 2012-05* (2012) – Provided further clarification in regard to the membership of the Guam Coral Reef Initiative (GCRI), specifying that the GCRI shall have an internal structure consisting of a Policy Advisory Committee (GCRIPAC) and a Coordinating Committee (GCRICC). The EO further instructed that the GCRIPAC would be composed of individual representatives from the following sectors: Guam governor’s office POC (chair), academia, commercial fisheries, recreational fisheries, maritime industry, maritime recreation, the Chamorro community, the environmental NGO sector, and one at-large seat. It was further specified that the GCRICC would be composed of the Guam governor’s office POC, and the heads of various Guam executive branch agencies, including DOA, BSP, EPA, among others. Both of the above committees were charged with providing input to the Guam Local Action Strategies developed under the NOAA Coral Reef Conservation Program.
- 4) *Executive Order 2010-15* (2010) – Establishes a Guam Energy Task Force, to provide recommendations for reduction of reliance on fossil fuels, development of

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<sup>2</sup> Statutory authorities in Guam are codified under Chapters of the Guam Code Annotated (GCA), and are referred to in this report by their GCA numbers. It is of note that many of the authorizing statutes for Guam executive agencies have been repealed and re-enacted several times over the past twenty-five years, with amendments to agency authorities in the process, and it has sometimes proven difficult to ascertain the dates of these actions. This section on authorities therefore deals with their most recent codification under the GCA. Executive orders have a chronological numbering series.

renewable energy sources, improvement of energy generation infrastructure, and education regarding energy efficiency and conservation.

- 5) *Executive Order 1997-10* (1997) – Establishes a Guam Coral Reef Initiative to promote more comprehensive and effective management of the Territory's coral reef resources.
- 6) *Land Management Act* (Title 21 GCA Ch. 60) – Confers to the Department of Land Management authority over all government real property on Guam, including survey, platting, inventory and classification. Land classifications are limited to urban, suburban, agricultural, grazing, industrial and commercial, forests, and wasteland (note that there is no provision for a coastal lands classification, but see Title 21 GCA Ch. 63 below). Allows the Department to reserve for future use any lands not currently allocated by statute to any other agency, and to transfer lands not otherwise encumbered to the Chamorro Land Trust Commission as deemed appropriate. It also establishes a 7-member Territorial Land-Use Commission, with administrative rulemaking authority for land-use.
- 7) *Guam Territorial Seashore Protection Act of 1974* (PL 12-108; Title 21 GCA Ch. 63) – Establishes a Guam Territorial Seashore Protection Commission, composed of members of the Guam Land-Use Commission, to manage all property owned by the Territory within a Seashore Reserve zone defined as extending from the shoreline seaward to the 10-fathom contour, and to acquire additional property that may be added to this Reserve by purchase, donation, or exchange. The Commission was also required to prepare a Guam Seashore Reserve Plan by 1 December 1975, which, among other objectives was to ensure “The maintenance, restoration, and enhancement of the overall quality of the seashore reserve environment...continued existence of optimum populations of all species of living organism...and preservation, consistent with sound conservation principles, of all living and non-living seashore resources.”
- 8) *Parks and Recreation* (PL 20-151; codified as Title 21 GCA Ch. 77) – Establishes a Department of Parks and Recreation containing within it, among other entities, a Division of Historic Preservation responsible for overseeing a historic preservation program on Guam. Historic preservation is defined as “research, protection, restoration and rehabilitation of sites, buildings, structures and objects significant in the history, architecture, archaeology or culture of Guam”. Oversight of historical objects and sites was subsequently transferred by statute to the Office of Chamorro Affairs (PL 25-69) until the Guam legislature realized that such an action would result in loss of federal funding, at which point the previous legislation was repealed and the authority restored to the State Office of Historic Preservation.
- 9) *Guam Environmental Protection Agency Act* (Title 10 GCA Ch. 45) – Passed in 1972, this act created the Guam Environmental Protection Agency and transferred to it the powers previously held by the Air Pollution Control Commission. This act also gave Guam EPA responsibility for implementation of the Water Resources

Conservation Act (Title 10 GCA Ch. 46), the Water Pollution Control Act (Title 10 GCA Ch. 47), and the Air Pollution Control Act (10 GCA Ch. 49), among others. Although there is no specific mention of climate change in the above authorities, the definition of “air pollution” in Title 10 GCA Ch. 47 is “...the presence in the outdoor atmosphere of one (1) or more substances in such quantities and duration as is, or tends to be, injurious to human health, welfare, plant life, animal life, or property...” This definitional mandate would appear broad enough to convey to Guam EPA the authority to regulate local emissions of CO2 and other greenhouse gases.

- 10) *Fish, Game, Forestry and Conservation* (Title 5 GCA Ch. 63) – Assigns to the Department of Agriculture (DOA) the responsibility for “control and regulation of fish and game in and about Guam” with “fish” being defined as “any aquatic animal life, including, but not limited to, oysters, clams, mollusks, mussels, crustaceans, other shellfish and coral” and “game” being defined as “all native or introduced species of wild birds and wild or feral animals.” It also conveys to DOA the responsibility for management of endangered species and forestry resources. Although no specific mention of climate change is present in this authorizing statute, the broad authority granted would imply that DOA has authority to address climate change impacts to coral reefs, forests, and all native biodiversity (although current programs targeting coral reefs are housed in the Governor’s Office under the Bureau of Statistics and Plans).

## Institutions

Guam executive branch departments with responsibilities related to climate change are as follows:

1. *Guam Office of the Governor* – This office has the authority to issue executive orders related to climate change matters, such as setting up working groups or task forces, a power which has been recently used to address climate change issues via EO 2015-08 (see below under Actions). This office also houses the Bureau of Statistics and Plans which has rather broad powers.
  - a. *Guam Office of Technology* – Established by statute in 2013, this office is intended to be a central hub of information technology for Guam and will eventually house the envisioned One Guam GIS system. The office is in the process of being developed to its full capacity and at the present time many of its functions, including GIS, are still housed in the Land-Use Planning Program of BSP (see below).
  - b. *Guam Bureau of Statistics and Plans* (BSP) – Located within the Office of the Governor, the BSP was created by statute, then statutorily redefined in 1990 (PL 20-147) and again in 2002 (PL 26-76), with the current name acquired during the latter amendments. As most recently redefined, the responsibility of the BSP is to “undertake any planning activity that is not being carried out or that is not the

function of another department.” The mission statement of the BSP is to “ensure that Guam’s resources are effectively used for the benefit of present and future generations, by ensuring consistency among various plans, policies and programs.” A BSP staff member is also the current Guam POC to the All Islands Committee associated with the U.S. Coral Reef Task Force. Given the above, the BSP could have a potentially important coordinating role in regard to climate change adaptation. The Bureau also contains the following two programs with direct nexus to climate change activities:

- i. *Guam Coastal Management Program* – This program is responsible for conducting consistency reviews under the federal Coastal Zone Management Act and receives funding from NOAA. In addition to addressing core CZM mandates, the GCMP also houses the local implementation of the NOAA Coral Reef Conservation Program (CRCP) and oversees the CRCP cooperative agreement. This program has produced a wide variety of basic marine resource management resources including an Atlas of the Reefs and Beaches of Guam and color-illustrated guides to the fishes and corals of Guam. It formerly had some degree of GIS capacity but this seems to have recently shifted to the Land-Use Planning Program (see immediately below).
  - ii. *Land-Use Planning Program (LUPP)* – This program is responsible for mapping and GIS services in the Territory, providing support to such agencies as DPW and GHS. As such, it would appear to be a key player in regard to future vulnerability assessments, particularly in coastal areas. An internal working group within LUPP is working on GIS data standards and management.
2. *Guam Environmental Protection Agency (Guam EPA)* – Established statutorily in 1972 (Title 10 GCA Ch. 45), the Guam EPA’s mandates are specifically related to regulation of air and water pollution, solid and hazardous wastes, pesticides, and drinking water. The agency also has responsibility for regulating water resource development. Although there is no specific mention of climate change or greenhouse gases in its authorizing statute, it would implicitly appear to have the power to regulate emissions of CO<sub>2</sub> and other greenhouse gases within Guam.
  3. *Guam Department of Land Management (Guam DLM)* – Established by statute (Title 5 GCA Ch. 3), the Guam DLM has authority over land-use decisions in the Territory with divisions devoted to land administration, records, survey, and planning. The latter, the Land Planning Division, contains within its structure the following commissions:
    - a. *Guam Land-Use Commission (Guam LUC)* – Established by statute (Title 21 GCA Ch. 60), this commission oversees deeds, titles, platting, and zoning. The latter function has a nexus to climate change adaptation, although plans for future zoning revisions would probably be undertaken by BSP.

- b. *Guam Seashore Protection Commission* – Established by statute in 1974 (Title 21 GCA Ch. 63), this commission is charged with preparing (and presumably periodically revising) a Guam Seashore Reserve Plan, covering all territorial lands and waters from the shoreline outward to the 10 fathom bathymetric contour. The mandates of this commission may interface with those of the Guam Coastal Management Program within the Office of the Governor, and the Aquatic Resources Division within the DOA, as there appears to be a degree of overlap between them.

Several other commissions are also housed within Guam DLM, specifically:

- c. *Guam Ancestral Lands Commission* (ALC) – This commission, established by statute in 1999 (Title 21 GCA Ch. 80), is charged with pursuing and overseeing the “return of excess U.S. Federal and Government of Guam lands to their original owners”, or providing compensation to such owners. Ancestral owners are considered those whose land was confiscated or condemned after 1 January 1930. This commission would appear to have little direct nexus to climate change issues at the present time.
  - d. *Chamorro Land Trust Commission* (CLTC) – This commission established by statute, oversees the administration and disposition of Guam public lands designated as Chamorro Homelands, pursuant to authorities granted under the Chamorro Land Trust Act (Title 21 GCA Ch. 75) and acts exclusively in the interests of Chamorro beneficiaries. The stated goals and objectives in the Commission in its 2015 mission statement include “sound land-use planning practices and principles that will protect trust lands”, which would logically include consideration of climate change impacts.
4. *Guam Department of Agriculture* (DoAG) – Established by statute (Title 5 GCA Ch. 60), this department, despite its name, contains Guam’s principal natural resource management agencies (see Title 5 GCA Ch. 63), including:
- a. *Division of Aquatic and Wildlife Resources* (DAWR) – This division has primary stewardship responsibilities for terrestrial, freshwater, and marine resources, with the exception of plants, which fall under the forestry division. The DAWR receives significant external funding from DOI through the Sport Fish Restoration and Enhancement and Federal Aid in Wildlife Restoration programs, but no funding from NOAA. Although the Aquatic Resources program would appear statutorily to have primary responsibility for coral reef conservation on Guam its activities appear to be largely focused on fisheries management, with coral reef management instead largely centered with the GCMP in the Bureau of Statistics and Plans, the latter being a planning agency rather than a resource management agency.

- b. *Division of Forestry and Soil Resources (DFSR)* – This division is responsible for forest stewardship and native plant conservation. It therefore has a clear nexus to adaptive watershed management in the context of climate change.
- 5. *Guam Energy Office* – Initially established by legislative action, and continued under EO 2007-14, the Guam Energy Office “supports energy conservation, energy efficiency, renewable energy programs and practices. “The office is a line agency within the Guam executive branch and has received previous grants from the U.S. Department of Energy via the DOI Office of Insular Affairs. This office would be an element of any climate change mitigation strategy for Guam.
- 6. *Guam Department of Public Works (DPW)* – This agency is responsible for road construction and maintenance, and siting of future roads, as approved by Guam DLM and its associated commissions (see discussion above).
- 7. *Guam Homeland Security and Office of Civil Defense (GHS)* – The mission of the GHS is to prepare for and respond to emergencies that may impact Guam. Such emergencies can include meteorological or oceanographic events influenced by climate change.
- 8. *Department of Chamorro Affairs (DCA)* – Although primarily concerned with advancing the interests of the Chamorro constituency, the DCA also until recently provided the Guam POC to the All Islands Committee associated with the U.S. Coral Reef Task Force (this function was recently moved back to BSP), and therefore provided a voice in relation to climate change impacts to coral reefs. This department also has oversight of the Hagatna Redevelopment and Restoration Authority, which is responsible for land-use planning in the Hagatna area.

All of the above entities are members of the Guam Climate Change Task Force as set up in 2015 under EO 2015-08. In addition, the Memorial Hospital Authority, Bureau of Budget Management and Research, Economic Development Authority, and Department of Public and Social Services are also mandated members of the Task Force, but it is not clear if they have any other specific responsibilities related to climate change. Other invited members of the Task Force, who may participate at their discretion, are the Guam Power Authority, the Guam Waterworks Authority, Guam Community College and the University of Guam (this latter having a significant base of technical expertise, including GIS, and a member of the Pacific Islands Climate Science Center academic consortium). The Task Force also has an Advisory Committee, with members to be selected by the Governor. This committee has yet to be set up.

- 9. *Department of Parks and Recreation* – Although not included as part of the Guam Climate Change Task Force, this department contains the Guam Historic Resources Division and its State Historic Preservation Office. Established by statute (Title 21 GCA Ch. 77), the division is charged with “establishing a comprehensive historic preservation program on Guam.” Although no mention is made of climate change

impacts in its authorizing statute, the wording of the law would seem to convey authority to address climate change impacts to cultural and historic sites.

10. *University of Guam (UoG)* – Established as a land grant institution by congress in 1972, the University of Guam is the only institution of higher learning in Guam offering 4-year and graduate level degrees, including a MS degree in Environmental Science. It also houses the Water and Environmental Research Institute of the Western Pacific program (see immediately below) and is a member of the university consortium of the DOI-funded Pacific Islands Climate Science Center.
11. *Water and Environmental Research Institute of the Western Pacific (WERI)* – WERI is a research institute at the University of Guam (UoG) that focuses on seeking solutions to issues and problems related to freshwater resources in CNMI, Guam, and FSM, through research, teaching and outreach programs. WERI may be a promising venue to pursue climate change vulnerability and adaptation assessments in each of the areas it serves.

## Actions

- 1) *Guam Climate Change Task Force (2015)* – Established by Executive Order 2015-08, this task force has 17 members with a wide range of expertise (see above). As of January 2016, the new task force had formally convened its first meeting but not yet completed the vulnerability assessments planned for the individual departmental level.
- 2) *Marine Planning and Climate Change Policy (2015)* – Developed in response to Executive Order 13547 (2010) that recognized the importance of fishery resources, marine planning, and climate change in Hawaii and the U.S. Pacific Territories. It was developed specifically for Guam's Western Regional Fishery Management Council (Council) to help guide the implementation and management of its Fishery Ecosystem Plans, programs and other activities.
- 3) *Adapting to a Changing Climate Workshop (2014)* – Held from 10-14 March 2014, this workshop was funded by The Nature Conservancy and NOAA, and hosted by the Office of the Governor. The objective was to provide Guam executive branch participants, representing a spectrum of agencies, with a basic understanding of climate change, its potential impacts, and available tools to undertake vulnerability assessments and adaptation planning. Of the 33 participants, exclusive of the facilitators, 10 represented executive branch agencies (Office of the Governor, BSP, Civil Defense, DoAG, DPW, EPA), 9 represented federal entities (NOAA, NPS), 5 represented the University of Guam, 3 represented NGOs, and 6 represented NGOs from outside the Pacific region. The outcomes of the workshop were a list of needs and proposed future actions, largely centering on outreach and education with key constituencies in Guam.



- 4) *Guam Strategic Energy Plan* (2013) – A product of the Guam Energy Task Force set up under EO 2010-15, this document sets forth goals to diversify energy sources and reduce fossil fuel consumption by 20% by the year 2020.
- 5) *Coral Reef Resilience Local Action Strategy* (2008) – Created to direct funding from the NOAA Coral Program to protect reefs and watersheds, guided by resilience action plans.

In addition to the previously mentioned local efforts, Guam is also a partner in several regional initiatives, including:

- 6) *The Micronesia Challenge* – Guam appears to engage in this effort primarily in the coral reef sector through programs run out of BSP. As with the CNMI, Guam has committed to making a \$2 million donation to the Micronesia Challenge endowment.

## Future Needs

- 1) *Vulnerability Assessment* – Guam is in need of a comprehensive vulnerability assessment of the type recently completed for Saipan. Under the terms of EO 2015-08 such assessments were planned with hopes of completion by April 2016. The Guam Climate Change Task Force created by the above EO would be a logical point of interface to the OIA grant process, and OIA funding could be useful in completing the vulnerability assessments and integrating them into a more synthetic planning document.
- 2) *Climate Change Action Plan* – Guam is also in need of an overall plan to guide climate change adaptation. The Governor has already expressed desire for such plan but has requested that it be based on priorities that emerge from the vulnerability assessments discussed above. Helping develop such a plan could be a useful second tier objective for OIA once the vulnerability assessment phase is complete. The aspirational goal is to have this plan developed in 2017, but the general consensus is that this timeline is overly optimistic. It has been indicated that the University of Guam would like the lead role in the peer-review of any such plan.

## 4. Territory of American Sāmoa

### Authorities<sup>3</sup>

- 1) *Executive Order 009-2013* (2013) – Amends EO 004-2010, directing agencies to expand solar energy installation, explore geothermal energy options, and develop a trash-to-energy plant.
- 2) *Executive Order 03-2012* (2012) – Establishes a list of actions to be taken to guide climate change mitigation focusing mainly on ways to diminish the government's impact on greenhouse gases. It also acknowledges that climate change will have detrimental effects on American Sāmoa's industries and unique natural resources and that adaptation is "the realistic future for American Sāmoa."
- 3) *Executive Order 002-2011* (2011) – Establishes the Territorial Climate Change Adaptation Advisory Group (see further discussion below under Actions).
- 4) *Executive Order 004-2010* (2010) – Establishes the American Sāmoa Renewable Energy Committee (see further discussion below under Actions).
- 5) *Executive Order 010A-2007* (2007) – Establishes the government's commitment to addressing the negative effects of global climate change and it outlines its intention to, "be a leader in the fight against climate change and global warming," through the development of initiatives to address climate change.
- 6) *American Sāmoa Soil and Water Conservation District Act of 1993 (PL 23-8; ASCA Title 24 Ch. 9)* – Establishes a soil and water conservation district to address soil erosion and protect and improve water quality. Although climate change is not mentioned, the conservation district works in cooperation with government agencies to promote conservation by working to control and prevent soil erosion, prevent flooding, and to protect and improve water quality of both surface and ground water.
- 7) *American Sāmoa Coastal Management Act of 1990 (PL 21-35; ASCA Title 24 Ch. 5)* – Establishes a system of environmental review at the territorial level, to be carried out by the Project Notification and Review System, whose jurisdiction is the coastal zone of American Sāmoa. The coastal zone is defined as the, "coastal waters ... transitional and intertidal areas, salt marshes, wetlands and beaches. The coastal zone extends inland from the shorelines to the extent necessary to control the shore...." The law also allows designation of Special Management Areas, and procedures for determination of federal consistency. This law is consistent with the

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<sup>3</sup> Statutory authorities in American Sāmoa are codified under Chapters of the American Sāmoa Code Annotated (ASCA), and are referred to here by their ASCA numbers. Executive orders have a chronological numbering series.

provisions of the federal Coastal Zone Management Act of 1972. One clause of somewhat ambiguous construction addresses climate change impacts and states that: “Excluded from the coastal zone are lands the use of which is by law subject solely to the discretion of or which is held in trust by the federal government, its officers and agents, and to control those geographical areas which are likely to be affected by or vulnerable to sea level rise.” It is not clear whether this indicates that areas subject to sea level rise are excluded from the provisions of this law, or whether only federal lands are subject to such exclusion.

- 8) *Department of Marine and Wildlife Resources of 1987* (PL 20-12; ASCA Title 24 Ch. 3) – Establishes a Department of Marine and Wildlife Resources within the Executive Branch, with broad powers to “manage, protect, preserve and perpetuate marine and wildlife resources in the Territory.” This includes preparation of management plans, collection and analysis of data, oversight of fisheries, administrative rulemaking, and receipt and management of grants from outside entities, including the federal government. Given this extensive mandate, much of the responsibility for dealing with climate change impact to natural resources in American Sāmoa is centralized within this department. The one exception is that oversight of threatened and endangered species rests with the American Sāmoa Natural Resources Commission.
- 9) *American Sāmoa Natural Resources Commission of 1982* (PL 17-49; ASCA Title 24 Ch. 7) – Establishes an American Sāmoa Natural Resources Commission, comprised of 5 members appointed by the Governor and confirmed by the Legislature, with responsibility for maintaining lists of endangered species within the Territory and suggesting programs for their conservation, protection and recovery, as well as identifying sources of funding for addressing such matters. The mandate of this Commission indicates that it would have primary responsibility for addressing climate change impacts to species legally designated as threatened or endangered.
- 10) *Department of Parks and Recreation of 1980* (PL 16-55; ASCA Title 18 Ch. 2) – Establishes a Department of Parks and Recreation, to “manage, develop, control and maintain the park system.” Although climate change is not mentioned in the authorizing statute, the authorities granted are sufficient to give this department a role in addressing climate change impacts to natural resources that may occur within the park system.
- 11) *Planning and Economic Development of 1978* (PL 15-64; ASCA Title 10 Ch. 1) – Establishes a Territorial Planning Commission, composed of 9 members appointed by the Governor. This Commission was charged with proposing balanced and sustainable allocations of land-use within the Territory for purposes of residential, commercial, agricultural and industrial development. Although climate change is not mentioned in the authorizing statute, this Commission may have an important role in terms of future climate change adaptation as it relates to zoning and land-use. This Commission was subsequently placed within the American Sāmoa Department of Commerce.

- 12) *Environmental Quality Act of 1972* (PL 12-45; ASCA Title 24 Ch. 1) – Establishes an Environmental Quality Commission (EQC) with a mandate to oversee air and water pollution prevention, abatement, and control. The Act does not mention climate change specifically, and the Commission does not possess any direct authorities in regard to the social or natural resource impacts of climate change, however, it does have implicit authority to regulate emissions of CO<sub>2</sub> and other greenhouse gases from sources within American Sāmoa.
- 13) *Executive Departments, Boards and Agencies of 1962* (PL 7-28; ASCA Title 4 Ch. 3) – Establishes the structure of the Executive Branch, including a requirement to establish certain departments, including Marine and Wildlife Resources, Commerce, Agriculture, Parks and Recreation, Public Works, and Port Administration. Many of these required departments were not formally established and empowered by statute until many years or decades afterward (25 years later in the case of DMWR). Interestingly, the EQC, with its powerful mandates to oversee air and water pollution, was not a required element of the Executive Branch under this law, yet it was established prior to many of the other mandated agencies.

## Institutions

American Sāmoa's executive branch departments with responsibilities related to climate change are as follows:

- 1) *American Sāmoa Office of the Governor* – This office has the authority to issue executive orders (Eos) related to climate change matters, such as setting up working groups or task forces, a power which has been used extensively in recent years to address climate change issues via EO 004-2010, EO 002-2011, and EO 009-2013 (also see below under Actions).
- 2) *American Sāmoa Department of Marine and Wildlife Resources* (DMWR) – Established statutorily in 1987 by PL 20-12, the DMWR is the primary steward for natural resources in American Sāmoa. Its policy directive is to “preserve, perpetuate, protect and manage” such resources, with the policy statement also noting that “such chapter is to be construed so as to implement such policy and purpose to its fullest extent.” Therefore, although its authorizing statute contains no references to climate change, it appears that the DMWR possesses the authority to address its impact on marine, freshwater, and terrestrial resources. Despite its broad mandate, not all natural resource management responsibilities in American Sāmoa are vested within DMWR. Threatened and protected species are instead managed by the American Sāmoa Natural Resources Commission, while the Coastal Management program and National Marine Sanctuary co-management responsibilities lie with the American Sāmoa Department of Commerce (see additional discussions below). It therefore appears that oversight of climate change impacts to coral reefs within the Territory is divided between DMWR and its Coral Reef Advisory Group (CRAG) on

one hand, and the AS Department of Commerce on the other. It should also be noted that leadership and control of the CRAG by DMWR is a recent development, with this group having previously been housed in the Department of Commerce, which also supplied its chair. DMWR also houses some internal GIS capacity, primarily devoted to mapping critical habitat for threatened and endangered plants and birds.

- 3) *American Sāmoa Natural Resources Commission (ASNRC)* – Established statutorily in 1982, five years prior to DMWR, the ASNRC has responsibility for management of formally listed threatened and endangered species within the Territory. As with DMWR, although its authorizing statute contains no reference to climate change, the Commission has implicit authority to factor such impacts into future management of listed species in American Sāmoa.
- 4) *American Sāmoa Environmental Protection Agency (ASEPA)* – Established statutorily in 1972, the ASEPA is the oldest resource management agency in the Territory, pre-dating the current DMWR by 15 years. Although its mandates are specifically focused on air and water pollution, making it a key player in regulating greenhouse gas emissions within the Territory, the ASEPA also seems to retain a certain degree of influence over policy regarding natural resources management as well. The ASEPA website has an extensive discussion of climate change threats and proposed adaptation strategies, including alternative energy sources, and green standards for government buildings and vehicles. The ASEPA is also a member of the Interagency Project Notification and Review System (PNRS) Board (see below) which reviews all development proposals to ensure that environmental standards are followed.
- 5) *American Sāmoa Department of Parks and Recreation (ASDPR)* – This small department, whose focus largely seems to concentrate on sports, has certain resource management responsibilities in regard to preservation of natural resources that lie within the units of the territorial park system and should therefore be involved in discussions regarding climate change impacts and adaptation strategies.
- 6) *American Sāmoa Department of Commerce (ASDOC)* – The Department of Commerce contains several bodies whose authorities have a nexus to both climate change adaptation and natural resource management. In particular, the ASDOC oversees: (a) land-use management in the Territory by administering the Territorial Planning Commission (TPC), which guides all aspects of infrastructure siting and development; (b) the Zoning Board of American Sāmoa (ABAS), which approves zoning decisions (these first two set up under ASCA Chapter 3); and (c) the Interagency Project Notification and Review System (PNRS) Board (established in 1980 under ASCA Title 26 Ch.2 and placed within the ASDOC under the Coastal Management Program, which provides the support staff and administration for this body), which oversees land-use decisions with a particular emphasis on the preservation of coastal zones and wetlands. The ASDOC also has certain natural resource management responsibilities related to its American Sāmoa Coastal

Management Program, which is responsible for review and planning of land-use activities in the coastal zone, as well as the restoration and enhancement of special areas. The ASDOC is also the American Sāmoa governmental co-manager, in concert with federal partner NOAA, of the National Marine Sanctuary of American Sāmoa, which includes Fagatele Bay on Tutuila, and the waters surrounding Rose Atoll. Finally, this department also has responsibility for producing and regularly updating the Hazard Mitigation Plan for American Sāmoa, which specifically includes assessments of risks related to climate change; the most recently updated version of this plan appeared in April 2015. The specific authorizing statute for ASDOC is ASCA Title 4 Ch. 3. The resource management authorities of ASDOC, which were acquired through the Coastal Management Act of 1990 and to some extent overlap with the responsibilities of the DMWR, make it an important partner in regard to climate change adaptation in coastal and marine zones.

- 7) *American Sāmoa Department of Agriculture* – This department, in collaboration with USDA, would be a logical partner for disseminating information on potential climate change impacts to small-scale subsistence farmers.
- 8) *American Sāmoa Power Authority (ASPA)* – This is a legally-mandated public utility, overseen by the Office of the Governor, responsible for providing electricity, water, and waste-handling services to the Territory. It is therefore an important entity in regard to development and implementation of alternative and renewable energy sources.
- 9) *American Sāmoa Department of Public Works* – This agency is responsible for road construction and maintenance, and siting of future roads, as approved by ASDOC and its associated boards and commissions (see discussion above).
- 10) *American Sāmoa Department of Health* – Although this department does not have any statutory mandates specifically related to climate change, it does have responsibility for responding to any new disease outbreaks that might occur as a result of climate-mediated expansion of potential vectors.
- 11) *American Sāmoa Department of Education (ASDOE)* – This department oversees primary and secondary schools in American Sāmoa as well as the American Sāmoa Community College. As such, it is a key partner in regard to educating the general public on the threats posed by climate change and potential adaptive strategies. The community college houses a GIS program, supported by ASDOC, which helped produce the American Sāmoa Forest Assessment and Resource Strategy (June 2010). Although it does not specifically address climate change threats, this document provides a large amount of useful information and mapping that can be used for future landscape-level conservation and climate change adaptation planning.

All of the above are members of the American Sāmoa Climate Change Task Force as set up in 2015 by executive memo. In addition, the Territorial Energy Office, as well as several mayors and legislators, are also members of this Task Force.

- 12) *American Sāmoa Historic Preservation Office (ASHPO)* – Established by statute in 1966, this office “identifies, evaluates, registers, interprets and protects American Sāmoa’s historic and cultural properties” and assists various agencies in complying with Section 106 of the federal National Historic Preservation Act. Although not included as part of the American Sāmoa Climate Change Task Force this office would appear to have authority to address climate change impacts to cultural and historic sites.
- 13) *American Sāmoa Community College (ASCC)* – ASCC is a 2-year community college designated as a land grant institution by congress in 1981. It received federal funds to develop Cooperative Extension Service (CES) programs in agriculture, agribusiness, forestry, family, and consumer sciences and natural resources. The agricultural related programs fall under the ASCC’s Community and Natural Resources / Land Grant programs emphasizing research and education. This would be logical venue to pursue climate change vulnerability analyses and planning within the agriculture sector.
- 14) *American Samoa Coral Reef Advisory Group (CRAG)* – coordinates coral reef management and conservation efforts, including education and outreach, policy and enforcement, and scientific research and monitoring. The group is a collaboration of local agencies (including DMWR, ASDOC, ASEPA, and ASCC) and the National Park of American Sāmoa (NPS).

## Actions

- 1) *American Sāmoa Climate Change Task Force (2015)* – This newly formed group appointed in October 2015 by Governor Moliga consists of 9 cabinet directors. It follows on the work of the previous Climate Change Advisory Group with focus on six topical areas: forestry, coastal hazards, infrastructure, energy, human health, and education. The Task Force is charged with developing an Action Plan to address adaptation strategies and proposing projects suitable for funding by OIA and other funders. American Sāmoa seems to be well aligned with OIA’s technical assistance program and making progress toward defining fundable priority actions. The strategy in this jurisdiction has been driven by top-down leadership, similar to Guam, rather than from the bottom up, as in CNMI. There is a robust institutional framework under which adaptation can be pursued.
- 2) *Territorial Climate Change Adaptation Framework (2012)* – This document resulted from the work of the now defunct Climate Change Advisory Group. It addresses threats, risks, data gaps, and potential adaptation projects across seven sectors: a) coral reef and mangroves; b) forestry, water, and agriculture; c) coastal hazards; d)



infrastructure development; e) energy; f) human health; and g) education and outreach.

- 3) *Territorial Climate Change Advisory Group* (2012) – This advisory group was set up for one year to produce a Climate Change Adaptation Framework in order to direct future climate change management strategies in American Sāmoa. The Advisory Group set up subcommittees to deal with specific subjects.
- 4) *Climate Change Summit* (2011) – This meeting was held in early February 2011 under the banner of “Making Climate Change Local: Building Climate Resilient Communities in the Pacific.” Over 200 participants, ranging from scientists to villagers to government officials were in attendance. The outcomes were summarized by the American Sāmoa Department of Commerce into a Climate Change Summit Report.
- 5) *American Sāmoa Renewable Energy Committee* (2010) – Established by EO004-2010, this is a non-regulatory advisory group tasked with producing a long-term strategic energy plan that emphasizes reducing dependence on fossil fuels and increasing adoption of renewable energy sources. Products have included an American Sāmoa Energy Action Plan, released in August 2013, and review of American Sāmoa Energy Strategies, released in December 2013. This group works in partnership with the American Sāmoa Power Authority, the American Sāmoa Territorial Energy Office, and the American Sāmoa EPA. The group has received previous funding from OIA.
- 6) *Coral Reef Resilience Local Action Strategy* (2008) – This strategy was created to direct funding from the NOAA Coral Program to protect reefs and watersheds, guided by resilience action plans.

In addition to the above local efforts, American Sāmoa is also a partner in regional initiatives, including:

- 7) *2 Sāmoas Environmental Collaboration Initiative* – Started in 2007, this partnership between American Sāmoa and the independent nation of Sāmoa was created with the goal of coordinating natural resource management across the entire Samoan Archipelago. Although initially focused on collaborative marine resource management, this alliance provides a potentially useful venue by which to advance future efforts in regard to climate change adaptation, given the general absence of third party NGOs in American Sāmoa.

## Future Needs

- 1) *Vulnerability Assessment* – The current Territorial Climate Change Action Framework does a good job of outlining climate change vulnerabilities but does not



analyze them in detail. A vulnerability assessment similar to that prepared for Saipan, incorporating GIS-based vulnerability mapping, would be extremely useful for climate change adaptation planning across the Territory. Given funding and data limitations, such as assessment be conducted incrementally beginning in Tutuila and could subsequently be extended to the other islands in the territory, including the atolls which have clear vulnerabilities to inundation.

- 2) *Coastal Hazards Assessment* – Due to the steeply dropping nature of most shorelines on Tutuila, where the majority of American Sāmoa’s population dwells, a significant number of villages and a large amount of vital infrastructure are located very close to the mean high water mark. Therefore, a specific assessment of coastal hazards and projected future inundation and erosion trends is important in regard to zoning and land-use planning. This could be undertaken prior to, as part of, or in parallel with the overall vulnerability assessment recommended above.

## 5. Republic of the Marshall Islands

### Authorities<sup>4</sup>

- 1) *Office of Environmental Planning and Policy Coordination (OEPPC) Act of 2003* (PL 2003-83; codified 35 MIRC Ch. 4) – Establishes an Office of Environmental Planning and Policy Coordination within the Executive Branch, to act as an advisory body to the President and cabinet ministers on “matters of environmental planning and policy generally” and to serve as a “focal point of contact in the coordination, management, and implementation of all international environmental projects/programs” and “focal point of contact in all negotiations with external sources and lending institutions” that might provide assistance in such areas.
- 2) *Marshall Islands Marine Resources Act of 1997* (PL 1997-60; codified Title 51 MIRC Ch. 1-5) – Establishes a Marshall Islands Marine Resources Authority with broad powers to regulate both commercial and recreational fisheries. It also incorporates the provisions of the *Marshall Islands Marine Zones (Declaration) Act 1984* (PL 1984-25) which establishes and defines a system of marine zoning for fisheries management and other resource extraction, including internal waters, archipelagic waters, a Territorial Sea, and an Exclusive Economic Zone.
- 3) *Alternative Energy Act of 1989* (PL 1989-63; codified Title 11 MIRC Ch. 17) – Created a revolving loan fund for development and operation of alternative energy systems, to be utilized by the Ministry of Resources and Development
- 4) *Coast Conservation Act of 1988* (PL 1988-13, codified Title 35 MIRC Ch. 3) – Creates a Director of Coast Conservation within the RMI National Environmental Protection Authority. This Director is responsible for the “protection and preservation of the coast from sea erosion or encroachment of the sea” including “planning and management of development activity within the Coastal Zone.” The Coastal Zone is defined as “the area laying within a limit of twenty-five (25) feet landwards of the mean high water line and two hundred feet seawards of the mean low water line.” The Director is also responsible for undertaking a nationwide survey of the coastal zone in order to determine the presence and location of all infrastructure, wetlands, and coral reefs, and with the preparation of a Coastal Zone Management Plan. The Coast Conservation Act of 1998 also gives the Director authority over issuance or

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<sup>4</sup> Statutory authorities in the RMI are codified under Chapters of the Marshall Islands Revised Code and are referred to here by their MIRC numbers. The latest official revision of this Code was undertaken in 2004, but an unofficial updated version was posted online in 2014 and is followed here in order to track recent statutory amendments.

denial of permits for construction in the coastal zone, and discretion as to whether to require an environmental impact statement for any such proposed development. The broad authorities conveyed in this act provide a basis for comprehensive adaptive approaches to rising sea levels.

- 5) *National Environmental Protection Act of 1984* (PL 1984-31; codified Title 35 MIRC Ch. 1) – Establishes an RMI National Environmental Protection Authority (RMIEPA) with responsibility to “preserve and improve the quality of the environment” and authority to regulate water and air pollution and environmental contaminants. It also conveys authority to oversee land-use, including inventory and classification of lands, determination of present uses, and “a comprehensive and accurate determination of the adaptability of land for community development, agriculture, industry or commerce.” Further conveys authority over natural resource management, including fisheries and soil conservation, and oversight of environmental impact statements. Finally, grants enforcement powers in regard to these areas of oversight and establishes a National Environmental Protection Authority Fund which may receive fines for violations but may also hold “grants, contributions, gifts and other assistance.”
- 6) *Public Lands and Resources Act of 1966* (TTC 1966; PL 2008-2; codified Title 9 MIRC Ch. 1) – Asserts public ownership of all marine waters below the high water mark, although exceptions are made for “traditional and customary right of the individual land owner, clan, family, or municipality to control the use of, or material in, marine areas below the ordinary high water mark”, but with such rights “subject only to, and limited by, the inherent rights of the Government of the Marshall Islands as the owner of such lands.” This law takes precedence over traditional marine tenure systems, at least in regard to ownership, and thereby gives the government broad discretion in regard to management of submerged lands. By contrast, traditional tenure rights on emergent land are specifically protected under the RMI constitution.

## Institutions

The RMI executive branch departments with responsibilities related to climate change are as follows:

- 1) *RMI Office of the President* – This office has the authority to issue executive orders related to climate change matters, such as setting up working groups or task forces. The Office of the President also oversees the following offices that have a nexus to climate change issues:
  - a. *Economic Policy, Planning and Statistics Office* (EPPSO) – This office is responsible for economic policy, strategic planning, and compiling statistics, including those related to the energy sector.

- b. *Office of Environmental Planning and Policy Coordination (OEPPC)* – Established by statute in 2003, this office has broad responsibilities in regard to climate change adaptation. Its main duties include providing policy advice to the Office of the President and all cabinet level agencies on RMI implementation of obligations under various multilateral environmental agreements, including the United Nations Framework on Climate Change and its Kyoto Protocol. Other specific duties include “to act as the national focal point of contact in all negotiations with external sources and lending institutions on programs and/or projects of assistance.” As such, it is the RMI point of contact for the South Pacific Regional Environmental Program (SPREP) and the U.S. Coral Reef Task Force. Among its long-term goals, it strives to “generate awareness regarding the influence of climate change” and conduct “vulnerability assessments as required for the purposes of reviewing sustainable development and energy planning.”
  - c. *National Climate Change Committee (NCCC)* – Set up by executive action under the Office of the President, this committee is charged with implementing the RMI National Climate Change Policy Framework (NCCPF, see below under Actions). The OEPPC (see above) is the secretariat for this committee, and provides its Vice Chair. Specifically assigned members of this committee include the Secretaries of OEPPC, MRD, MIMRA, RMIEPA, MoF, and Education (for explanations of acronyms see list of agencies below). Non-governmental organizations that may also participate on the NCCC at their discretion include Women United Together Marshall Islands (WUTMI), the Marshall Islands Council of NGOs (MICNGOs), and the Marshall Islands Conservation Society.
- 2) *Ministry of Public Works (MPW)* – This agency is responsible for road construction and maintenance, and siting of future roads. This ministry does not appear to be a current member of the RMI National Climate Change Committee.
  - 3) *Ministry of Resources and Development (MRD)* – This agency was established constitutionally in 1979 as a cabinet-level agency with authorities over agriculture, energy, trade, and investment, which are to be developed in a “sustainable and productive manner.” The MRD oversees the RMI National Energy Task Force and as such appears to have primary responsibility for development of alternative energy in the country. The MRD also contains the Energy Planning Division (EPD) which is responsible for national energy policy and would therefore seem to be the logical point of contact for renewable energy initiatives.
  - 4) *National Environmental Protection Authority (RMIEPA)* – Established by statute in 1984, RMIEPA is the agency with primary responsibility for environmental protection, including nature conservation, environmental contaminants, and environmental education. Under the authorities granted by PL 1988-13, RMIEPA has a broad mandate to comprehensively address climate change impacts from rising sea levels and coastal inundation, including land-use planning and permitting in the coastal zone. It also appears to be the national focal point for the United Nations’ Pacific Islands Climate Change Assistance Program (PICCAP), as well as other

international cooperative efforts relating to global monitoring of sea level rise. In this latter regard, it is not clear how RMIEPA interacts with OEPPC in the Office of the President, given that the latter office is also involved in international coordination on climate change.

- 5) *Marshall Islands Marine Resources Authority (MIMRA)* – Established by statute in 1997, this agency is charged with regulation of commercial and recreational fisheries, which are significant economic drivers in the RMI, although overall authority for marine resource management as a whole would appear to lie with RMIEPA. Both are members of the RMI National Climate Change Committee, with MIMRA focused on extraction issues, and RMIEPA on conservation.
- 6) *Ministry of Foreign Affairs* – This ministry is the lead agency in regard to coordinating financial assistance from foreign nations for climate change and other matters and therefore is an obligatory initial point of contact for international support of climate change adaptation efforts.
- 7) *Ministry of Education* – Established in 1979, this ministry oversees primary and secondary schools throughout the country and the College of the Marshall Islands, a vocational and technical institution located on Majuro. It is the logical partner for collaborations dealing with education and outreach in regard to climate change adaptation, although certain such authorities are also statutorily granted to RMIEPA (see above), creating a degree of overlap in mandates.
- 8) *Marshall's Energy Company (MEC)* – A state-owned enterprise which operates under a board consisting of the president and her cabinet (there is no independent body with regulatory oversight of utilities in the RMI). This is the power company that serves Majuro Atoll. The MEC also owns, operates, maintains, and collects fees for the use of PVE-battery electric systems on other atolls in the country. In addition, it provides sewer and wastewater services to Majuro.
- 9) *Kwajalein Joint Utilities Resources (KAJUR)* – Another state-owned enterprise that also operates under a board consisting of the president and her cabinet. This is the power company that serves Ebeye on Kwajalein Atoll. It also provides water and sewer services to Ebeye.
- 10) *Marshall Islands Historic Preservation Office (HPO)* – This agency is charged with oversight of culturally and historically significant areas. Many of these are located in areas susceptible to coastal inundation, so there would seem to be a need for some level of vulnerability assessment and adaptation planning assistance.

## Actions

- 1) *National Strategic Plan (2014)* – Completed in June of 2014 by EPPSO in the Office of the President, this document serves as a framework to lay out medium-term

development goals for the RMI from 2015 to 2017. It is compatible with but to some extent supersedes the Vision 2018 plan created in 2001. One of its major national development themes involves mitigating the impacts of climate change. Under the Environment, Climate Change and Resiliency section, the need for vulnerability assessment and disaster risk reduction is specifically called out.

- 2) *Joint National Action Plan for Climate Change and Disaster Risk Management* (~2014) – Preparation of this document was specified in the RMI National Climate Change Policy Framework of 2011, and its existence has been mentioned as a completed plan by several web-based sources and by RMI participants at the U.S. Insular Climate Change Stakeholder Meeting in June of 2015. Even so, it has not been possible for the authors of this report to locate a copy of this document, and it is not clear if the document has been finalized.
- 3) *RMI National Energy Policy and Planning Workshop* (2012) – This workshop brought together key stakeholders to discuss needs and opportunities in the energy sector, including expansion of renewable energy options. The outcomes formed part of the basis for development of an updated National Energy Policy. Although late-stage drafts of this document are available, dating from April 2014, it is not clear if this revised policy has been finalized.
- 4) *RMI National Climate Change Policy Framework* (2011) – This document lays out a national strategic framework by which the RMI proposes to address its commitments and responsibilities in regard to climate change. It provides a useful basis for structuring future funding proposals in regard to climate change adaptation, by setting forth a set of strategic goals. The implementation of the framework is the responsibility of a National Climate Change Committee under the Office of the President.
- 5) *RMI Climate Change Roadmap* (2010) – Adopted in September of 2010, this document was intended to provide a framework for reforms in the energy sector and various other aspects of climate change adaptation as a means of accessing Fast Start financing based on provisions of the Copenhagen Accord. It appears to have been largely superseded by the more detailed RMI National Climate Change Policy Framework adopted in 2011.
- 6) *National Energy Policy and Energy Action Plan* (2009) – Funded by the Asian Development Bank, the NEPEAP lays out a number of goals germane to climate change adaptation, including 20% indigenous renewable energy production by 2020; a 50% improvement in energy efficiency of houses and business by 2020, and a 75% improvement along these same lines in government buildings; and a 40% reduction of fossil fuels used by the government by 2020. Because both major power utilities are state-owned enterprises, this implies a 40% reduction in use of imported fossil fuels for electricity generation by 2020. The goals set forth in the plan are not legally binding.

- 7) *RMI Coastal Management Framework* (2009) – Produced by RMIEPA, this document provides a comprehensive review of coastal conditions throughout the RMI, assesses current activities impacting coastlines, and provides recommendations for action and policy. Sea level rise and other climate change impacts are specifically addressed, and certain recommendations for adaptation and best management practices are provided. This appears to be the best current foundational document for addressing coastal issues in the country.
- 8) *RMI Disaster Risk Management National Action Plan 2008-2018* (2008) – This document addresses priorities for action in relation to both disaster risk reduction and management, including impacts related to climate change. A successor document is currently under development.
- 9) *Reimaanlok: National Conservation Area Plan for the Marshall Islands 2007-2012* (2008). Prepared by MRD with support from the Australian Government, this plan provides a baseline assessment of RMI biodiversity, with recommendations for establishment of marine managed areas, information management, improvements to the legal framework, coordination mechanisms, and sustainable financing. Although useful, this plan is now more than 8 years old, has exceeded its designated timeline, and is in need of an update incorporating more recent scientific knowledge and current climate change information.
- 10) *Vision 2018. The Strategic Development Plan Framework 2003-2018* (2001) – Produced by the SEDP Office in the Ministry of Finance, this document was intended as a strategic plan to guide national development for 15 years. Of the ten major challenges identified as facing the country at that time, climate change adaptation was not among them.

In addition to the above local efforts, the RMI is also a partner in several International Initiatives, including:

- 11) *The Micronesia Challenge* – The RMI is engaging with the Micronesia Challenge process via a Coastal Management Advisory Council (CMAC), a non-governmental group led by the MIMRA containing membership from OEPPC, RMIEPA, HPO, the Ministry of Internal Affairs, and the Marshall Islands Visitors Authority. Non-governmental membership includes the Marshall Islands Conservation Society. The group is preparing a strategic plan with elements focusing on community-based fishery management, natural heritage preservation, and sustainable finance. In April of 2009, the RMI hosted a workshop on “Climate Change & the Micronesia Challenge: Ways Forward in Collaboration and Adaptation.” To date, the RMI government has contributed \$3.7 million to the Micronesia Challenge Endowment.
- 12) *Majuro Declaration for Climate Leadership* – An outcome of the 44<sup>th</sup> Pacific Islands Forum held at Majuro in September 2013, this document recognizes the reality of climate change, calls upon all parties to take leadership in addressing it, and outlines

a set of commitments by the parties in regard to emission reductions, implementation of renewable energy technologies, and improved natural resource management, particularly in the forestry sector. The RMI commitments include a 40% reduction in CO<sub>2</sub> emissions below 2009 levels by 2020, electrification of 100% of urban households and 95% of rural households by 2015, a 20% efficiency improvement in transportation fuel sector use by 2020, and significantly improved energy efficiency for households, businesses, and government buildings.

- 13) *2015 United Nations Climate Change Conference, Conference of the Parties 21* – Generally referred to as COP 21, this meeting was held in Paris, France from 30 November to 12 December 2015, and represented the 21<sup>st</sup> yearly meeting of the parties to the 1992 United Nations Framework Convention on Climate Change, as well as the 11<sup>th</sup> session of the Meeting of the Parties to the 1997 Kyoto Protocol. The meeting resulted in a global commitment to reduce climate change. On 5 October 2016, the threshold for entry into force of the Paris Agreement was achieved. The Paris Agreement entered into force on 4 November 2016. Prior to the start of the conference, the RMI delegation submitted an Intended Nationally Determined Contribution of climate change mitigation targets for the country, with the stated goal of a 32% cut to greenhouse gas emissions by 2025, a 45% reduction by 2030, and zero net emissions by 2050. The RMI delegation also noted that although the country produces less than 0.00001% of total global greenhouse gas emissions, it is suffering disproportionate adverse effects from rising sea levels linked to climate change. During the COP 21 deliberations, the RMI strongly advocated for an agreement that would seek to hold future global warming to no more than 1.5°C above current levels. In the final agreement, the parties agreed to reduce their carbon output “as soon as possible” and to make the best efforts to keep future warming to “well below 2 degrees C.”

The following policy and analysis documents have also been prepared by third parties working in concert with the RMI government:

- 14) *Climate Change Finance Assessment* (2014) – Prepared by the Pacific Islands Forum Secretariat (PIFS), and using methodology from the Pacific Climate Change Finance Assessment Framework (PCCFAF) developed by the United Nations Development Program, this assessment is intended to provide advice to the RMI government on sources of funding for activities related to climate change. Six specific topics are analyzed: funding resources; public financial management and expenditure; policies and plans; institutional arrangements; human capacity; and development effectiveness.
- 15) *Vulnerability and Adaptation Assessment for the Water Sector in Majuro* (2014) – Prepared by SPREP’s Pacific Adaptation to Climate Change (PACC) project, this document assesses baseline conditions, vulnerability, and adaptation options for the Laura Lens aquifer on Majuro. It contains a useful and detailed section on local expression of climate change drivers, including air temperature, precipitation, tropical cyclones, and storm surge.



- 16) *Republic of the Marshall Islands Country Energy Security Indicator Profile 2009* (2012) – Prepared by the Secretariat of the Pacific Community, this document assesses the current status of the FSM energy sector using a wide array of metrics and indicators (SPC 2012a).
- 17) *National Integrated Water Resources Management Report* (2007) – A detailed review of the RMI water sector, with discussion of threats, current governmental capacity limitations, and policy needed to address these. This report was prepared by the South Pacific Applied Geosciences Commission (SOPAC) whose functions were subsequently transferred to the Secretariat of the Pacific Community (SPC) and the Secretariat of the Pacific Regional Environmental Program (SPREP). The document is somewhat dated, with climate change threats mentioned in passing but not analyzed in detail. Even so, this probably remains one of the best overall reference documents in regard to assessing adaptation needs in the water sector across the entire RMI.

## Future Needs

The RMI has limited economic and technical resources for addressing climate change vulnerability and adaptation, and therefore relies largely on foreign donors and organizations to collaborate on studies necessary to plan for future impacts. Although a number of studies have already been undertaken in the water (SOPAC 2007; SPREP 2014) and energy sectors (SPREP 2012; Isaka et al. 2013), focused primarily on the administrative center at Majuro, the following areas appear to represent clear near term needs:

- 1) *Climate Change Adaptation Plan* – A variety of studies have highlighted the extreme vulnerability of the RMI to impacts from climate change, particularly in regard to inundation from rising sea levels (GFDRR 2011), but there does not appear to be any overall synthesis of these studies into a comprehensive adaptation plan for the country. The need for such a plan is laid out in the RMI National Strategic Plan of 2014, and the National Climate Change Policy Framework of 2011, the latter calling for the development of a Climate Change and Disaster Risk Management National Action Plan for RMI (a.k.a., Joint NAP). As previously noted, is not clear where the development of the latter plan currently stands. Many of the previously developed strategic documents upon which it is based (relating to overall strategic development, energy policy, disaster risk management, and water resource management) are between 7 and 15 years old and in many cases did not fully anticipate the magnitude of the climate change impacts now facing the country. The agency with statutory authority for development of such a plan is the OEPPC in the Office of the President.
- 2) *Land-Use Management Plan* – A detailed, GIS-based assessment of inundation risk needs to be undertaken for all islands in the RMI in order to understand the full extent of vulnerabilities faced by infrastructure and communities and as a basis for

scenario planning in the event certain strategic retreats are required. Modelling of inundation risk to date has logically been concentrated at Majuro and Kwajalein atolls, where the majority of the country's population resides. In addition to these localized case studies, a more comprehensive approach needs to be extended to the remainder of the country. This should include incorporation of wave force models on top of simple projections of sea level rise (Storlazzi et al. 2015). Such an assessment could also address two separate strategic goals – urban planning and infrastructure development, and land and coastal management – set forth in the RMI National Climate Change Policy Framework of 2011. RMIEPA, with its statutory mandates to oversee both land-use planning and impacts from rising sea levels, would be important in such efforts. OEPPC might also have a role to play.

- 3) *Energy Strategy and Policy Development* – The RMI currently meets over 99% of its energy needs from imported fossil fuels (SPC 2012a). This is problematic both in terms of foreign exchange and climate change adaptation. Although there has been incipient adoption of solar photovoltaic technologies and initial experiments with coconut-based biofuels, the alternative energy sector is not fully developed. The most recent National Energy Action Plan was adopted in 2009 and is likely becoming dated given recent advances in technology, particularly in the solar PVE sector. Additional needs include development of policies for interconnection of renewable energy sources to the existing power grid, net metering, and power production outside of the two state-owned enterprises at Majuro and Ebeye.

## 6. Federated States of Micronesia

### Authorities<sup>5</sup>

- 1) *Federated States of Micronesia Climate Change Act of 2014* (PL 18-34) – This act was passed in order to implement the actions set forth in the Nationwide Integrated Disaster Risk Management and Climate Change Adaptation Policy of 2013. It requires the following executive branch departments to prepare climate change plans and policies by 1 October 2014: Department of Resources and Development (R&D), Office of Environment and Emergency Management (OEEM); Department of Transportation, Communications, and Infrastructure (TCI); Department of Health and Social Affairs (DHSA); Department of Education (DOE); Department of Finance and Administration; Office of Statistics, Budget and Economic Management (SBOC); and Department of Foreign Affairs. These plans are to be consistent with the provisions of the FSM Climate Change Policy. The implementation of this mandate is made the responsibility of the OEEM.
- 2) *Federated States of Micronesia Environmental Protection Act of 1984* (PL 3-83§1; codified Title 25 FSMC Ch. 5-7) – Establishes an Environmental Protection Board within the Office of the President, with responsibility to “protect the environmental, human health, welfare, and safety, to ablate, control and prohibit pollution or contamination of air, land and water...” In 1987 the powers and functions of the Board were statutorily transferred to the Department of Human Resources (DHR). This statute conveys broad authority to adopt, enforce, and adaptively revise environmental protection regulations, and to administer regulatory permits related to these. Although climate change is not specifically mentioned, the law’s language would appear to convey authority to regulate CO<sub>2</sub> emissions within the FSM and also potentially to address sources of ocean acidification to the extent that can be locally accomplished.
- 3) *Trust Territory Endangered Species Act of 1975* (PL 6-55§1, codified Title 23 FSMC Ch. 3) – Calls for the production of a list of native species within the FSM considered as Threatened or Endangered and assigns responsibility for protection and management of such species to the Chief Conservationist within the Department of Resources and Development (R&D). States that “The indigenous plants and animals of the Trust Territory are of esthetic [sic], ecological, historical, recreational, scientific and economic value and it is the policy of the government of the Trust Territory to foster the well-being of these plants and animals by whatever means necessary to

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<sup>5</sup> Statutory authorities in the FSM are codified under Chapters of the Code of the Federated States of Micronesia (FSMC), and are referred to here by their FSMC numbers. The latest official revision of this Code was undertaken in 1997, but updates were subsequently made in 2001 pursuant to PL 12-12, and this latter modified codification is followed here. In addition, each of the four states in the FSM have their own individual constitutions and legal codes which are compatible with but modify to varying degrees the national-level laws. The current review deals only with the national-level statutes.

prevent the extinction of any species or subspecies from our islands or the waters surrounding them.” Passed during the Trust Territory period, the authorities in this statute have been incorporated into the post-independence FSM legal code. Although climate change is not specifically mentioned, the authorities provided to R&D provide broad leeway for addressing climate change threats to native species, provided they are listed as Threatened or Endangered.

- 4) *Educational System* (PL 8-132§4, codified Title 40 FSMC Ch. 1) – Confers authority to the FSM Secretary of Education to “administer and coordinate the educational system” including coordination of “efforts to obtain foreign assistance for the States and to distribute foreign aid for education in an equitable manner which will provide the maximum benefit to the students of the FSM” and providing “technical assistance to the States concerning educational administration, programs, facilities and training.” Although climate change is not specifically mentioned, it appears that the FSM Department of Education has the authority to receive OIA funding and technical assistance in regard to climate change curricula and outreach materials.
- 5) *College of Micronesia* (PL 7-29§1, codified Title 40 FSMC Ch. 4) – Establishes the College of Micronesia as a public corporation overseen by a Rector and Board of Regents, with a mandate to promote high quality, post-secondary education and to “conduct research, and to disseminate such knowledge and advanced learning as the Board may from time to time prescribe...” These authorities would make the college a logical entity to pursue vulnerability analyses and adaptation plans related to climate change.

## Institutions

The FSM executive branch agencies with responsibilities related to climate change are as follows:

- 1) *FSM Office of the President* – This office has the authority to issue executive orders related to climate change matters, such as setting up working groups or task forces. The Office of the President also oversees the following offices that have a nexus to climate change issues:
  - a. *Office of Statistics, Budget, and Economic Management Overseas Development* (SBOC) – This office is responsible for economic policy, strategic planning, and compiling statistics – including those related to the energy sector. As is the case in many countries, these plans do not always incorporate long-term natural resource management and/or cultural site preservation goals.
  - b. *Office of Administrative Services* (OAS) – This office contains the Division of Archives and Historic Preservation. The bulk of this Division’s funding has historically come from the National Park Service, and then been distributed to individual FSM states. Building the capacity of OAS to undertake a vulnerability

analysis of cultural properties and sites may be desirable to OIA and other funders.

- 2) *Department of Transportation, Communications and Infrastructure* (TCI) – This agency is responsible for road construction, maintenance of national government structures, and regulation of air and sea transportation. Its authorities make it the logical point of contact for vulnerability assessments and adaptation strategies involving roads, harbors, and airports.
- 3) *Department of Resources and Development* (R&D) – The director of this agency is given the authority by statute with administering marine and land-based natural resources, including fisheries and agriculture, and with overseeing provisions of the FSM endangered species legislation (Title 23 FSMC Ch. 3), including management and protection of taxa listed in regulations subsequently promulgated under that statute. This department also contains the Division of Statistics (see the related SBOC in the Office of the President above). In addition, R&D contains the FSM energy office, with a staff of one, which has oversight of the renewable energy sector. The Department of Resources and Development is responsible for implementing the FSM commitments to the Micronesia Challenge.
- 4) *Office of Environment and Emergency Management* (OEEM) – This agency has the responsibility for overseeing commitments related to environmental treaties and conventions to which the FSM is a party, and is also responsible for disaster response. In the latter context, it was heavily challenged during 2015 by the successive impacts of Typhoon Maysak, which hit Chuuk and the outer islands of Yap in late March of 2015; Typhoon Noul, which hit the main island of Yap in early May of 2015; and Typhoon Dolphin, which caused damage to Kosrae and Pohnpei, also in early May of 2015. Based on these events, OEEM is re-evaluating its disaster response plans, and this might represent a timely point of engagement for integrating future climate change projections, including potential higher incidence of strong storms, into such plans.
- 5) *Department of Human Resources* (DHR) – This department has oversight of authorities previously held by the FSM Environmental Protection Board, the equivalent of the RMIEPA in the Marshall Islands. This department has largely interpreted its authorities as being focused on health and sanitation, although the authorizing legislation also implicitly conveys authorities to regulate local emissions of CO<sub>2</sub> and other greenhouse gases.
- 6) *Department of External Affairs* (DEA) – This agency represents the FSM at regional and international meetings, including those where climate change is discussed. It appears to be a potential point of liaison for conceptual discussions regarding climate change adaptation initiatives.
- 7) *Department of Foreign Affairs* – This ministry is the lead agency in regard to coordinating financial assistance from foreign nations for climate change and other

matters. It would seem to be an obligatory initial point of contact in regard to international funding for climate change adaptation initiatives in the FSM.

- 8) *Department of Education* – Established by statute (40 FSMC Ch. 1), this department oversees education and outreach efforts throughout the FSM, and is the logical point of engagement for climate change education initiatives.
- 9) *Department of Health and Social Affairs (DHSA)* – This department has responsibility for public health, and also sports. It is the lead agency for development of the FSM National Climate Change and Health Action Plan, a document that has not yet been completed.
- 10) *Kosrae Utilities Authority (KUA)* – This is the local power company that serves Kosrae. Given the absence of a central power authority in the FSM, it is a key point of contact for implementation of renewable energy strategies in the state of Kosrae.
- 11) *Pohnpei Utilities Corporation (PUC)* - This privately owned power company serves Pohnpei and also runs the island's drinking water system. Given the absence of a central power authority in the FSM, it is a key point of contact for implementation of renewable energy strategies in the state of Pohnpei and also for implementing watershed management strategies that take account of potential future climate change impacts.
- 12) *Chuuk Public Utilities Corporation* - This is the local power company that serves Chuuk. Given the absence of a central power authority in the FSM it is a key point of contact for implementation of renewable energy strategies in the state of Chuuk.
- 13) *Yap State Public Service Corporation (YSPSC)* – This is the local power company that serves Yap. Given the absence of a central power authority in the FSM it is a key point of contact for implementation of renewable energy strategies in the state of Yap.
- 14) *College of Micronesia* – Established by statute as a public corporation and located on Pohnpei, this is the only institution of higher education in the FSM. This institution may offer a promising venue for development of centralized GIS capacity that can be applied to vulnerability assessments on a nationwide basis.
- 15) *Office of National Archives, Culture, and Historic Preservation (NACH)* – The mission of this office is to “protect and preserve the diverse cultural heritage of the peoples of Micronesia, and in furtherance of this policy to assist in the identification and maintenance of those areas, sites and objects.” It is the obvious point of engagement for any assistance regarding climate change impacts to cultural sites.

## Actions

- 1) *Nation Wide Integrated Disaster Risk Management and Climate Change Policy* (2013) – Completed in June of 2013, this is a largely aspirational document that calls out future goals and assigns general responsibilities for the implementation to various executive branch departments. It discusses vulnerability assessments for various sectors, and notes the significant need for enhanced GIS capacity and updated digital elevation models on a countrywide basis for the visualization of risks.
- 2) *FSM Energy Policy* (2012) – Building on a previous study prepared in 1999, this two volume document lays out countrywide renewable energy and energy efficiency goals, including increasing the renewable energy sector to 30% of total generation by 2020 and concurrently improving energy efficiency by 50%. It also provides both national and state-level energy plans designed to meet the proposed targets.
- 3) *FSM Agriculture Policy 2012-2016* (2012) – This document serves as a “basis for action by both public and private sectors to invigorate sustainable agriculture growth in the Federated States of Micronesia.” It does make specific mention of climate change but mostly in the context of factoring potential impacts into future plans related to specific crops or farming systems rather than in a broad, strategic context for the sector.
- 4) *FSM Framework National Water and Sanitation Policy* (2011) – This framework was developed with assistance from the GEF, following Integrated Water Resources Management (IWRM) guidelines. The initial framework was formally endorsed by the FSM President and the four state Governors in March 2011 with the objective of having a fully developed policy in place by early 2013. It is not clear if such a policy has yet been completed. The goals set forth in the framework include ensuring access to safe drinking water for all citizens of the FSM and the promotion of sustainable forestry and watershed practices so as to ensure adequate water production. Climate change does not seem to be specifically mentioned in the framework but could be made an element of the emerging policy. This is an area of potential contribution and collaboration at the human health and climate change nexus (also see *FSM National Climate Change and Health Action Plan* below).
- 5) *FSM National Climate Change and Health Action Plan* (2011) – The process of developing this policy was initiated in September 2011 at a workshop in Pohnpei, with a stated goal of “mainstreaming of climate change considerations into activities for the health sector.” The lead agency for the development of this policy is DHSA.
- 6) *FSM State-Wide Assessment and Resource Strategy* (2010) – Although not completely evident from its name, this document is a strategic forest resources management plan covering timber harvesting, soil conservation, and watershed management. Although it does not specifically address climate change adaptation, it does contain references to climate change. There are some overlaps in terms of focus and objectives with the Framework National Water and Sanitation Policy mentioned previously, and as in that case, international collaboration and support

might prove useful in integrating climate change perspectives into the overall watershed management dialogue in the FSM.

- 7) *FSM Climate Change Policy 2009* (2009) – Promulgated by executive decree, this policy directive charged the agriculture, energy, water, infrastructure, transport, finance, and health sectors in the FSM government with updating their existing plans to reflect measures to mitigate and adapt to climate change.
- 8) *FSM 2004-2023 Strategic Development Plan* (2004) – This twenty-year guidance document lays out a large number of well-reasoned approaches to climate change and other challenges facing the FSM. In particular, its Strategic Goal 1 aspires to “Mainstream environmental considerations, including climate change, into national policy and planning as well as in all economic development activities.” In support of this, the document calls for comprehensive land-use planning and zoning, development of GIS centers in all four states, and nationwide assessments of land cover and other natural resources. This plan would seem to provide an excellent framework by which OIA and other partners could engage at numerous sector levels with currently defined objectives and activities, some of which have as yet to be put into practice.
- 9) *FSM Biodiversity Strategy and Action Plan* (2002) – Funded by the UNDP’s Global Environmental Facility, this plan was designed to help the FSM fulfill its commitments under the UN Convention on Biodiversity, and to foster sustainable natural resource management. This plan makes specific note of climate change threats to native biodiversity – including sea level rise, changes in precipitation patterns, and potentially increased frequency of tropical storms – but does not contain adaptive management recommendations to address climate change threats.

In addition to the above local efforts, the RMI is also a partner in several International Initiatives, including:

- 10) *The Micronesia Challenge* – To date, the FSM government has contributed \$5.2 million to the Micronesia Challenge Endowment. Participation is coordinated through the Department of Resources & Development.
- 11) *Majuro Declaration for Climate Leadership* – The FSM is a party to the Majuro Declaration. Its commitments in the context of this document include a 50% reduction in the use of imported petroleum fuels by 2020, generation of 10% of urban electricity and 50% of rural electricity from renewable sources by 2020, and an increase in forest cover and coral reef health.
- 12) *2015 United Nations Climate Change Conference, Conference of the Parties 21* – The FSM was a party to COP 21, and prior to the start of the conference submitted an Intended Nationally Determined Contribution of climate change mitigation targets for the country with an unconditional commitment to a 28% cut to its greenhouse gas



emissions below year 2000 levels by 2025 and a conditional target of an additional 35% reduction over year 2000 levels by 2025 if additional financial, technical, and capacity building support becomes available from the international community. In particular, the need to design a national inventory system and develop a domestic Monitoring, Reporting and Verification framework for greenhouse gas emissions is a specifically identified technical need. The FSM also notes that, similar to the RMI and other small island developing states, its contribution to global climate change is marginal whereas its adaptation costs are high.

The following policy and analysis documents have also been prepared by third parties working in concert with the FSM government:

- 13) *Climate Change Legislation in the Federated States of Micronesia* (2015) – Prepared by the Gratham Research Institute on Climate Change and the Environment, this is a stand-alone excerpt (Nachmany et al. 2015) from a broader review of climate change legislation across 99 countries worldwide. It is the only such review for any of the three FAS and contains a useful summary of recent legislative and executive actions.
- 14) *Federated States of Micronesia Country Energy Security Indicator Profile 2009* (2012) – Prepared by the Secretariat of the Pacific Community, this document assesses the current status of the FSM energy sector using a wide array of metrics and indicators (SPC 2012b).

## Future Needs

Like the RMI, the FSM has limited economic and technical resources for addressing climate change vulnerability and adaptation, and therefore the nation relies largely on foreign donors and organizations to collaborate on studies necessary to plan for future impacts. Although certain studies have already been undertaken in the energy sector (SPC 2012b), the following areas appear to represent clear near term needs:

- 1) *Integrated Climate Change Adaptation Strategy* – Given the highly decentralized nature of land ownership and government authority in the FSM, the development, adoption, and communication of a nationwide climate change adaptation strategy will be a complicated task. This is an area where the central government could provide an important and unifying role in the face of a common threat faced by all four constituent FSM states. The recent FSM Climate Change Act of 2013 called for most executive branch departments to complete climate change plans. The progress of these separate climate change plans is unclear to the authors of this report. Developing a cohesive synthesis from emerging plans of individual agencies, and then integrating this with the existing FSM 2004-2023 Strategic Development Plan (which already has a significant climate change adaptation component) will be a substantial task. International and OIA funding could be directed toward assisting agencies in completing the plans and subsequent prioritization could in turn form the

basis for sequencing future funding proposals for specific climate change adaptation projects.

- 2) *Land-Use Management Planning and Zoning* – A detailed, GIS-based assessment of inundation risk needs to be undertaken for all islands in the FSM, particularly the outlying atolls, in order to understand the full extent of vulnerabilities faced by infrastructure and communities and as a basis for scenario planning in the event certain strategic retreats are required. In addition, there is a clear need to update the land cover analysis for the high islands in the FSM in order to assess the magnitude of significant recent losses of primary forest due to clearing for agriculture (e.g., on Pohnpei for kava cultivation in the uplands) and as a baseline by which to assess future climate-driven vegetation shifts. Highlighted as a specific need in the FSM 2004-2023 Strategic Development Plan, there is a distinct lack of GIS capacity in the country with which to implement such analyses, and this is an area where external funding could help to fill a significant gap, possibly working through the University of Micronesia or the Department of Resources & Development.
- 3) *Energy Policy Implementation* – The FSM currently meets over 99% of its energy needs from imported fossil fuels (SPC 2012b). This creates challenges both in terms of foreign exchange and climate change adaptation. Although there has been emerging adoption of solar photovoltaic technologies, primarily on Chuuk and Kosrae, the alternative energy sector accounts for only 0.04% of total generation in 2009 (SPC 2012b). The nation's only hydroelectric generating plant, on Pohnpei, is currently inoperable. Due to its fragmented geography, the power generation sector in the FSM is of necessity highly segmented, with each of the four states having a separate utility company, and fewer than 50% of households having a direct connection to one of these local grids, a significantly lower percentage than in the RMI or Palau. This would make the country an excellent candidate for deployment of distributed PVE systems, which would also reduce carbon emissions and fossil fuel dependence. Despite the development of a national energy plan in 2012, subsequent implementation appears to have been tentative at best. Assistance could be directed to development of policies for interconnection of renewable energy sources to the existing power grid, net metering in relation to the four major power companies on Kosrae, Pohnpei, Chuuk and Yap, and deployment of renewable energy technologies on the smaller outlying islands.

# 7. Republic of Palau

## Authorities<sup>6</sup>

- 1) *Palau Public Lands (PNCA Title 35 Ch. 1-2)* - Defines as public lands all lands in Palau that were previously held by the Japanese administration prior to World War II or the subsequent Trust Territory Government. It also asserts government title to all submerged lands below the normal high watermark. Creates an autonomous Palau Public Lands Authority, governed by a Board of Trustees, whose purpose is to, among others, “administer, manage and regulate the use of lands and income arising therefrom in trust for the people of the Republic.” Given this mandate, it would appear that the Palau Public Lands Authority has control over land-use decisions for all submerged lands in the country, which has a clear nexus to climate change adaptation.
- 2) *Palau Environmental Protection Act (PL 1-58§1 modified; PNCA Title 24 Ch. 1)* - Establishes a Palau Environmental Protection Board in the Office of the President. This board is responsible for preparation of an annual report on the “status and condition of the major natural, man-made, or altered environmental classes of the Republic, including but not limited to, the air; the waters, including marine, estuarine and fresh water; and the terrestrial environment, including but not limited to, the forest, mangrove area, beaches, reefs, dryland, wetland, urban and rural environment.” This annual report is also tasked to contain information on “Current and foreseeable trends in the quality, management and utilization of such environments and the effects of those trends on the social, economic, and other requirements of the Republic.” The language of this act is very wide-reaching, requiring that to the fullest extent possible all other policies, regulations, and public laws be interpreted and administered in accordance with it.
- 3) *Palau Community College (PL 4.2§3(2) modified; PNCA Title 22 Ch. 3)* - Establishes a Palau Community College as a public, non-profit educational corporation to “make high quality, postsecondary education available to the citizens of the Republic of Palau, the Republic of the Marshall Islands, and the Federated States of Micronesia” and to serve as an agency for Land Grant and Sea Grant programs and related extension services.
- 4) *Historical and Cultural Preservation Act (PL 1-48§1(a) modified; PNCA Title 19 Ch. 1)* - Establishes the Palau Historical and Cultural Advisory Board supported by a Division of Cultural Affairs, with duties including a requirement to “prepare, review and revise a national historical cultural preservation plan, including budget

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<sup>6</sup> Statutory authorities in Palau are codified under Chapters of the Palau National Code Annotated (PNCA), and are referred to here by their PNCA numbers.

requirements, land-use recommendations, and plans for the support, maintenance and sponsorship of living national treasures.”

- 5) *Aeronautics* (PL 7-35 as amended; *PNCA Title 8 Ch. 1*): Specifies that the Ministry of Public Infrastructure, Industries and Commerce has responsibility for “establishment of airports and air navigation facilities in appropriate areas” and specifies that it may receive financial aid from the United States government for these purposes. Although climate change is not mentioned, this statute appears to allow its effects to be taken into account when locating or re-locating aviation facilities.
- 6) *Executive Branch Organization Act* (PL 7-8-8§1 modified; *PNCA Title 2 Ch. 1*) Establishes the Ministries of State; Public Infrastructure, Industries and Commerce; Health; Education; Community and Cultural Affairs; and Natural Resources, Environment and Tourism, among others (this list includes those which appear to have some potential nexus to climate change adaptation). The Executive Branch Organization Act lays out the functions of these ministries as follows:
  - *Ministry of State* – This agency is responsible for national defense, treaty matters, relations with other nations, the United Nations and other international organizations.
  - *Ministry of Public Infrastructure, Industries and Commerce* – This agency is responsible for operation and design of major public infrastructure including public utilities, ports, roads, airports, and communications, as well as land surveys.
  - *Ministry of Health* – This agency is responsible for public health and operation of public medical facilities.
  - *Ministry of Education* – This agency is responsible for overseeing public elementary and secondary schools, and developing their curricula.
  - *Ministry of Community and Cultural Affairs* – This agency is responsible for oversight of cultural and historical resources, including the Palau Museum; the development and management of park facilities; and social welfare programs.
  - *Ministry of Natural Resources, Environment and Tourism* – This agency is responsible for natural resource management and development, including oversight of commercial fishing, agriculture, aquaculture, and silviculture; development of tourism; and environmental protection and management. It also contains the Bureau of Labor and Human Resources, which deals with labor issues.

## Institutions

Palau executive branch agencies with responsibilities related to climate change are as follows (for further detail on specific agency tasking in regard to climate change the reader is referred to Annex 1 of the 2015 Palau Climate Change Policy):

- 1) *Palau Office of the President* – This office has the authority to issue executive orders related to climate change matters, such as setting up working groups or task forces to develop new policies and plans.
  - a. *Palau Environmental Quality Protection Board (EQPB)* – Established by statute within the Office of the President, this board oversees environmental reviews and drinking water regulations. In addition, it is required to produce an annual status and trends report for Palau’s marine, freshwater and terrestrial ecosystems. This latter mandate makes it a logical partner to engage in climate change monitoring and adaptation activities. Its mandates appear to overlap to some degree with those of the Ministry of Natural Resources, Environment and Tourism but may preempt due to the broad language of its authorizing statute (see Authorities section above).
  - b. *Office of Environmental Response and Coordination (OERC)* – Established in 2001, this office coordinates and implements Palau’s commitments to the United Nations Framework Convention on Climate Change, the UN Convention on Biodiversity, and develops other broad and coordinated planning approaches to environmental issues. It is also charged with integrating climate change considerations into national and state level land-use and marine spatial plans. Its portfolio would seem to make it a potential point of contact in regard to both regional climate change adaptation initiatives and in-country land-use planning.
- 2) *Ministry of Finance (MOF)* – Established by statute (Title 2 PNCA Ch. 1), this agency oversees fiscal matters in Palau and was recently given lead responsibility in regard to coordinating climate change adaptation under the 2015 Palau Climate Change Policy. The following bureaus and offices within this agency have a direct nexus to climate change matters:
  - a. *Bureau of Budget and Planning* – Deals primarily with other government agencies in relation to fiscal matters but also interfaces with the private sector and international organizations in regard to national or regional planning efforts. This bureau also contains the Office of Planning and Statistics which compiles statistical records in wide variety of areas, including both environmental and climate variables.
    - i. *Office of Palau Automated Land and Resources Information System (PALARIS)* – Originally established by executive order under the Bureau of Land Survey, and subsequently promoted to a separate national-level office in the Ministry of Public Infrastructure, Industry and Commerce by executive order, and then moved again by executive action to the Ministry of Finance, the PALARIS office is responsible for developing the national GIS system for Palau, providing services to all other executive branch agencies. OIA has previously provided funding to this office through a technical assistance grant, and it remains an important area for potential future investment given its potentially key role in vulnerability assessments.

- ii. *Office of Climate Change* – Newly created by executive action in 2015, this office is responsible for annual review of the Palau Climate Change Policy and its implementation, and with developing an updated Climate Change Action Plan at five year intervals.
- 3) *Ministry of Natural Resources, Environment and Tourism (MNRET)* – This ministry, established by statute (Title 2 PNCA Ch. 1) oversees many broad authorities for natural resource management as established under 24 PNCA, Divisions 2 and 3, pertaining to wildlife protection and protected areas respectively. It contains three bureaus that have authorities applicable to climate change adaptation.
  - a. *Bureau of Agriculture* – This agency has oversight of the agricultural sector as a whole, although this task is complicated by the fact that at least 12 other agencies have roles in regulating or servicing this sector. The Bureau of Agriculture’s conservation mandates also seem to overlap with those of programs in other agencies.
  - b. *Bureau of Marine Resources (BMR)* – This agency has authority for conservation and management of fisheries, coral reef ecosystems, and all other aspects of marine biodiversity in Palau. It therefore represents a potentially important point of contact for climate change adaptation and resilience planning related to coral reefs.
  - c. *Protected Areas Network (PAN)* – This office, which receives support from The Nature Conservancy, is charged with overseeing the national network of protected areas. Many of these areas include coral reefs, which are vulnerable to climate change impacts.
- 4) *Ministry of Public Infrastructure, Industry and Commerce (MPIIC)* – This ministry, established by statute (Title 2 PNCA Ch. 1), has authority over infrastructure and land surveys. As such, it is a key point of engagement for vulnerability analyses.
  - a. *Bureau of Aviation* – This bureau is responsible for operation and maintenance of airports. Although the main international airport on Babeldaob lies inland at an elevation of 160 feet above sea level, and is therefore not at risk of inundation, the two regional airstrips on Peleliu and Angaur islands by contrast lie at elevations of 10 feet or less and thus possess certain vulnerabilities to future sea level rise.
  - b. *Bureau of Public Works (BPW)* – This bureau is responsible for roads, ports, utilities, and other public infrastructure and also contains the Palau Energy Office, which has oversight of renewable energy and energy efficiency projects in the country.

- c. *Bureau of Lands and Survey (BLS)* – This bureau is responsible for platting and registration of land ownership but does not oversee zoning regulations (see subsequent discussion under the Palau Public Lands Authority).
- 5) *Palau Public Lands Authority (PPLA)* – Established by statute, this agency has control of all land-use decisions regarding submerged lands in Palau as well as emergent lands also considered as public lands. This makes it one of the stronger land-use entities in the Palauan government, with authority to enforce land-use restrictions in accordance with environmental and historical preservation laws. It would appear to be an important player in regard to climate change adaptation strategies in the coastal zone. The PPLA may delegate some of its powers to a locally based State Public Lands Authority but still retains ultimate oversight.
- 6) *Palau Public Utilities Corporation (PPUC)* – This is a public corporation established to operate electrical power, water, and wastewater systems in the country. It is therefore an important entity in regard to development and implementation of alternative and renewable energy sources and energy conservation strategies.
- 7) *Ministry of Health (MOH)* – This ministry, established by statute (Title 2 PNCA Ch. 1) does not have any legal mandates specifically related to climate change but does have responsibility for responding to any new disease outbreaks that might occur as a result of climate-mediated expansion of potential vectors.
- 8) *Ministry of Education (MOE)* – Established by statute (Title 2 PNCA Ch. 1), this agency contains a Bureau of Curriculum and Instruction which appears to be a potential point of engagement for development of climate change outreach materials.
- 9) *Palau Community College (PCC)* – Established by statute (Title 22 PNCA Ch. 3), this is an accredited, public, non-profit educational institution governed by a Board of Trustees. It also serves as the host for Land Grant and Sea Grant programs in Palau( and their associated extension services) making it a logical partner for climate change education and outreach activities.
- 10) *Ministry of Cultural and Community Affairs (MCCA)* – Established by statute (Title 2 PNCA Ch. 1), this ministry has management authority over cultural sites and their preservation through its Bureau of Arts and Culture. Although climate change is not mentioned in its authorizing statute, the authority to recommend land-uses in regard to cultural and historic preservation provides a basis for the Division to address threats from rising sea level to sites in the coastal zone.
- 11) *National Emergency Management Office (NEMO)* – This office is responsible for upgrading emergency response systems to deal with future climate change impact events, with a focus on capacity, equipment, financial resources, and institutional structure.

## Actions

- 1) *Palau Climate Change Policy for Climate and Disaster Resilient Low Emissions Development* (2015) – Funded by multiple international donors, including the European Union, the Secretariat of the Pacific Community, and USAID, this document addresses climate change adaptation strategies, greenhouse gas emission reduction, and disaster risk management. The policy sets out a national goal of providing 20% of energy needs from renewable resources by 2020 and to reach a carbon neutral status by 2050. It provides assessments and recommendations for nine sectors: Agriculture and Fisheries; Health; Biodiversity Conservation and Natural Resources; Society and Culture; Tourism; Critical Infrastructure; Utilities; Finance, Commerce and Economic Development; and Education. Annex 1 to this document contains a 5-year action plan with detailed breakdowns of actions, deliverables, responsible agencies and, in some cases, budgets for specific items.
- 2) *National Energy Policy* (2010) – This policy outlines the need to pass a national energy act and create a centralized national energy administration, and calls for the establishment of a National Energy Committee.
- 3) *National Disaster Risk Management Framework* (2010) – This framework establishes a mechanism for incorporating disaster risk and mitigation, and potentially climate change adaptation and mitigation, into national development planning, as the framework specifically recognizes that “accelerated global warming exacerbates climate variability which increases the frequency and severity of natural disasters in the Pacific.” It calls for all ministries and agencies of the Executive Branch to coordinate efforts and cooperate to meet challenges posed by disasters and national emergencies.
- 4) *Actions for Palau’s Future – The Medium-Term Development Strategy 2009 to 2014* (2009) – Prepared by the Government of Palau with assistance from the Facility for Economic and Infrastructure Development, and the Asian Development Bank, this document summarizes challenges, opportunities, and current internal regulatory structures for the environment, tourism, fisheries, agriculture, infrastructure, and education sectors, among others. It provides important insights into areas where regulatory or agency organizational reforms are needed.

In addition to the above local efforts, Palau is also a partner in several International Initiatives, including:

- 5) *The Micronesia Challenge* – Palau initiated the Micronesia Challenge in 2005 during the first administration of President Tommy Remengesau. To date, the Palau government has contributed \$9.1 million to the Micronesia Challenge Endowment, and the main Micronesia Challenge offices are located on Koror.



- 6) *Majuro Declaration for Climate Leadership* – Palau is a party to the Majuro Declaration. Its commitments in the context of this document include a 30% reduction in energy consumption through energy efficiency and conservation, generation of 20% of electricity from renewable sources by 2020, and improvements in energy sector policy.
- 7) *2015 United Nations Climate Change Conference, Conference of the Parties 21* – In company with the RMI and the FSM, Palau was a party to COP 21 in Paris. Prior to the start of the conference, Palau submitted an Intended Nationally Determined Contribution of climate change mitigation targets for the country, with the stated goal of a 22% cut to energy sector greenhouse gas emissions from 2005 levels by 2025, a 45% renewable energy target by 2025, and a 35% energy efficiency target by 2025.
- 8) *Institutional Strengthening in Pacific Island Countries to Adapt to Climate Change (ISACC) Project* – In February 2017 a joint assessment team led by the Pacific Islands Forum Secretariat (PIFS), with the Pacific Community (SPC) and the USAID/SPC, in partnership with the Government of Palau, initiated an assessment of “the practical application of options for improved access to, and management of, climate change and disaster risk finance for Palau. The assessment and resulting report and recommendations will identify opportunities to develop or update relevant policies and plans, strengthen human capacity, enhance institutional coordination and ensure that cross-cutting issues like gender and social inclusion are mainstreamed and supported.” This assessment should provide useful information to OIA for future technical assistance on climate change adaptation activities in the natural resources, energy, and infrastructure sectors.

The following policy and analysis document has also been prepared by third parties working in concert with the Palau government:

- 9) *Palau Country Energy Security Indicator Profile 2009 (2012)* – Prepared by the Secretariat of the Pacific Community, this document assesses the current status of the Palau energy sector using a wide array of metrics and indicators (SPC 2012c).

## Future Needs

Self-identified needs in Palau include institutional capacity-building, information management, and increasing community resilience and engagement.

- 1) *Vulnerability Assessment* – A climate change vulnerability assessment using GIS-based vulnerability mapping is recommended. Palau does not seem to have a current climate change vulnerability assessment at the national level. A GIS-based study, using capacity previously funded by OIA in the PALARIS office, would be extremely useful in visualizing future risks, especially at Kayangel Atoll in the north of the country which is vulnerable to inundation. In addition, because many of the

inhabited islands in Palau have steeply dropping limestone hills, with narrow coastal flats backed by cliffs, a significant amount of vital infrastructure is located very close to the mean high water mark. Therefore, a specific assessment of coastal hazards and projected future inundation and erosion trends is important in regard to zoning and land-use planning. This could be undertaken prior to, as part of, or in parallel with the overall vulnerability assessment recommended above, and could be a separate funding initiative.

- 2) *Energy Policy Implementation* – Palau is similar to the other FAS in that it currently meets over 99% of its energy needs from imported fossil fuels (SPC 2012c), which is undesirable in terms of both foreign exchange and climate change adaptation. Due to the fact that its population is relatively tightly concentrated on a few closely proximal islands in the north of the country, 99% of Palau households are connected to the public electrical grid and there is only one public power company (in comparison to the dispersed situation in the FSM where there are 4 separate power companies, and less than 50% of households have a grid connection). This centralization of population and power infrastructure makes Palau a promising candidate for deployment of alternative energy technologies. There has been some adoption of solar photovoltaic panels, primarily as demonstration systems on government buildings, but these accounted for only 0.3% of the total electricity generation in 2009 (SPC 2012c), and 2.2% presently (the latter according to figures presented in the 2015 Palau Climate Change Policy). The SPC analysis also concluded that Palau was the most energy-inefficient country among small Pacific island states as a whole, indicating there were significant gains to be made from both renewable sources and conservation. Although progress has been made since the 2009 energy audit, assistance potentially could be provided in regard to promoting deployment of residential rooftop solar photovoltaic capacity, and concurrent development of policies for interconnection of such renewable energy sources to the existing power grid, clarifying a net metering scheme, and general improvements to energy efficiency across the country's economy as a whole.

## 8. Discussion

Moving forward in preparations for climate change requires collaboration at multiple scales. This chapter considers opportunities for improved collaboration, beginning with insights gained from the climate change adaptation workshops followed by a discussion on the major implications of the climate change adaptation capacity assessment. We conclude with recommendations on future opportunities to support climate change resiliency in the U.S. Pacific Territories and Freely Associated States.

### Workshop Observations and Recommendations

#### *In General*

CNMI, Guam, American Sāmoa all have the need for a permanent, high-level climate coordinator who is not affiliated with any department in order to improve cross-departmental coordination and avoid the appearance that climate change activities are being driven by any single department.

In each of the workshops held in the U.S. Pacific Territories, natural resource agency staff expressed that they had been trying to address climate change through building resilience in their management efforts for several years. However, there was a sense of frustration because of the lack of funding, policies, regulations, and/or political will for them to carry out the needed actions (e.g., too few enforcement officers to support existing regulations regarding fisheries, the lack of forestry management practices needed to build resilience). In some cases, the necessary plans had been developed but not implemented, which supports the frequently-heard observation that what the jurisdictions need are additional staff positions (or the funding to support them) in order to build long-term institutional capacity.

Some of the most pressing climate change vulnerabilities identified by workshop participants were related to infrastructure. However, the presence of infrastructure often increases the vulnerability of natural resources, both now and into the future. This is specifically the case with stormwater and wastewater runoff into marine systems, and coastal roads that block the natural adaptive capacity of coastal ecosystems. This tension could be addressed by focusing funding efforts on sustaining and restoring natural infrastructure where feasible (e.g., coastal mangrove forests, wetlands, and natural drainage features).

Local government capacity to incorporate climate change into existing decision frameworks seemed to be a pervasive issue. While agency employees can be directed to participate in workshops, when they return to their daily routine climate change is not

part of their job description (with a few notable exceptions). What is needed is an approach that “mainstreams” climate change into agency missions and work plans.

Each jurisdiction expressed the desire to design and/or improve GIS databases. Funding offered on this could be designed to support the objectives of climate change project(s) and agencies in climate change relevant decision-making roles.

CNMI and American Sāmoa expressed an interest in bringing in outside contractors (e.g., engineers) to work directly with agencies in “climatizing” their programs and plans. This will be necessary because the on-island capacity to do this work is so limited that there is a high risk of maladaptation, especially in the case of engineers who understand how to design projects that are environmentally sound.

In CNMI, Guam, and American Sāmoa, it remains to be seen how climate change efforts will be sustained through time and changes in leadership. At all three jurisdictional workshops frustrations were expressed related to this issue. American Sāmoa has suffered from regime change more so than elsewhere and this has manifested in the desire to recreate tasks that were done in previous administrations rather than build on previous climate change efforts.

## *CNMI*

The previously active Climate Change Working Group (established in 2014 to work on two vulnerability assessments) appears to have disbanded as of early 2016. Enough time has passed that the individuals involved have moved on to other projects, and most new agency staff were unaware of the assessments. As the Working Group had formed voluntarily and did not include all agencies with an interest in climate change, a possible solution to regaining momentum would be an executive order reconvening and formalizing the body or forming an Interagency Task Force.

## *Guam*

As of 2016, the political will regarding climate change seemed high in Guam relative to the other jurisdictions. An executive order was establishing to create a climate change body as well as conduct vulnerability assessments. The Governor appointed a high-level climate coordinator who reports directly to him and who worked diligently to ensure strong representation from both agency leadership and program staff at the workshop. The coordinator was vital to securing participation from agencies that previously had not worked on climate change.

## *American Sāmoa*

American Sāmoa also seems to have a level of political will to tackle climate change that presently is increasing. A Climate Change Task Force was identified in 2015,

although participation does not seem to be enforced but rather is voluntary. Additionally, it appears that the Task Force is mostly active at the subcommittee level.

There was a lack of local policy knowledge in American Sāmoa (e.g. which department is in charge of what aspect of policy guidance and development, regulatory oversight, program implementation, and data management). It might help for the Climate Change Task Force to break down some of the internal silos and increase information flow between departments, but it is likely that this is a systemic problem that needs to be addressed at all levels of government.

### *Workshop Recommendations*

Through the course of these climate change adaptation workshops, many project ideas were developed. Ideally, support would be provided to continue to develop these ideas and efforts in a collaborative way, perhaps by a climate change coordinator (as in Guam) or by a climate change point of contact for each agency. These individuals could follow up on the discussions and decisions of the collaborative group, as well as integrate within their agencies the information generated by funded projects. OIA or other funding bodies might consider funding support staff positions for this purpose.

There is a pervasive need for high level expertise to work directly within Territorial agencies to support mainstreaming climate change information, strategies, and actions into their existing programs, plans, and projects. It is extremely difficult for jurisdictional governments to identify and hire the high-level experts needed. Ideally, the federal government could begin providing more direct support by funding short-term sit-in positions to help build capacity within and across local agencies. There have been some examples of this type of approach which have been very successful (e.g., the NOAA CZM Fellow who developed the CNMI Vulnerability Assessments using his GIS and computer modeling skills). Positions like this occur in the FAS as well through U.S. Embassy Science Fellows and Peace Corps Response Positions.

## **Adaptation Capacity Assessment Findings and Discussion**

### *Climate Change Adaptation in the U.S. Pacific Territories*

Within the U.S. Pacific Territories, responsibilities for various aspects of climate change adaptation are spread out among multiple executive branch agencies and bureaus. At present, there is not a centralized office or program overseeing climate change vulnerability assessments or adaptation strategies in these jurisdictions. Yet CNMI, Guam, and American Sāmoa all have key individuals that have assumed roles as either designated or *de facto* climate change coordinators. These coordinators have different regulatory toolboxes to work with. For example, CNMI possesses agency-level staff with a useful base of skills in regard to climate change assessment, and has produced a model vulnerability assessment for Saipan. Both Guam and American Sāmoa have

frameworks established by executive order in the form of local task forces that meet periodically to discuss climate change issues, with specified timelines for outcomes in terms of associated plans and policies. All three U.S. Pacific Territories have recently completed energy action plans (Haase et al. 2013; Conrad & Ness 2013a, 2013b) and energy strategies (Conrad et al. 2013; Conrad & Esterly 2013; Conrad & Ness 2013c).

Due to the diversity of challenges that climate change adaptation seeks to build resiliency towards, the common occurrence of fragmented natural resource management authorities and overlapping mandates between agencies can be organizationally challenging. For instance, in the CNMI the DLNR has responsibility for fish and game laws, terrestrial and marine biodiversity, endangered species, forests, and agriculture, whereas the Division of Environmental Quality inside BECQ has responsibility for coral reef monitoring and the NOAA Coral Reef Conservation Program. The Division of Coastal Resources Management within BECQ has responsibility for coastal land management and zoning and aspects of marine resource protection since it can designate Areas of Particular Concern based on the presence of coral reefs or mangroves. At the same time, DLNR has explicit statutory authority for management of marine resources, leading to an overlap of mandates and responsibilities. Overall, there will be a need for institutional integration of climate change adaptation efforts in the CNMI since the current efforts are being directed from the Bureau of Coastal and Environmental Quality without a formal charge or mandate. These efforts are laudable and have produced some excellent products in terms of vulnerability assessments. Increasing the integration of adaptation strategies at the inter-departmental level will help this climate change adaptation work as it goes forward.

Natural resource management on Guam is organized with the primary stewardship responsibilities vested in several divisions under the Department of Agriculture. As with CNMI, the oversight of the NOAA Coral Reef Conservation Program in Guam lies with a bureau in the governor's office, in this case the Bureau of Statistics and Plans, which is outside the line resource management agency structure. The current Governor's POC for coral reef issues, including representation to the U.S. Coral Reef Task Force, is a representative of the Department of Land and Natural Resource's Division of Aquatic and Wildlife Resources. . Agency mandates and agendas for addressing the natural resource impacts of climate change are presently dispersed within the Guam executive branch, although the recent creation of a "Special Assistant to the Governor for Climate Change"( an unclassified position within the Office of the Governor) has enabled improved coordination on climate change adaptation in Guam.

In American Sāmoa, natural resource management authorities, formerly bifurcated between the Department of Commerce for NOAA-funded marine and coral programs on one hand, and the Department of Marine and Wildlife Resources for DOI-funded fish and game programs on the other, have been recently re-consolidated to some extent within DMWR by the Loliga administration. This makes sense in regard to statutory authorities and also provides a more centralized point of entry for funding support. The local Coral Reef Working Group contains representatives of all key departments (e.g., DOC, DMWR, EPA, AS Community College) that would represent logical partners in

addressing climate change impacts to natural resources and in providing outreach to the public.

In the U.S. Pacific Territories, support for embedded legal fellows within various executive branch agencies could be a very useful means of incorporating climate change language amendments into existing statutes and administrative rules. The authorizing statutes of most agencies lack specific reference to climate change; therefore the authority to address its effects is implied rather than explicit. By embedding fellows who have both a law degree on one hand and a certain degree of appropriate sector expertise on the other into selected agencies for 12 to 18 months, it would be possible to produce appropriately structured language relating to climate change that could then be incorporated into law, either through legislative action or agency rule-making. This is another avenue of support that funders might consider investigating in order to strengthen climate change adaptation capacity.

As a final note, it is not clear how unexpected changes in the governorship of the CNMI may affect the organization of executive branch agencies and bureaus in that jurisdiction. As such, it should be borne in mind that the analysis and recommendations contained in this document were developed in early 2016, and may not be entirely applicable in the context of new and future administrative changes.

### *Climate Change Adaptation in the Freely Associated States*

The Freely Associated States vary in regard to their authorities and governmental structures applicable to climate change adaptation. The RMI has a National Climate Change Policy Framework, produced in 2011, and an Office of Environmental Planning and Policy Coordination (OEPPC), which provides a focal point of contact for matters related to climate change. OEPPC provides the initial entry point for liaison and coordination, but vulnerability assessments or other technical work would appear to fall both statutorily and in terms of staff support with RMIEPA. In addition, the centralization of coastal management issues under a Director of Coast Conservation in RMIEPA provides consolidated authority for climate change adaptation discussions in regard to this critical geographic zone and is a model that could potentially be replicated emulated in FSM and Palau. Overall, RMI has the governmental organization and the base of planning by which to address climate change but is seriously hampered by a lack of financial resources and a dauntingly low-lying national geography that is acutely vulnerable to sea level rise.

In contrast to the RMI, authorities pertaining to natural resource management and environmental protection are highly fragmented in the FSM. The two chapters under Title 23 pertaining to Resource Conservation concern various restrictions in regard to means of take for marine species and the management of native species formally listed as threatened or endangered. Chapter 2 of this title, which would presumably apply to broader resource management authorities for wildlife as a whole, is currently reserved. The authorities of this chapter fall to the Department of Resources and Development, which as its name implies has mandates in regard to both resource utilization and



resource preservation. Title 24 pertaining to Marine Resources deals almost exclusively with fisheries regulations. In addition, there are competing jurisdictional claims between the states and the national government across multiple areas of environmental law and between different departments within the central government. This context can make addressing climate change impacts across various sectors more challenging. As noted in Boer (1996): “With little linkage between Departments regarding these emerging environmental issues, and little funding available to start new programs and Divisions, a coherent National Government response to varied environmental issues has been difficult to formulate.”

All of the states in the FSM have retained their traditional land tenure systems, and the country does not have a single overarching and centralized national agency with authority over land-use planning or zoning. Instead, land- use planning resides at the level of individual states. In Kosrae, land is mostly private, although rivers, submerged lands, and certain government facilities are considered public lands. On Pohnpei, over 50% of all lands are public, being held in collective trust by the government based on former tribal arrangements, with restrictions on ownership, leasing, and sale; the exceptions are Kapingamarangi and Nukuoro atolls, where most land is individually owned. In both Kosrae and Pohnpei, submerged lands are managed as public trust lands. On Chuuk most land is privately owned and passed down through matrilineal inheritance, with traditional rights prevailing over submerged lands as well, and little if any land treated as public or government-owned. There are currently no zoning or land-use laws on Chuuk. On Yap nearly all land, including submerged lands, is in private, traditional ownership. Given the highly decentralized patterns of land ownership and management in the states of FSM, it is understandably challenging to develop a national-level land-use planning and implementation processes to address the future impacts of climate change, particularly inundation of coastal zones. Similarly, there is not legislation currently extant at the national level for establishment of protected areas or nature reserves, or to address watershed management or forestry issues, which means that developing large-scale approaches to climate change adaptation in these sectors is more challenging.

Mirroring the case with land management and zoning, there is also no central government body equivalent in FSM to the environmental protection agencies seen in the other FAS or the United States Pacific jurisdictions. Although the FSMEPA legislation of 1984 would seem to provide the basis for a centralized system of environmental review, attempts by the central government to require environmental impact statements for large construction projects have been challenged by the individual states and not yet sorted out by the judicial branch. In some cases, such as Chuuk, there are no state-level equivalent authorities or agencies to oversee such environmental reviews. Overall authority for environmental and natural resource management is dispersed at the central government level among the Office of Environment and Emergency Management, the Department of Resources and Development, and Environmental Health, among others.



Each state in the FSM has its own electricity utility, rather than having a centralized energy and electoral power generation authority. Individual states and utilities have a limited number of small-scale PVE deployments that hold great promise given the widely distributed nature of the islands, but renewable energy technologies are still very limited in use.

The central government of the FSM has the technical ability but not the institutional structure and authorities necessary to implement extensive climate change plans at the national level. The government's decentralized structure means that implementation of climate change action is devolved to the individual states. Donor agencies and international partners working with the FSM therefore need to move forward within this structure, collaborating with central and state governments. The country's hundreds of low-lying atoll islets will rapidly face acute threats from rising sea levels. This shared threat may lead to a more cohesive response from the central government and states of the FSM.

The development of climate change plans and associated institutional frameworks are further along in the FSM and RMI than in Palau. In 2015 Palau completed a national climate change policy document and it is now beginning the process of policy implementation. In Palau the zoning regulations and building codes for private land holdings are under control of the individual states. Certain states on Babeldaob Island, notably Airai and Melekeok, have local master plans and zoning codes which make mention of climate change. Responsibilities relevant to climate change are dispersed among multiple environmental management authorities, with overlap between the Ministry of Natural Resources, Environment and Tourism on one hand, and the separate and autonomous Environmental Quality Protection Board in the Office of the President on the other. It would be helpful to have an overarching policy framework for environmental management in Palau that could complement and facilitate Palau's climate change policy.

## Future Opportunities

There are multiple opportunities for engagement on climate change assessment and adaptation within each of the U.S. Pacific Territories and FAS. These lie in a variety of sectors, as described below.

### *Zoning and Land-Use Management*

The production of spatially-based vulnerability assessments, particularly for assets in the coastal zone, will be vital. This involves both development and enhancement of centralized GIS capability, in order to clearly delineate and visualize the vulnerabilities, and some level of authority to implement, or at least recommend, proper zoning and land-use planning so as to minimize future impacts. The key offices for engagement in regard to land-use planning activities are:

*CNMI*: Department of Public Lands, Office of the Governor (Commonwealth Zoning Board, Bureau of Environmental and Coastal Quality)

*Guam*: Office of the Governor (Office of Technology, Bureau of Statistics and Plans Land-Use Planning Program GIS), Department of Land Management (Guam Land-Use Commission, Guam Seashore Protection Commission, Chamorro Land Trust Commission)

*American Sāmoa*: Department of Commerce (Territorial Planning Commission), Department of Education (American Sāmoa Community College GIS program)

*RMI*: National Environmental Protection Authority, Office of the President (Office of Environmental Planning and Policy Coordination)

*FSM*: Department of Resources and Development

*Palau*: Ministry of Public Infrastructure, Industry and Commerce (Bureau of Public Works; Bureau of Land Survey; Palau Automated Land and Resources Information System); Palau Public Lands Authority

### *Forest and Watershed Management*

One aspect of future climate change that has created significant concern is the potential for changes in precipitation patterns and stream discharges, which can in turn lead to impacts on municipal water supplies, agriculture, and biodiversity conservation. At the present time, prediction of such future trends is tenuous at best, given the lack of downscaled climate models for the region. Even so, it would seem prudent to undertake scenario planning even in advance of such pending model outputs so as to more clearly understand potential vulnerabilities and tradeoffs going forward. These could take the form of watershed management strategies, incorporating considerations for both water production and biodiversity conservation, particularly in regard to species formally listed as threatened or endangered. Such watershed studies will be of more immediate importance in Guam, American Sāmoa, FSM, and Palau, due to their perennial streams, and somewhat less so in CNMI, which has only a few perennial streams, confined to the island of Rota. The key offices for engagement in regard to forest and watershed activities are:

*CNMI*: Department of Lands and Natural Resources (Division of Fish and Wildlife)

*Guam*: Department of Agriculture (Division of Marine and Wildlife Resources, Division of Forestry and Soil Resources)

*American Sāmoa*: Department of Marine and Wildlife Resources, Department of Agriculture, American Sāmoa Natural Resources Commission

*RMI*: Not applicable in the absence of watersheds.

*FSM:* Department of Resources and Development

*Palau:* Ministry of Natural Resources, Environment and Tourism

### *Coral Reef and Marine Systems Management*

It has become clear in recent decades that coral reefs are among the most vulnerable of ecosystem classes to the near-term effects of climate change. At the same time, they provide vital ecosystem services in regard to coastal protection, nearshore fisheries, and tourism. Therefore, coral reef monitoring and management would appear to be a logical area for future funding and collaboration.

Engagement in coral reef management in the U.S. Pacific Territories is complicated, however, by the fact that the NOAA-funded programs dealing with marine resource management have been consolidated as semi-autonomous offices outside of the line agencies statutorily charged with natural resource management (i.e., under bureaus in the Governor's offices of CNMI and Guam; and as part of the Department of Commerce in American Sāmoa). This has led to overlapping mandates between different agencies in a situation interestingly similar to that prevailing in the United States federal government between NOAA and DOI. In particular, it seems that the Coastal Zone Management programs in each of the U.S. Pacific Territories have been used as a means to steer Coral Reef Conservation Program funding and implementation into agencies that lack a clear statutory resource stewardship mandate (although this has recently changed in American Sāmoa with the transfer of the Coral Reef Working Group to the DMWR). These executive branch structural anomalies create certain challenges in regard to targeting climate change funding for coral reefs but is not a matter that can be directly addressed by OIA since the current jurisdictional programmatic arrangements can only be changed through future executive orders or legislative action. Given the above, and fully realizing that there are overlapping mandates involved, the key offices for engagement on coral reef and marine resources management activities are (line resource management agency with primary statutory authority listed first):

*CNMI:* Department of Lands and Natural Resources (Division of Fish and Wildlife), Office of the Governor (Bureau of Environmental and Coastal Quality)

*Guam:* Department of Agriculture (Division of Aquatic and Wildlife Resources), Office of the Governor (Bureau of Statistics and Plans)

*American Sāmoa:* Department of Marine and Wildlife Resources, Department of Commerce

All of the FAS contain significant coral reef resources that are threatened by climate change. The reefs of Palau suffered significant bleaching during the El Niño event of 1998, and the more recent 2015 El Niño has caused similar impacts to reefs in the RMI. Monitoring of such events, assessment of the overall natural resource losses caused,

and identification of potentially resilient areas that may require special management and protection are needed in all three countries. The key offices for engagement on coral reef and marine resources management activities are:

*RMI:* National Environmental Protection Authority, Marshalls Energy Company, Kwajalein Joint Utilities Resources

*FSM:* Department of Resources and Development

*Palau:* Ministry of Natural Resources, Environment and Tourism (Bureau of Marine Resources)

### *Outreach and Education*

Communicating to the greater public the future challenges posed by climate change, and the necessity of pursuing adaptive strategies, is essential for building and retaining popular support for difficult future decisions and for moving adaptation measures forward. Therefore, funding should logically be directed toward those agencies that have oversight of education at all levels. It should be noted that there are disparities in regard to the development of educational systems: CNMI has only a public school system, overseen by a Commissioner of Education, plus Northern Marianas College; Guam has public schools, a community college, and the fully accredited University of Guam; American Sāmoa has public schools and a community college; the RMI has public schools and the College of the Marshall Islands; the FSM has public schools and the University of Micronesia, with a main campus on Pohnpei and multiple satellite campuses in the other states; and Palau has public schools and an independent community college. The key entities for engagement in regard to education and outreach are:

*CNMI:* Office of the Commissioner of Education

*Guam:* Guam Department of Education, Guam Community College, University of Guam

*American Sāmoa:* Department of Education (includes American Sāmoa Community College)

*RMI:* Ministry of Education, College of the Marshall Islands

*FSM:* Department of Education, University of Micronesia

*Palau:* Ministry of Education, Palau Community College

In addition to the four sectors highlighted above, the two sectors below – focused on energy and food security – present opportunities for collaboration in the Freely Associated States in particular.

## *Renewable Energy and Energy Efficiency*

All three of the FAS have energy sectors that are almost totally reliant on imported fossil fuels for electricity generation. In addition, adoption of renewable energy technologies has been quite limited, and energy efficiency, particularly in Palau, has significant room for improvement. In many cases the local energy offices that would oversee such projects are understaffed. The key agencies for engagement on such energy issues are:

*RMI:* Ministry of Resources and Development (RMI National Energy Task Force)

*FSM:* Department of Resources and Development, Kosrae Utilities Authority, Pohnpei Utilities Corporation, Chuuk Public Utilities Corporation, Yap State Public Service Corporation

*Palau:* Ministry of Public Infrastructure, Industry and Commerce (Palau Energy Office in the Bureau of Public Works)

## *Food Security*

Climate change has the clear potential to affect food security in the FAS by changing rainfall patterns upon which crops depend, creating new climatic conditions to which traditional crops may not adapt, rendering croplands and groundwater unusable by way of saltwater intrusion (via increased storm surge and sea level rise), and by altering oceanographic conditions in such a way that key fisheries are diminished or geographically displaced. As such, there is a need to assess the vulnerability of current food crops and fishery stocks to predicted future climate regimes, and educate local farmers as to potential alternative crops that might be employed if traditional staples begin to fail. In addition to the executive branch entities listed below, the agricultural extension services linked to local educational institutions will also be important partners in this effort. The key entities for engagement on food security in the context of agriculture and fisheries are:

*RMI:* Ministry of Resources and Development (for agriculture), Marshall Islands Marine Resources Authority (for fisheries), Ministry of Education (for extension services)

*FSM:* Department of Resources and Development (for agriculture and fisheries), College of Micronesia (for extension services)

*Palau:* Ministry of Natural Resources, Environment and Tourism, specifically the Bureau of Agriculture, and the Bureau of Marine Resources (for agriculture and fisheries respectively); Palau Community College (for extension services)

## Conclusion and Acknowledgements

We hope that this report has provided a useful structure for better understanding the government agencies and authorities relevant to climate change in the U.S. Affiliated Pacific Islands. We welcome feedback on further ideas on ways to improve collaboration in building ecological and community resiliency in the Pacific. Preparation of this capacity assessment was made possible by the Pacific Islands Climate Change Cooperative (PICCC) in Honolulu, Hawai'i, one of the Landscape Conservation Cooperatives under the U.S. Department of the Interior (DOI). Dr. Dan Polhemus' detail to the PICCC was in turn supported by the DOI Office of Insular Affairs in Washington, DC. This report greatly benefited from the time and contributions of interviewees and workshop participants.

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