Gaps and Needs Analysis towards the development of a Climate Change Policy Framework

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Abstract

In order to realize a vision of "Happy, healthy and resilient Palauan communities in a changing world" for the Climate Change Policy Framework being developed by the Government of Palau with the assistance of SPC, several gaps need to be filled that are closely aligned with six internationally proposed sustainable development goals: thriving lives and livelihoods, food security, water security, clean energy, healthy ecosystems and good governances. To achieve the goal of thriving lives and livelihoods, the following gaps need to be addressed: climate change is mainstreamed into all sectors, institutional capacity is built, and the 2002 National Implementation Strategy for Climate Change and the 2010 National Disaster Risk Management Framework are fully implemented. Other identified gaps to fill are as follows: real time data of vector borne illnesses and non-communicable diseases linked to Climate Change impacts; comprehensive education programs with a localized curriculum that incorporates local practices; development and implementation of waste management policies and construction of a national landfill with a recycling program; development of a building code and transportation policy; and a focus upon the most vulnerable members of society.. The goal for sustainable food security requires the following gaps to be filled: the development of a National Food Security Policy and Action Plan; implementation of the Sustainable Land Management Policy,: a significant increase in local food production including salt, drought and flood resistant crops; real time data on food production; job opportunities and the establishment of a Central Market. In order to achieve the goal for sustainable water security, the following gaps need to be addressed: real time data on water resources and production; effective watershed management, upgraded infrastructure, more effective and enforceable storm water regulations; greater protection of watersheds and ground water; increased education and awareness, and a review of Palau's Water Policy. The goal for Clean Energy requires the following gaps to be filled: updated carbon emission regulations and targets for reduction; energy efficiency building codes; incentives to promote energy efficiency; enforcement of emission standards; real time GHG inventories in energy sector; energy efficient public transportation; implementation of the National Energy Policy; national support for Palau Energy Office; capacity building; and sustainable financing. in the energy sector. The goal for healthy Productive ecosystems require the following gaps to be filled: performance standards for all land use practices that attain zero net increase in stormwater discharge; ratification of the 2004 National Biodiversity Strategic Action Plan; real time data on species distribution abundance and ecosystem health and natural and manmade hazards; incorporation of climate change and disaster risk management in ecosystem planning; ecosystem services valuation that is integrated into fiscal policy, planning and budgeting; enforcement of environmental laws; support of community based activities that protect the environment and implementation of the Sustainable Land Management Policy. The goal for Good Governance requires the following gaps to be filled: the establishment of a Climate Change Policy Framework Development Advisory Committee under the National Environment Protection Council (NEPC); coordination and mainstreaming of Climate Change and Disaster Risk Management activities in all sectoral and State planning; a people centered approach building upon existing social networks and initiatives; development of an overseas development aid policy for climate change; and support for a data hub for GHG inventories. The lack of building codes and comprehensive integrative planning at the local, state and national levels that include vulnerability and adaptive assessment are critical gaps to fill for all States. Palau, as a matter of urgency, needs to build an adequate national landfill and hazardous waste facility to reduce stress to watersheds and critical ecosystems.

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Contents

Acronyms

ADB	Asian Development Bank
AIPVAA	An Integrated Planning and Vulnerability Assessment Approach
BCRC	Bopha Catastrophe Relief Committee
CCPF	Climate Change Policy Framework
CCVAM- DRM	Climate Change Vulnerability and Adaptation Management- Disaster Risk Management
CP	Culture Policy
NDRMF	National Disaster Risk Management Framework
NDRMFIP	National Disaster Risk Management Framework Implementation Plan
EQPB	Environmental Quality Protection Board
GCCA	Global Climate Change Alliance
GHG	Green House Gas
GP	Gender Policy
IPCC	Intergovernmental Panel on Climate Change
JNAP-CCDRM	Joint National Action Plan- Climate Change Disaster Risk Management
MNRET	Ministry of Natural Resources, Environment and Tourism
MPIIC	Ministry of Public Infrastructure Industries and Commerce
NDMAP	National Drought Mitigation Action Plan
NDRMF	National Disaster Risk Management Framework
NEHAP	National Environmental Health Strategic Action Plan
NEPC	National Environment Protection Council
NIS	National Implementation Strategy- the 2002 First National Communication
	United Nations Framework for the Convention on Climate Change
OERC	Office for Environmental Coordination and Response
PALARIS	Palau Automated Land and Resources Information System
PAN	Protected Area Network
PCAA	Palau Community Action Agency
PCC	Palau Community College
PIFACC	Pacific Islands Framework for Action on Climate Change
PIREP	Pacific Island Renewable Energy Project
PNYC	Palau National Youth Council
PRCS	Palau Red Cross Society
PSIS	Pacific Small Island States
PVA	Palau Visitor's Authority
ROP	Republic of Palau
SIACM	Strategic International Action for Chemical Management
SLMP	Sustainable Land Management Policy
SPC	Secretariat of the Pacific Community
TTM	Taiwan Technical Mission
UAK	Ulekerreuil a Klengar
UNDP	United Nations Development Program
UNFCCC	United Nations Framework to the Convention on Climate Change
UNICEF	United Nations International Children's Emergency Fund
WB	World Bank

I. Introduction

The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (2007) projects with very high confidence that impacts to small island states include: (1)Increased vulnerability to the effects of climate change, sea-level rise, and extreme events;(2)Sea-level rise is expected to exacerbate inundation, storm surge, erosion, and other coastal hazards, thus threatening vital infrastructure, settlements, and facilities that support the livelihood of island communities; and (3) Water resources in small islands are likely to be seriously compromised. The IPCC (2007) projects with high confidence that climate change impacts to small island states will also include (1) negative effects on coral reefs, fisheries, and other marine-based resources; (2) subsistence and commercial agriculture will be adversely affected; and (3) tourism are likely to be directly and indirectly impacted. There is growing concern that global climate change is likely to impact human health, mostly in adverse ways (medium confidence).

The Pacific Islands Framework for Action on Climate Change (PIFACC) 2006–2015 has the following vision:"Pacific island people, their livelihoods and the environment resilient to the risks and impacts of climate change" The goal is to "ensure Pacific island people build their capacity to be resilient to the risks and impacts of climate change." The key objective is to deliver on the expected outcomes under the following six interlinked goals: (1)Implementing tangible, on-the- ground adaptation measures; Water Security and Food Security, and Functional Ecosystems; (2)Governance and decision-making; (3)Improving understanding of climate change;(4)Education, training and awareness; (5)Mitigation of global greenhouse gas emissions; and (6) partnerships and cooperation.

This Gaps and Needs Assessment towards the development of Palau's National Climate Change Policy Framework addresses: (1) The current status of climate change adaptation and mitigation inclusive of climate related disaster risk management; (2) Identifies the perspective of Palau communities on climate change issues and the preparation of a Joint National Action Plan on Climate Change and Disaster Risk Management (JNAP-CCDRM); (3) Provides a vision statement developed by the key stakeholders describing where Palau wants to position itself in relation to climate change; and (4) Identifies the gaps that need to be filled to reach the envisaged status.

II. Vision Statement

A vision statement was developed by key stakeholders during two working sessions in April and June of 2013. Five Groups developed 5 potential visions statements during the inception workshop in April 2013. A final June 21, 2013workshop was requested by the participants and hosted by PICRC through the CC project – EU Global Climate Change Alliance (GCCA). A total of 39 participants[1]attended and modified and finalized a Vision for a Climate Change Policy Framework providing an English and Palauan version as follows:

"Happy, healthy and resilient Palauan communities in a changing world"
"A Belau a kldmokl, mesisiich, modewades e Klekar"

[1] Appendix 11

III. Gaps that need to be addressed to achieve the envisaged status

Key Climate Change issues build upon the communities' concerns and issues over several decades and were top issues raised during the 2013 inception workshop and focus group meetings. The issues and concerns were as follows: water and food security, sea level rise, coastal erosion, ecosystem functionality, clean energy and good governance. These top issues or concerns are closely aligned with internationally proposed six comprehensive sustainable development goals[2] as follows:

Goal 1: Thriving lives and livelihoods and improve well being through access to education, employment, information, better health; safe housing and infrastructure and clean air.

Goal 2: Sustainable Food Security which is linked to most of the environmental issues as sea level rise and invasive species impact taro and other food production; acidification, bleaching, pollution, impact fisheries.

Goal 3: Sustainable Water Security is directly linked with food security and watershed protection.

Goal 4: Universal Clean Energy is linked with production, distribution, storage and access to water and food supplies and sustainable livelihoods and mitigation of GHG.

Goal 5: Healthy Productive Ecosystems is linked with food and water supplies; effectively managed ecosystems such a as reefs, forests and agroforests provide water and food; and

Goal 6: Good Governance is linked to all the social and institutional issues raised during the inception workshop and focus group meetings and issues rose over the last few decades.

Therefore it is recommended that the Palau climate change policy framework be aligned with these proposed six global sustainable development goals. In the following sections, gaps that need to be addressed to develop a national Climate Change Policy Framework were identified and organized according to these six recommended goals. The gaps for each goal address links to existing national policies and when known, for responsible agencies. Specific actions are stated that address either the national, state or community level. Actions may address the entire nation, the main archipelago, the outer lying States, specific communities or areas (i.e. PAN sites). The 2002 National Implementation Strategy of the First National Communication to the UN Framework Convention on Climate Change and the 2010 National Disaster Risk Management Framework serve as key guiding instruments for the development of a Climate Change Policy Framework for Palau. These two instruments provide an integrative approach to address Climate Change that meets the nation's vision of sustainable development.

The Republic of Palau is part of the large blue continent of the Pacific, with a rich, dynamic and complex culture that is directly linked to its diverse natural resources. This very complexity has built a resilient nation that strives to effectively serve its people. Taking action to fill the gaps identified in the following sections will enable Palau's to better adapt to and mitigate the impacts of Climate Change and contribute towards regional and global initiatives to adapt to a changing environment.

[2] Griggs D. 2013. Sustainable Development Goals for People and Plant. Nature 496:305-307.

Goal 1 Thriving lives and livelihoods

Attaining the goal of thriving lives and livelihoods will depend upon addressing key gaps to ensure safety and well being in Palau to build resilience to the impacts of climate change (CC) and disaster risk management (DRM) in order to realize the vision of happy, health resilient people in a changing world.

Gaps that need to be addressed to achieve the goal of sustainable livelihoods within the Climate Change Policy Framework were identified through a literature review and three stakeholder meetings. Detailed information can be found in Appendix 1. The gaps identified were as follows:

- Mainstreaming climate change adaptation into all sectors[3]
- Institutional capacity to understand the impacts of climate change and degree of vulnerability
- Implementation of sustainable practices; connecting actions and impacts[4]
- Implementation of the National Disaster Risk Management Framework (NDRMF) and National Implementation Strategy for Climate Change
- Real time data to effectively tracked climate change related vector borne illnesses and non-Communicable Diseases (NCDs) indirectly linked to the impacts of climate change[5]
- Incorporation of CC impacts on human health in national health management plans
- Comprehensive education programs that incorporate science and local practices and knowledge about CC impacts[6]
- Integration of CCVAM- DRM into school curriculum from preschool to college level that contributed towards increased standards of excellence in science and math[7]
- Formally incorporate local practices into best management practices and regulations to address CC impacts
- Develop and implement a waste management policy and action plan to build and manage a national landfill and a hazardous waste facility to reduce environmental and health impacts
- Finalize and implement the proposed policy for sound chemical management in Palau[8].
- Establish recycling programs in all states to reduce dependency on plastics, paper and foam products by 50% by 2020[9]
- Prioritization of the most vulnerable (e.g. children, elderly and handicapped) on preparedness based on predicted high temperatures, increased rainfall and more intense storms and recovery from extreme events (e.g. special needs students receive special training for emergency drills)
- Women representation in high level decision making positions dealing with CCVAM- DRM
- An integrated planning and vulnerability and adaption approach for state-wide planning[10]
- Establish a building code commission to develop a building code[11];
- Develop and implement a transportation policy to address GHG mitigation
- Develop culture and gender polices that address CCVAM- DRM
- Implementation of socio-economic monitoring for PAN sites[12]
- Mainstreaming green growth approaches such as green budgeting and tax reform to encourage and support the implementation of mitigation and adaptation measures[13]

[3] 2012 SLM Policy under the cultural element
[4] 2013 Sustainable Livelihood Working Group
[5] Appendix 10
[6] Pacific Islands Climate Education Partnership, 2010 NDRMP
[7] 2010 NDRMP
[8] EQPB. 2011. Proposed Policy for Sound Chemical Management in Palau
[9] 2013 Sustainable Livelihood Working Group
[10] Appendix 7
[11] Senate Bill No. 9-26 states that a commission shall be composed of seven members including Minister of MPIIC as chairperson; three local building contractors, a local architect a local registered engineer and a local traditional builder Island Times Vol 8 No 37 March 15, 2013
[12] Appendix 8
[13] Holm, T. 2012 Greening Palau's Economy Pacific Institute for Public Policy

Goal 2 Sustainable Food Security

Climate Change Adaptation strategies for strengthening food security in the Pacific Region[14]call for: (1) Linking food security with poverty, trade, gender, sustainable livelihoods, nutrition, and regional food production and distribution practices. (2) Establishing policies that enable robust and best-practice climate change adaptation measures to be implemented effectively; (3)Mainstreaming food security into regional and national CC adaptation and disaster risk reduction initiatives;(4) Climate-proofing existing food security initiatives; (5) Assessing and amending initiatives to ensure they address the long-term impacts of CC.

In Palau, agriculture is 5.6% of the total gross domestic product (GDP) and food imports represent 10% of the GDP.[15] Sustainable agriculture is critical for Palau's economy. Over the past decades there is a trend of increasing dependency on imported food, and low local food production. The major imported foods are rice, fruits, meat and meat products and vegetables. In the last decade, food imports increased by 133% while the local population increased by 20%. There is potential for increasing agriculture production of local crops for commercial purpose. Migrant labors have increased productivity, especially fresh vegetable production.[16]

Listed below are the gaps that need to be addressed in order to achieve the goal of sustainable food security within the context of adaptation measures for the Climate Change Policy Framework. These gaps were identified through literature reviews, workshops and interviews. Detailed information can be found in Appendix 2. The gaps and needs identified were as follows:

- Development and implementation of a National Food Security Policy and Action Plan[17]
- Implementation of the SLM Policy to prioritize agricultural land for agricultural use[18]
- Increase local food production[19]
- Development and distribution of salt, drought, and flood resistant varieties of crops[20]
- Development of a better data acquisition, analysis and distribution systems related to our local food production and availability in agriculture, agroforestry and fisheries[21]
- Provided job opportunities for agriculture, fisheries and aquaculture[22]
- Establishment of a Central Market[23]
- Eradication of monkey and fruit flies and other agricultural pests[24]
- Updating and implementation of strategic plans for agriculture and aquaculture with 5-year work plans and a coordination mechanism for Agriculture, Fisheries, and stakeholders in food production[25]
- Effective integration of local food production into the school curricula with a grade associated – lesson plans[26]
- Mainstreaming adaptation measures into fisheries development and management policies

[14] FAO 2009
[15] ADB 2012
[16] 2012 Recovery Plan for Super Typhoon Bopha
[17] The Environment, Inc. (TEI) 2012. Gaps and Needs Analysis for Bureau of Agriculture PACC;
[18] SLM Policy 2012
[19] 2002 NIS; 2013 Food Security Working Group; PCC-CRE 2012 Plan of Work; 2010 NDRMF
[20] Palau Community College (PCC)- College of Research and Extension (CRE) 2012 Plan of Work; Palau Community Action Agency Ben Adelbai pers. comm.. 2013; 2010 NDRMF
[21] 2013 Sustainable Food Security Working Group
[22] The Environment, Inc. (TEI) 2012. Gaps and Needs Analysis for Bureau of Agriculture PACC; The Environment, Inc. (TEI) 2012. Gaps and Needs Analysis for the Bureau of Marine Resources PACC
[23] Tracey-White J. 2004 Central Market Feasibility Study FAO
[24] Republic of Palau. 2013. National Invasive Species Committee Strategic 2013-2017Action Plan
[25] The Environment, Inc. (TEI). 2012. Gaps and Needs Analysis for Bureau of Agriculture PACC; The Environment, Inc. 2012. Gaps and Needs Analysis for the Bureau of Marine Resources PACC
[26] Programs coordinated through the Ministry of Health; Ministry of Education, and UAK

Goal 3 Sustainable Water Security

Water Policy and Climate: Palau's water management must address, through mitigation and adaptation, various effects and threats stemming from climate change. Rising sea levels threaten some freshwater supplies and some agricultural areas. Changing rainfall patterns are increasing drought frequency and severity during dry months, while increasing runoff and sedimentation in wet months."[27] The number of rainy days and dry days are increasing in the Southwest Islands and freshwater needs to be brought in by boat during extreme droughts.[28]

Gaps that need to be addressed in order to effectively implement Goal 3 Sustainable Water Security as a component towards the development of a Climate Change Policy Framework (CCPF) were identified through literature review, workshops, interviews, round table discussions and field trips to outer-lying States. Detailed information is found in Appendix 3. The gaps and needs identified were as follows:

- Updated and comprehensive data of water resources and production[29]
- Watershed/ land management planning, zoning and enforcement
- Upgrade all water systems and increase storage capacity with community input on local practices[30]
- More effective regulations on storm water and erosion & sediment control[31]
- Protection of watersheds and groundwater sources (Public Enforcement at all levels)
- Education and awareness through the Palau Public Utilities Corporation (PPUC)
- Review, update and implement the Palau Water Policy and further develop the CCVAM-DRM component of this policy[32]
- States identify, protect, and manage water sources in partnership with PPUC[33]
- Enforcement of water quality regulations (EQPB and State Governments)[34]
- Development and implementation of drought-storm- early warning system (NEMO, PPUC, MNRET)[35]
- Water laboratory & hydrological research (PPUC and EQPB)[36]
- Update and implement the Water Safety Plan[37]
- Implementation of the Airai State Watershed Management Plan[38]
- Conduct a Cost Benefit Analysis of Desalination Options[39]
- Build capacity to maintain water and sewer system[40]

[27] 2012 National Water Policy
[28] Governor Thomas Patris pers.comm. 2013
[29] 2013 Water Security Working Group
[30] Palau Public Utility Corporation (PPUC)-SPC-GCCA PSIS Adaptation Project Workshop: Addressing Water Sector Climate Change Vulnerabilities in the Out Lying States in Particular Angaur State May 1-2, 2013; 2002 NIS for First National Communication to the UNFCCC
[31] 2013 Water Security Working Group
[32] Republic of Palau 2012 Water Policy of the Republic of Palau; 2013 Water Security Working Group
[33] 2013 Water Security Working Group
[34] 2013 Inception Workshop for Gaps and Needs towards the development of a CCPF
[35] 2013 Water Security Working Group; 2010 NDRMP
[36] Palau Water and Sewage Corporation-SPC-GCCA PSIS Adaptation Project Workshop: Addressing Water Sector Climate Change Vulnerabilities in the Out Lying States in Particular Angaur State May 1-2, 2013
[37] Kitalong, A. The Environment, Inc. 2012. National Water Outlook. MNRET EU IWRMP
[38] Airai State. 2013. Airai State Watershed Management Plan
[39] 2002 NIS for National Communication to the UNFCCC
[40] Palau Public Utility Corporation (PPUC)-SPC-GCCA PSIS Adaptation Project Workshop: Addressing Water Sector Climate Change Vulnerabilities in the Out Lying States in Particular Angaur State May 1-2, 2013; 2002 NIS for First National Communication to the UNFCCC

Goal 4 Universal Clean Energy

Clean energy is linked with production, distribution, storage, and access to water and food supplies, and sustainable livelihoods and mitigation of GHG. Emissions from the energy sector accounted for 84% to 95% of Palau's annual GHG emissions since 1994, Palau's mitigation efforts focus primarily on the energy sector. In 2005, the emissions from Palau's energy sector totaled 331.74 Gg-CO_2 (GHG Inventory): an increase of 334% since 1994. In 2009, 99.95% of Palau's energy consumption was derived from imported fossil fuels (SPC, 2012). Renewable energy, including grid-connected solar PV systems at the Capitol Complex and the airport, now contributes almost 3% to Palau's total energy supply.[41] The Palau Energy Office is Palau's energy regulatory entity that works with the Palau Public Utilities Corporation (PPUC) on implementing energy projects. The Net Metering Act of 2012 encourages residential and commercial installation of grid-connected solar PV systems by allowing users to receive credits for excess energy generated by their solar systems.[42]In 2010, Palau endorsed the National Energy Policy (NEP) along with an Energy Sector Strategic Action Plan (ESSAP) to implement the NEP. The NEP calls for improved institutional arrangements, increased energy efficiency, and the promotion of renewable energy. The NEP sets national targets to reduce energy consumption 30% by 2020 and to produce a minimum of 20% of total energy from renewable sources by 2020.

Gaps that need to be addressed in order to achieve the goal of Universal Clean Energy were identified based upon a literature review, workshops, interviews, and field trips to the outer lying States. A more detail description of these gaps can be found in Appendix 4. The identified gaps and needs are as follows:

- Update regulations on carbon emissions and set targets for reduction[43]
- Establishment of a Building Code for energy efficiency[44]
- Rebates or tax breaks for energy efficient imports and Smart Technology[45]
- Enforce emission standards for transportation, incineration, power generation[46]
- Institutional GHG Inventory reporting across sectors[47]
- Transportation Policy and Action Plan for regulations of GHG emissions
- Identify and promote viable energy efficient public transportation[48]
- Nationally funded permanent positions in Palau Energy Office[49]
- Implementation of the 2010 National Energy Policy (NEP) and Energy Sector Strategic Plan (ESSP) and Energy Sector Framework[50]
- Education and Awareness on climate change mitigation and adaptation
- Technology appropriate for the climate[51]
- Capacity building to maintain the systems [52]
- Sustainable Financing for maintenance and training[53]
- Ensure that users are compensated when no services rendered[54]

[41] Palau Energy Office 2013
[42] RPPL No. 8-39
[43] 2013 Energy Working Group Gaps and Needs Workshop towards the development of a CCPF
[44] 2002 National Implementation Strategy(NIS) for the First National Communication to the UNFCCC
[45] 2013 Energy Working Group Gaps and Needs Workshop towards the development of a CCPF
[46] EQPB Regulations
[47] 2013 Second National Communication to the UNFCCC
[48] 2002 NIS for the First National Communication to the UNFCCC
[49] 2013 Inception Workshop for the Gaps and Needs Workshop towards the development of a CCPF
[50] 2010 National Energy Policy; Nick Kloulubak pers. comm. 2013
[51] Palau Public Utility Corporation (PPUC)-SPC-GCCA PSIS Adaptation Project Workshop: Addressing Water Sector Climate Change Vulnerabilities in the Out Lying States in Particular Angaur State May 1-2, 2013; 2002 NIS for First National Communication to the UNFCCC
[52]2013PPUC-SPC-GCCA- PSIS Adaptation Project Workshop: Addressing Water Sector Climate Change Vulnerabilities in the Out Lying States in Particular Angaur State May 1-2, 2013; 2002 NIS of the First National Communication to the UNFCCC
[53] 2013 Second National Communication to the UNFCCC
[54]Energy Working Group 2013 Gaps and Needs Workshop

Goal 5 Healthy Productive Ecosystems

Healthy, productive ecosystems are linked with food and water supplies; effectively managed ecosystems such as reefs, forests, and agroforests provide water and food and other ecosystem services with high potential values.

Gaps that need to be addressed in order to achieve the goal of Healthy Productive Ecosystems as a component within the CC Policy Framework were identified through a literature search, workshops, small group sessions, interviews, and field trips. Details regarding these gaps and needs can be found in Appendix 5. The following gaps were identified:[55]

- Performance standards for all land use practices to attain zero net increase of storm water by December 2015 for the national government and December 2018 for States to be in compliance[56]
- Update, ratify, and implement the 2004 National Biodiversity Strategic Action Plan[57]
- Data collection, analysis, and reporting on species distribution, abundance and ecosystem health[58]
- Geospatial data for analysis for prioritization of protected areas[59]
- Real time data on habitat area and impact from natural and man-made hazards[60]
- National connectivity designs to guide allocation of technical and funding resources[61]
- State-wide planning for critical ecosystems incorporating CC and DRM[62]
- Development of Conservation Action Plans (CAP) into Protected Area Network (PAN) plans and State Master Plans integrating risk and vulnerability assessments[63]
- Local climate data for more accurate climate change models for Palau[64]
- Sustainable finance mechanism to achieve goal[65]
- Establish a National Zero (cradle to cradle)Waste Policy and Action Plan[66,67]
- Enforcement of existing environmental laws and regulations[68]
- Upgrade infrastructure to reduce impacts to the environment and human health[69]
- Assess and quantify available water for potential usage in the community
- Support community based activities and program that protect and conserve the environment
- Implement the Sustainable Land Management Policy[70]
- Finalize and implement the proposed Policy for Sound Chemical Management in Palau.[71]
- Ecosystem services valuation integrated in fiscal planning and budgeting

[55] Priorities were taken from literature review and 2013 stakeholder meetings
[56] 2013 Working Group on Healthy Productive Ecosystems
[57] 2004 National Biodiversity Strategic Action Plan
[58] 2004 National Biodiversity Strategic Action Plan
[59] Sustainable Land Management (SLM) Project 2011. PALARIS Capacity Needs Assessment Appendix 9; Kitalong 2010 The Republic of Palau Statewide Assessment of Forest Resources and Resource Strategy
[60] 2013 Second National Communication to the UNFCCC
[61] 2013 Second National Communication to the UNFCCC
[62] 2013 Working Group on Healthy Productive Ecosystems
[63] Appendix 8 and the Palau Conservation Society. 2013 Community Strategy
[64] 2013 Second National Communication to the UNFCCC
[65] Protected Areas Network Fund
[66] Kitalong A. 2011. National Chemical Profile; EQPB 2011 Proposed Policy for Sound Chemical Management in Palau
[67] Kitalong A. 2012. The EIA Process as an effective process for sustainable development in Palau Atlantic International University School of Economics and Business. PhD Dissertation
[68] 2013 Working Group on Healthy Productive Ecosystems
[69] Stakeholder meeting 2013
[70] Kitalong, A. 2011
[71] EQPB. 2011. Proposed Policy for Sound Chemical Management in Palau

Goal 6 Good Governance

Good Governance is linked to all the social and institutional issues.[72] For decades, gaps and needs have been identified to address good governance as follows: coordination and communication, data acquisition, analysis and sharing, centralized data, regulations, policies, and transparency in all activities. A people centered policy that is cost effective and equitable enabling access to and understanding of information and promotes livelihood diversification is likely to achieve the vision for a Climate Change Policy Framework (CCPF). Two tiers of planning have been proposed on at the community level: (1) the Local Early Adaptation Planning (LEAP) and (2) An Integrated Planning and Vulnerability Approach for State level planning to build resilience to all stresses not just climate change and disaster related stresses.[73] It is critical to address the uniqueness of each community in order to achieve effective governance:

> *"Each community has very distinct social/cultural characteristics which are often linked to legends and traditional governance systems. It is important to realize the cultural beliefs and values because they influence expressions, character, decisions and actions of each community.[74]"*

Gaps that need to be addressed in order to meet the goal for good governance as part of CCPF were identified by a literature review, workshops, focus groups and interviews**.** More information on these gaps is found in Appendix 6. The identified gaps and needs were as follows:

- Establishment of a Climate Change Policy Framework Development Advisory Committee under the National Environment Protection Council (NEPC)[75]
- Coordinate CC Vulnerability and Adaptation Management and Disaster Risk Management (CCVAM-DRM)[76]
- Effective mainstreaming of CCVAM-DRM in all Sectors
- Effective enforcement of existing regulations and laws[77]
- A People Centered Approach combining CC Adaptation and Mitigation and DRM using existing social networks to build resilience through ecosystem based management[78]
- Implementation of existing policies, legislation and regulations for sustainable land management, energy, water, hazardous materials, sustainable finance, health, education, biodiversity, Persistent Organic Pollutants (POPS)[79], and Ozone Depleting Substances (ODS)
- Development and implementation of a Policy for CCVAM-DRM and Overseas Development Aid (ODA)[80]
- Acquisition, analysis and sharing of data for GHG emission, Land Use Change[81],meteorological service observations, water, health, coastal, asset values, cost benefit analysis, and extreme weather events; and ensure that these datasets are harmonized with national reporting obligations[82] at a central data hub[83]

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[72] 2013 Inception Workshop
[73] 2013 Inception Workshop for Gaps and Needs Analysis towards the development of a CC Policy Framework;
A Roadmap towards a Post 2015 Integrated Regional Strategy for Disaster Risk Management and Climate Change Adaptation & Mitigation - Strengthening Coordination in the Mainstreaming of Disaster and Climate Risk into Planning and Decision-making Processes at Regional, National and Sub National Levels in the Pacific PREP 22SM/WP 8.2.1/Att.1
[74] Joyce Kloulechad Beoch. 2013. Climate Change Community Outreach. Palau Conservation Society.
[75] Charlene Mersai Climate Change Coordinator pers. comm. 2013
[76] A Roadmap towards a Post 2015 Integrated Regional Strategy(IRS) for Disaster Risk Management and Climate Change Adaptation & Mitigation PREP 22SM/WP 8.2.1/Att.1
[77] 2013 Inception Workshop and Gaps and Needs Workshop
[78] Palau Conservation Society 2013 Community Strategy; A Road Map towards Post 2013 IRSDRM and CCA&M
[79] The Environment Inc. 2006
[80] Forum Compact Peer Review for Palau. 2013. Aid Memoire.
[81] Iida 2012
[82] First and Second National Communications to the UNFCCC
[83] 2013 Inception Workshop and Gaps and Needs Workshop;, 2012 Sustainable Land Management Policy

- Mainstreaming green budgeting (including environmental accounting) and tax reform as part of the financial and budgeting process[84]
- Mainstreaming CCVAM- DRM into macroeconomic and fiscal policy and budgetary processes
- Integrating CCVAM- DRM in the Environmental Impact Assessment (EIA)[85]and Social Impact Assessment (SIA) tools to evaluate policies, regulations, programs, projects
- Requiring Health Impact Assessments (HIA) in relation to CCVAM- DRM
- Communications strategy with designated implementers for CCVAM-DRM
- Awareness on national and regional trade negotiations[86]
- Establishment of a Pacific Regional Climate Change Fund[87]

IV. Practical and pragmatic actions proposed to fill gaps to further develop a Climate Change Policy Framework (CCPF)

In order to develop practical and pragmatic actions to fill the identified gaps to further develop a Climate Change Policy Framework (CCPF), it is critical to identify the lessons learned from previous and ongoing processes in developing other frameworks. The main gaps need to be prioritized and dealt with first if at all possible. It is also important to build upon current activities that support a CCPF. The following sections will further describe these three components required for the successful development of a CCPF.

(a) Lessons learned and ways to develop and implement a Climate Change Policy Framework

- Community visioning is an effective tool to use in the development of a CCPF, this process must be led by elected leaders in order to be legitimate and successful and requires funding, technical and political support.[88]

- Work from within sectors and synergize efforts with a strong policy framework: Large issues like Climate Change Vulnerability and Adaptation Management and Disaster Risk Management (CCVAM-DRM) require cross sectoral changes with synergized efforts to build overall efficiency and strengthen social networks.

- Ensure that the process implemented to develop the CCPF is one that works from within all sectors and harnesses the current capacity that exists locally among key stakeholders. Synergizing efforts will enable the cross sectoral changes required for effective CCVAM-DRM. Working from within sectors builds important collaborative relationships between stakeholders which may improve efficiency.

- Cross sectoral education and awareness about CCVAM-DRM require locally relevant educational materials in an enabling environment linked to the community. School and community gardens can integrate local knowledge with science and math to develop CCVAM-DRM learning modules at all levels. Crop production involves mathematics to determine harvest yields based upon the science of organic gardening (i.e. local composting, soil characteristics, and knowledge of local plant varieties).An integrative approach to learning provides water and food security and contributes to happy, healthy, and resilient people.[89]Local practices link food security, water

[84] 2013 Inception Workshop
[85] 2002 National Implementation Strategy for the First National Communication to the UNFCCC
[86] 2013 Round table discussion on the Pacific Plan
[87] A Roadmap towards a Post 2015 Integrated Regional Strategy(IRS) for Disaster Risk Management and Climate Change Adaptation & Mitigation PREP 22SM/WP 8.2.1/Att.1
[88] PCS 2013 **Synthesis Report on Community Engagement Activities and implications for Climate Change Actions**
[89] Ebil Society Summer Program, Ibobang School Summer Program; Koror State Summer Programs

management, and best management practices for soil and water that require ongoing support to implement.

- A national initiative to provide sustainable energy, water, and sewer services to the community has been further developed in 2013.The Palau Public Utility Corporation (PPUC) was initially mandated to address energy utilities. In May 2013, the OEK Congress merged the newly established Palau Water and Sewer Corporation (PSWC) that is mandated to manage water and sewer utilities under the umbrella of the PPUC. The justification of the merger of PSWC under the PPUC was to improve services, lower administrative and other operational costs, and effectively use and provide access of resources and services to the community. This approach to consolidate services is based upon past lessons learned regarding the high cost of delivering complementary services to a small population. Limited funds and expertise are available to provide consistent high quality service if multiple utility boards are established and additional technical expertise for relatively low volume of usage. Critical complex technical problems can be best addressed through regional expertise and capacity building.

- Collaborative efforts between the Palau Energy Office, MPIIC, EQPB, and States Government aim at harmonized efforts to support community infrastructure needs that are adaptive to climate change. Appropriate systems that conserve valuable resources and meet the community needs can be developed through collaboration and information sharing. It is critical that there is effective engagement and ownership between the national, state, traditional leadership and community in order for a Climate Change Policy Framework (CCPF) to be implemented.

(b) Gaps to fill in order to further develop and implement a Climate Change Policy Framework

Key issues that need to be addressed include water security, food security, sea level rise, coastal erosion, stress on ecosystems due to pollution, unsustainable development, and loss of local knowledge and practices. Stakeholders were also concerned with the impact of CC and unsustainable practices leading to the decline in marine resources, increased crop disease and invasive species, and the lack of enforcement of laws to mitigate these impacts.[90]

Two major gaps that need to be addressed are the lack of building codes and integrative planning at the local, state and national levels that include vulnerability and adaptive assessment. The recovery from the impact of Super Typhoon Bopha has built further awareness of the need to fill these gaps through an effective CCPF and Joint National Action Plan (JNAP).

There are skills gaps in the environmental sector to equip society to deal with CCVAM-DRM. The lack of an adequate national landfill and hazardous waste facility threatens human and ecosystem health, reducing resilience to the impacts of climate change. Regulations to control stormwater and other pollutants need to be strengthened and enforceable at the national, state and community levels. Expansion of the Protected Areas Network (PAN) requires more integrative approaches and more local meteorological data, species distribution and abundance data, and local small and large scale data for effective modeling to build resilient systems. Alternative livelihoods, diversification of resource uses and capacity building in new and local practices are needed to better adapt to projected changes in species abundance and distribution, habitat changes and potential loss of income and local knowledge in relation to resource uses.

A flexible, integrated and holistic form of governance[91] is needed that supports: (1) data collection for resources through legislation and compliance; (2) promotes access and incentives to purchase energy efficient products, (3) enables enforcement of environmental standards for land, water and sea; (4)

[90] Kitalong 2011;
[91] UNEP. 2012. 21 Issues for the 21st Century

promotes tested science; experimentation and innovation to deal with waste management; energy efficiency, water and food security and environmental accounting;(5) supports cross scale and multi-level institutional linkages to deal with CCVAM-DRM; and (6) mandates that existing policies and actions plans are updated and implemented and new policies are developed for emerging issues.[92]An adaptive government ensures that the most vulnerable people are cared for through sustainable financing, especially for recovery from the impact of extreme weather events linked to climate change.[93]

(b) Practical and pragmatic actions

Current Actions Being Implemented:

- The Palau Community Action Agency (PCAA) and the Ministries of Health (MOH) and Education (MOE) together with the non-government organization called Ulekerreuil a Klengar (UAK) are taking an integrative approach to address food security and non-communicable diseases. These partners are working with the community to develop home gardens, promoting local food production and providing opportunities for low income families and initiating clean energy projects.[94]
- Local Early Action Plans (LEAP) are being developed to be used as models for community planning to adapt to climate change[95]
- Conservation Action Plans are being developed as part of the Palau Watershed Alliance to are addressing water security as an adaptive strategy for Climate Change[96]
- Vulnerability assessments of coastal erosion studies began in Koror,[97] Kayangel, and Ngaraard States; Ngardmau State began a vulnerability assessment for flooding.[98]
- Melekeok State used An Integrative Planning and Vulnerability Assessment Approach (AIPVAA) to further develop their State Master Plan.[99]
- The Pacific Adaptation to Climate Change (PACC) Project is a collaborative national effort to implement Climate Change Adaption demonstration projects in Ngatpang State to increase local food productions.[100]
- The Bureau of Agriculture (BoA) is working with organic farmers to promote sustainable organic farming.[101] Salt tolerant varieties of taro and other crops are being tested and distributed for farmers.[102]
- The Palau Energy Office has initiated several renewable energy projects throughout Palau over the past decades for public infrastructure. A Disaster Risk Management Plan is being implemented as part of the recovery from Super Typhoon Bopha.
- The National Development Bank of Palau (NDBP) is providing low interest loans for energy efficient homes, and small industries such as farming, fishing, and eco-tourism.
- The Protected Areas Network Fund (PANF) provides sustainable financing for integrated ecosystems management for food and water resources and critical ecosystem services. Community programs are being implemented to teach the children local practices and knowledge to sustain local resources.
- The Palau Public Utility Corporation (PPUC) programs and activities (i.e. leak detection and metering program, technical and financial services for water and power systems nationwide, energy audits, power token system) enabling efficient use of water and power.

[92]National Workshop on Gaps and Needs Analysis for the development of a Climate Change Policy April 22-23, 2013
[93] Inception consultation towards the development of a Gender Policy for Palau May 9, 2013
[94]Ben Adelbai 2013 pers.comm.
[95] PCS 2013 **Synthesis Report on Community Engagement Activities and implications for Climate Change Actions**
[96] PCS 2013 **Synthesis Report on Community Engagement Activities and implications for Climate Change Actions**
[97] Webb 2012
[98] Emaurois et al. 2012
[99] Palau Conservation Society Community Climate Change Strategy 2013
[100] Leonard Basilius PCAA PACC Project pers. comm. 2013
[101] FAO Project Bureau of Agriculture Bob Bishop pers. comm. 2013
[102] Thomas Taro PCC-CRE pers. comm. 2013

- International collaboration between centers of excellence has increased training in order to fill the skills gap in the green sector. Planning is being coordinated and harmonized to better drive sustainable financing with donor organizations.
- Financial sustainability through the Health Care Fund, PANFund, Water and Sewer Act is ensuring access to health care, healthy productive ecosystems, employment and clean water.

IV. Emerging challenges and opportunities for the climate change policy framework development

"*As globalization arrives, our worldview as Pacific Island peoples will soon be overwhelmed. The world will so become plural community with the loss of characteristics that have defined us for centuries. For me as [a] Palauan, there [are] things that we Palauans do that I would trade readily now for better approaches from other cultures and societies. These are the characteristics of Palauaism. But I will not trade my Palauness: the philosophy of living that has carved our lives and made us survive for the millennia. Things like respect, communal, perseverance, hope, harmony and a sense of environmental wellness. If Micronesians are not careful, we will lose what made us survive*."[103]Dr Stevenson Kuartei MD 2012.

A. Emerging issues

Emerging issues related to the impacts of climate change are:

- Increased temperature, more intense storms, rising sea level and coastal erosion, storm surges (i.e. Super Typhoon Bopha), more threats to water and food security, safety and well being.
- The rise in water borne diseases, and Non-Communicable Diseases such as obesity and tobacco use is a concern for our community health which reduces social resilience to CC.
- Increasing imports of processed food is leading to increasing NCDs and increases Palau's vulnerability to CC.
- Apart from food security is food safety.[104]
- Damage to homes, taro gardens and farmlands from sea level rise and storm surge[105]
- The increasing number of visitors puts added demands on old infrastructure and limited resources.
- The lack of a building code increases community vulnerability to extreme weather and climate events.
- Koror and Airai include more than half of Palau's population consuming more energy and emitting more emissions than all other States in Palau.
- Old inefficient and non-functional infrastructure leads to environmental and health risks that lower community resilience.
- The creeping impact of unsustainable water extraction especially in the outer lying islands threatens the quality and quantity of available water.
- The increasing costs for consumer products and services and overall cost of living are pushing more and more families towards the threshold of poverty.
- Inadequate care for the most vulnerable in society: the elderly and our children also impacts community resilience.
- Unsustainable behavior has shifted society towards its current high consumption levels and polluting activities.
- The lack of enforcement of stormwater guidelines and air emissions regulations and the lack of a national sanitary landfill and hazardous chemical disposal site lead to pollution from solid wastes, sewerage, storm water, oil, hazardous materials and GHG emissions that subsequent lead to

[103] Stevenson Kuartei, MD The Effects of Social Evolution on Health in Micronesia September 18, 2012
[104] UNEP 2012
[105] Joyce Kloulechad Beouch 2013. Climate Change Community Outreach. Palau Conservation Society

increased vulnerability of communities, reduced resilience of ecosystems and threatens food and water security.

- Tourism growth is dependent upon a healthy clean environment to flourish. Therefore it is critical to address these issues that threaten both the environment and the economy of Palau.

B. Recommendations and initiative for ways and means to address emerging issues

There is need to implement existing policies and develop legislative intervention to deal with emerging issues present in Section A. Support of existing initiatives within communities to address these emerging issues related to climate change are critical, such as specific building codes for low lying flood prone areas and options for relocation for vulnerable members of society. Green urban areas that are more compact, have a mix of land uses and access to low energy transport options are being developed. Expansion of integrative watershed planning is needed for all watersheds in Palau. Committed small working groups from each sector can work with national and international expertise to prioritize an address the top emerging issues. A comprehensive ODA Policy is needed to ensure national priorities are harmonized with donor aid. Palau is maintaining a steady course with its compass heading in the direction of resilience to the impacts of Climate Change.

Palau is built upon the principle of respect of self, community and environment and reciprocity- helping one another. Wealth is not measured by the material positions but on the strength of relationships between families that extends back hundreds of years- sustainable livelihoods. Transformative change through an adaptive government developing public policy with a mix of economic incentives, public awareness, and clear statements about existing health risks with commitments on all[106] levels is beginning to happen. Maintaining complexity within Palau's ecosystems and social structure builds resilience in the face of a changing world. Palau is world famous for its conservation ethnic and a champion of sustainable development; as a result many committed regional and international partners with their compasses heading in the same direction.

C. Collaborative partnerships

Collaborative partnerships are working and have enhanced Palau's ability to address future challenges and opportunities. The Pacific region is gathering in July 2013 to set the direction needed in order to address future challenges and opportunities in the region in order to meet the goal of sustainable development post 2015. Top concerns within the region are shared: food and water security, impacts of climate change, non- communicable disease, infrastructure that can withstand more intensive storms; social transformation with the cash economy, erosion of culture, waste management. During the Pacific Plan roundtable held in Palau in 2013 there were recommendations for fair trade, reliable air transportation, and real time information on safe products, business ventures, investment opportunities and improving social networks to ensure priorities. During the PEER review a national aid policy was recommended to support priorities to sustainable develop and build resilient communities in the region.

V. Conclusion

An adaptive government ensures that communities are happy, healthy and resilient in a changing world. Mainstreaming Climate Change Vulnerability and Adaption Management and Disaster Risk Management (CCVAM-DRM) into every sector is critical as projections for increases in sea level, temperatures and storm intensities become more and more certain. An enabling environment with financial mechanisms (e.g., user and service fees) to sustain CCVAM-DRM programs and support community efforts at all levels to develop and implement in Local Early Adaption Planning (LEAP) for communities and An Integrative Planning and Vulnerability Assessment Approach (AIPVAA) for State planning is urgent.

[106] UNEP 2012

The Bureau of Marine Resources (BMR), Bureau of Agriculture (BOA), Palau Community College (PCC) and Palau Community Action Agency (PCAA) together with State governments and local leaders need to quantify the current level of local food production; set realistic targets to increase production, and provide technical and financial support to agro and aqua farmers to increase production of local foods for varying climate conditions. The States have access to the PAN funds and technical assistance from the PAN Technical Committee to further develop and implement management plans that address CCVAM-DRM and build resilience and effectively protect and manage their resources. Resource managers need to work closely with the community to incorporate local knowledge and practices into their activities. CCVAM-DRM needs to be embedded into Palau's local building designs, planning and land use practices. Many plant varieties have been developed by Palauans to adapt to climate change for centuries.

Palau, as a matter of urgency, needs to build an adequate national landfill and hazardous waste facility to reduce stress to watersheds and critical ecosystems. Reducing stress can potential increase ecosystem services such as sources of food from functional agroforests and healthy reefs, watersheds that provide clean water; mangrove systems that act as buffers from extreme weather events; and forests and oceans that act as carbon sinks to mitigate climate change impacts. Potential sources of revenue include taxes and fees that internalize the negative externalities of human activities and products that contribute to the increasing vulnerabilities to climate change, such as taxes on non-recyclable and hazardous products, green fee to support best management practices, and fees linked to the amounts and types of wastes produced and discharged into the environment. The Environment Quality Protection Board (EQPB) in partnership with the States must enforce existing regulations on land, water, and air pollution to protect threatened environments. Financial incentives may help expedite desired behavior changes such as investment into energy efficient products and vehicles. Development and enforcement of emission standards by EPQB will decrease air pollution and GHG emissions especially in the transportation sector.

In order to integrate CCVAM-DRM into education and health programs, there is a need to strengthen institutions, build capacity through regional and international training in the environmental sector and provide employment opportunities with equal opportunities for men and women. It is critical to build upon "successful" community engagement approaches to mainstream CCVAM-DRM at all levels.[107] The Palau Public Utilities Corporation (PPUC) must continually work with regional and international partners to financial State-wide infrastructure improvements for clean accessible water and clean energy options. The overarching national vision of Palau is sustainable development that builds resilience and enables adaptation to a changing climate. Immediate action to fill the identified priority gaps and address the needs will enable the vision for a Climate Change Policy Framework: "***Happy, healthy, and resilient people in a changing world***" to be attained.

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Appendices

Appendix 1 Goal 1 Thriving lives and livelihoods

Lessons Learned From Super Typhoon Bopha (STB): A National Disaster Risk Management Framework (NDRMF) and a Recovery Plan for STB were developed by the Republic of Palau through the National Emergency Management Office (NEMO). The NDRMF lists storm surge as a top natural threat. The Melekeok Vulnerability Assessment addressed Storm surge and predicted its potential impact area. The impact of storm surge and wind and rain from **Super Typhoon Bopha (STB)** on livelihoods was severe. A total of 112 homes were destroyed in eastern Babeldaob (including Melekeok). Since Bopha struck, many families still live with relatives in crowded conditions as new homes are being constructed. In some cases, homes were relocated to upper grounds due to unclear land titles and ownership. State leases were made available in some cases in order to be eligible for loans for new homes and also access to recovery funds Peleliu and Angaur. Additional damage was occurred in other parts of Palau that are yet to be fully assessed (i.e. Rock Island Southern Lagoon (RISL) and Kayangel). Impacts to ecosystems such as reefs, forests and the shoreline were extensive but yet to be comprehensively assessed. **GAP:** a comprehensive health impact assessment (HIA) is needed for post-BOPHA recovery.

Livelihoods: The livelihood needs identified for recovery from STB were as follows: betelnut tree restoration; small scale/ household level processing and technology for betel nut, dried fish and "cut flower" production; support for small businesses (i.e. small stores, aquaculture and agricultural businesses). There are data gaps on local fish production for consumption and sale, low tech small scale carving and other types of handicraft produced locally and imported and betel nut production. These data gaps make it difficult to determine the past and current levels of production and future production targets to strive towards. After Bopha, prices for betelnut increased from $1-1.50/10 nuts to $2.00-$3.00/10 nuts. Restoration costs are needed as was provided by the Bureau of Arts and Culture: restoration of 10 damaged cultural sites has an estimated cost of $800,000.[108]

The **2013 STB Recovery Plan** top priority was reconstruction of primary homes.[109] A total of112 houses in7 States were completely destroyed; 136 houses in 6 States were severely damaged; 131 people were in temporary shelter and many people stayed with relatives in 5 States. Public infrastructures – traditional structures and national/ state structures were also a priority. Initial estimated economic losses in the housing sector were about $2.2M [110]that has since increased to over $3M. Damaged public infrastructure included schools, roads and pubic docks and jetties and temporary shutdown access to electricity, drinking water and communication. National policies were developed for compensation for homes and were being developed for public and traditional infrastructure. In Melekeok, STB funds were used to repair the damaged pier. Based upon the available assessment reports from the Bopha Catastrophe Recovery Committee (BCRC), the Palau Red Cross Society (PRCS) and the Palau Community College (PCC), a list of activities were proposed with a tentative budget of $2.175M.[111] This was later modified to $6.9M.[112] During a 2013 press conference, the Vice President of the Republic of Palau called for a transparent Disaster Policy with equitable benefits for all.

Good Governance: The Chair of NEC was designated as the Catastrophe Relief Coordinator. The Palau Housing Authority chairs the Sub-Committee on Residential Projects and the Bureau of Public Works chair the subcommittee on Public/traditional infrastructure within the Bopha Catastrophe Relief Committee (BCRC). Policies or guidelines were developed for relief funding criteria for residential housing structures, wrongfully claimed and awarded BCRC projects, and to maintain respectable level of discipline, accountability, consistency and fairness in assessing, re-assessing and addressing claims for Bopha Relief.[113]

[108] Bureau of Arts and Culture 2012
[109] Appendix 2
[110] The estimated costs of homes was modified in the final assessment
[111] Appendix 3
[112] Modified Recovery Plan Budget June 2013
[113] Bopha Relief Guidelines. 2013. Bopha Catastrophe Relief Committee Office of Vice President. Memorandum Serial No. VP023-13; Bopha Relief Guidelines April 16, 2013; Appendix 1 Bopha Relief Guidelines April 2, 2013

Appendix 2 Goal 2 Food Security

The **2013 Food Security Working Group**[114] identified key objectives to achieve the goal of Food Security. The objectives were as follows in order of priority:(1) increase local food production by increasing import tariffs on imported foods and price supports;(2) Collect data on the percent of local production compared to the percent of imported food and the percent that is used in customs and the percent used for sale and conduct standard appraisals of production levels. (3) Increase existing farm incentive programs; and (4) Develop mitigation strategies for salt water intrusion (i.e. tidal gates). The following policy statement was drafted: **Purpose/Goal:** Agriculture statistics will be collected by a designated person and a system for annual data reporting will be developed. **Action:** A regulation will be adopted that will require all farmers to provide annual crop data. (An alternative is to provide financial and technical incentives to report information.) **Outcome:** This will result in consistent data collection and encourage adequate monitoring and evaluation. **Target date**: By 2015, funding will be identified to establish a position for a qualified person to report on annual local crop production. A law will be drafted to administer appropriate system by the Ministry of Natural Resources Environment and Tourism.

Pacific Adaptation to Climate Change (PACC)

In order to develop a Food Security Policy for Palau, the Pacific Adaptation to Climate Change (PACC) and Food Security Project initiated gaps and needs analysis for agriculture and fisheries. The Bureaus of Marine Resources and Agriculture need to develop fundamental components within their policies to more effectively address: (1) Coordination and communication between branches within and between the Bureaus and among their stakeholders and partners; (2) Best management practices in data management and reporting; and food production. (3) Sustainable finance mechanism for services provided.

In order to effectively address climate change adaptation (CCA), the Bureau of Agriculture needs to implement the following (1) develop a vision and mission statement that incorporate CCA; (2) integrate CCA into its programs with tasks, actions and targets to measure change in local food production over time; (3)set up demonstration plots of Best Management Practices (BMPs) in sustainable agriculture and agroforestry at Nekken Station and local farms; (4) develop sustainable finance components to enable support for distribution and marketing local food; (5) build and operate a central market for the communities and visitors; (6) collect regular statistics on local productivity to provide a baseline to set targets; and (7) develop an effective mechanism to collaborate and disseminate data and information on all levels.[115]

Agriculture sector operations: (1) Collect crop production data to determine effectiveness of techniques used (2) Collect date on commercial production (3) set up a database of, farmers to track information and progress over time. (4)Set up a licensing system for commercial farming linked with EQPB who are monitoring pesticides with required annual reporting (5) Set up a database for markets and types and amounts of for fresh crop and fruit sold and distributed; (6) Diversify products to minimize potential stock depletions (7) Invest in long term maintenance of equipment; (8) Assess impact of commercial farming on forests and soil.(9) Set up a mechanism to support community-oriented, small scale farm production based upon local resources and labor to retain control over what people consume for survival in local hands. (10) Set up a mechanism to support local food consumption at the community level. (11) Conduct long term studies of the impact of climate change to the food production.

Aquaculture/Mariculture sector specific needs and gaps -(1) National Aquaculture Strategic Plan not finalized or implemented (2) Sustainable Finance Plan for cultured species (i.e.) fees for providing juvenile species of cultured fish and invertebrates to farmers, development of alternative products (clam shells for tourists), marketing , and supply and demand and distribution of cultured species (2) Standardized risk assessments for pollution and invasive species; (3)Site selection criteria and protocols for optimum water exchange and grow-out of organisms; (4) Conflict resolution mechanisms for on water and land use; (5) Long term strategy to privatize aquaculture for giant clam and other species; (6)

[114]During the Gaps and Needs Analysis Workshop towards the development of a CC policy framework, 6 main Goals were identified including Food Security, A working group focused on Food Security during the second day of the workshop on April 23, 2013

[115] Kitalong, A. 2011. Gap Analysis for Agriculture PACC. BoA

Certification program for aquaculture farmers including a reporting mechanism for farm inventories to prevent sales of wild clams through farms; (7)Annual report on production statistics and distribution of products to address food security for the Republic; (8) Sufficient accounting of farm inventories, growth, survival and sales- tagging of distributed clams to ensure farms are not taking clams from the wild) Tracking system from BMDC to sales. Lack of linkage between export reports of cultured animals and farm inventories; (9)Market study to ensure prices are in line with up to date costs; (10) Policy on supplementing inshore areas with cultured clams to augment local food security as an adaptation to climate change impacts; (11)Data on private clam farms (survival rates, growth rates, sales, distributors, market prices, percent for local consumption, level of poaching); (12) Consistent supply of clam seedlings for farmers; (13) More staffing (i.e. 6 positions in fisheries when12 positions recommended to implement work plan; (14) Annual Performance Evaluation, Work Plan and Budget for Tasks; (15) Annual Report (digital copy to be incorporated into BMR annual report for budget hearings; (16) Zoning and proper site locations of farms that account for water quality, human health or conflicts in water use (i.e. recreation versus food production); (17) Reporting on costs and benefits of aquaculture programs based upon local demands and food security; (18) Need to close life history cycle for imported juveniles (i.e. crabs, milkfish, grouper larvae) to reduce costs and risk of disease and invasive species; (18) nutrient management protocols and studies; (19) research on locally made fish feeds that is cost effective for fish farmers; (20) Coordination between government and non government sector for sound aquaculture in Palau. **Fisheries Management Branch**- (1) Strategic Plan for Inshore Fisheries (2) Annual Report, Work Plans, Performance Evaluation and Budget; (3) Annual Report (4) Sustainable finance plans for specific resources (i.e. trochus, sea cucumbers, and inshore fish, sporting fishing. (5) Collaboration with Ministry of Finance (Move) for periodic tax audits of outlets; (6)Regulations in place setting overtime pay for all Coastal Officers monitoring and inspecting outbound flights and this must be dealt with urgently in order to effectively monitor, inspect, and implement the Marine Protection Act**. Oceanic Fisheries Branc**h- (1)Effective coordination between Division of Taxation, Ministry of Justices and Bureau of Marine Resources to follow-up on violations recorded by the observers and prosecute offenders, revoke licenses or impose fines.(2) Financial mechanism to access fees and fines for implementing programs. **Gap:** Review, Update and full implementation of the BoA Strategic Action Plan; Forest Action Plan-Section on Climate Change

National Disaster Risk Management Framework designates the Ministry of Education as the Lead Response Agency for Mass Care (Food) with support from the Red Cross and NGO's; however the Bureau of Agriculture is not specifically included except collectively with "all bureaus" for initial and comprehensive assessments. Disaster Recovery is mentioned but no process is proposed on how to measure recovery (i.e. food production restored). The NDRMF calls for Mainstreaming DRR in Health and Nutrition but does specific indicators for nutrition in plan. **2.** Livelihoods (b) Under Advocacy and Awareness : **Agriculture or MNRET have a long term strategy for agricultural development:** Under Existing DRR Activities, the BoA is tasked to introduce and distribute drought, salt and pest tolerant crops and educate farmers on proper and effective pesticide use, proper land use to prevent soil erosion; tasked to development and implement forest management plans (Forest Strategy with CC component- add in here- deals with construction and forest clearing in vulnerable areas); and rapid response plans for new introductions of pests and invasive species (Invasive Species Action Plan 2012). **PACC-Adaptive Taro Cultivation:** Through the National Pacific Adaptation to Climate Change Project; PCAA and PCC-CRE are developing and documenting adaptive taro cultivation techniques. A challenge is to address sea water inundation. Several methods are being tested however yet to be fully demonstrated.[116] An **Invasive Species Strategic Plan** was revised in 2013, and one of the urgent actions identified was the eradication of the introduced monkey in Angaur as a threat to food security. A systematic programs was designed to eradicate the monkey, however funding has not be identified. Consequently, the State is utilizing National funds to set a bounty on each monkey. This method is thought to be a temporary solution to an ongoing problem

[116] Leonard Basilius pers.comm. June 2013

The 2013 **Second National Communication to the UNFCCC** identified a data gaps for (1) the amount of fertilizer used for GHG inventory and (2) land use change: need local data. The 2002 National Implementation Plan (NIP) called for the immediate increase in agriculture and aquaculture production and the access to new technologies by stakeholders. In 2012, Taiwan aid was used to build a new **Aquaculture Facility** at MRD. In 2013, Taiwan provided an additional $300,000 towards the further development of the grouper hatchery. There is a need to have statistics on local food production from government and non government activities.

Disaster Recovery- As mandated in the NDRMF Bureau of Agriculture (BoA), Palau Community College-College of Research and Extension and Palau Community Action Agency (PCC-CRE) assessed the value of lost crops from Super Typhoon Bopha (STB). Need: An assessment that covers the full cost of recovery and potential annual harvest. In Angaur, it may take 10 years to recover because of saltwater intrusion in freshwater lens which is 10 years of potential harvest. However in other areas such as Ngkeklau, recovery may be faster. Although plants may appear healthy, the crop once harvested may be damaged[117]. There is a need for a coordinated effort driven by communities. Children need to plant their own crops to learn and value and consume. Adults tend to overlook the need to have longer term impacts and seek fast restoration with adults implementing projects. To date, no accurate surveys of crop loss or costs of crops and no costs to restore productivity only value of lost crop. **PCAA- Food Security:** The Palau Community Action Agency is addressing Food Security through home gardens and providing opportunities for low income families and clean energy initiatives (Ben Adelbai pers.com 2013).

Food Security: Taro[118]

Taro is an essential part of Palau's food base and plays a unique role in its culture. Taro is used as a major component of food exchange in all traditional customs. Palau has at least 70 varieties of taro of which many are resistant to specific pests and diseases. It is important that these varieties are safeguarded from sea level rise, drought, and land degradation.[119]Taro patches are usually found at lower elevations around a village and close to a water source. This increases susceptibility of taro patches to saltwater inundations. During STB, farming areas along the east coasts of Ngaraard, Ngiwal, Melekeok, Peleliu and Angaur were inundated with seawater. Salinity test of taro patches after the storm showed values of 2000 parts per thousand. Crops can usually survive values of 35 parts per thousand. Value of lost taro crop was estimated to be $80,000 USD.[120]

Climatic Impacts-The agricultural sector depends upon regular rainfall for crop production. Because of this, the 1997/98 El Nino caused the complete destruction of taro patches in several islands and along the western coast of Babeldaob (OERC, 2002). The States of Angaur and Peleliu, and much of the western coast of Babeldaob lost 100% of its taro crops during the 1998 ENSO event. This loss was caused by saltwater intrusion and prolonged drought stemming from sea level rise associated with climate change and climate variability. It is critical to improve storage and distribution of water for the current and future droughts as well as to develop an action plan for fire prevention. **Implemented Adaptation Strategies:** Palau is implementing a food security project under the regional Pacific Adaptation to Climate Change (PACC) project focusing on taro production in Ngatpang State, where taro production decreased as a result of saltwater inundation into low-lying areas. Project activities include conducting a vulnerability assessment of coastal food production systems, creating guidelines to increase resilience of food production systems, and completing a pilot project demonstrating the utilization of the guidelines to increase resilience to climate change in local taro production. In 2001, the **National Drought Mitigation Action Plan** (NDMAP) was developed to mitigate and/or adapt to the changing global climate, but requires funding to implement. The NDMAP includes the assessment of agricultural practices and identification of salinity resistant crops and potential agricultural sites to sustain nationwide food security during the ENSO event and associated drought. **The Recovery Plan for Super Typhoon Bopha** (STB) targeted 3 core inter-linked sectors; agriculture, livelihoods and strengthening of the disaster risk

[117] Leonard Basilius pers. comm. June 2013
[118] David Idip 2013 Vulnerability Chapter Second Communication to the UNFCCC
[119] David Idip 2013 Second Communication to the UNFCCC
[120]Bopha Recovery Plan

management policy, institutional mechanisms and technical capacity.[121] The Palau Community Action Agency (PCAA), Palau Community College/College of Research and Extension (PCC-CRE), Bureau of Agriculture (BoA),Ulekerreuil a Klengar (UAK), Palau Red Cross Society (PRCS), State Governments, and Taiwan Technical Mission (TTM) are working together to implement the plan. The team is conducting upland farming, high value crops; providing agricultural inputs such as fertilizer, seeds, saplings, cultivation/tillage support to cultivate upland; cleaning up the soil salination of the taro swamps; using their knowledge and inputs for commercial poultry production; and knowledge of plant species that can withstand/ grow in a salty soil and less fertile upland soil with less intercultural operations to help families recover from STB.[122]The major damaged due to STB in agriculture was the salination of taro patches (swampy areas) and betel nut fields. Taro serves as the main source of starch in Palau, a staple food and source of household level economy, and betel-nut as a source of income for livelihoods. The immediate and long term needs in agriculture sector are expertise, labor, fertilizer, seeds, saplings and fuel for tractors or labors to cultivate suitable upland for taro and other suitable crop cultivation such as cassava, and sweet potato. The PCC- CRE is researching varieties of taro and root crops that can withstand salty soil and suitable to climatic conditions.

STRATEGIES: The BOA is collaborating with PCC – CRE, PRCS, PCAA and TTM to assist farmers clean their land for new cultivation including plowing gardens, saplings, seeds, manures and technology in Peleliu and few other islands. These agencies provided technical support to initiate a small scale kitchen-garden with the use of old tires, coolers, and wooden boxes. Assistances will be expanded to other States severely damaged by STB. These agencies are supporting farmers to plant/replant taro, sweet potato and vegetables in a few affected states. The following strategies have been proposed to revitalize the agriculture sector:

- Collaborating agencies develop a medium term (1 – 5 years) agriculture including livestock improvement/ development plan and budget focusing to revive the agriculture affected by STB and sustainable agriculture development to reduce food imports by an achievable percentage within next five years.
- The final plan will be presented in a round table donor meeting (ADB, WB, USAID, EU, Japan Government, Taiwan Government, and AusAid and development partners such as UNDP, Asian Vegetable Research Centre Taiwan, SOPAC, etc).
- Until the new plan is operational, collaborating agencies will support needy farmers.
- Explore possibility for low tech, low resources required and high value (such as mushroom, vanilla, and cocoa) commercial cultivation of green/ leafy vegetables using proven technologies such as hydro-phonic vegetable farming.
- Establish Farmer's Cooperatives (focusing to women) at state level for technology transfer, commercial farming, processing and marketing of agricultural products and services.

Activities are proposed based on available information, technical and financial resources to successfully implement the agriculture strategies.[123]

[121] The total estimated budget for the recovery activities is US$ 2,840,000, (agriculture and livestock – US$ 215,000, livelihoods – US$ 250,000, housing US$ 2,175,000 and disaster risk management US$ 200,000) out of which government has already mobilized US$ 855,000 for houses construction from its internal source and remaining US$ 1,985,000 will be mobilized from donors and development partners. See Appendix 3 for budget breakdown for Agriculture.
[122] Leonard Basilius PCAA, pers. comm. June 6, 2013
[123] Appendix 5

Appendix 3 Goal 3 Sustainable Water Security

The **2013 Water Security Working group**[124] identified key objectives to achieve the goal of Water Security as follows in order of priority: (1) Water resources and production assessment/inventory "baseline" ; (2) Water Conservation Policies; (3) Vulnerability Deficit[125]; (4) Continuity (data, information, program and focus and (5) Water Data interpretation. The participants developed the following policy statement: **Water Security: Objective** –To review and update the existing water policy which addresses climate change by 2015. Responsibilities and Roles – Palau Public Utility Corporation (PPUC): Provide service and gap analysis; State: identify /protect/manage water sources: EQPB: test and regulate water quality; educate and raise awareness. NEMO/MNRET: establish drought early warning system; Bureau of Public Safety (BPS): to cite during droughts; Ministry of Health (MoH), Division of Environmental Health (DEH) to be involved with the Palau National Youth Council (PNYC) to educate and raise awareness.

The primary source of fresh water is surface water from precipitation. The Ngerikiil watershed in Airai State is the major source of portable water for 75% of the population supplying 4M gallons of water per day.[126] Groundwater supplies most of the outer lying States, but the groundwater lens is fairly thin and most is non-potable. Groundwater is less developed because of well maintenance problems, water quality problems and limited well yields. Palau has high water consumption rates with an expanding tourism industry and limited water management infrastructure. Road construction, housing, and agricultural activity contribute to erosion and sedimentation along the lower Ngerikiil River tributaries and into its estuarine system in Airai Bay. Intense drought and storm activity are causing land degradation and sedimentation problems in or near the watershed.[127] In 2005 the Palau Natural Resources Council and Airai Community conducted a study on the Ngerikiil watershed[128]. Five key threats to water quality soil erosion and sedimentation mainly from unpaved roads. The Ngerikiil watershed area has undergone rapid growth with sedimentation rates 10 to 19 times higher than the less developed Ngerdorch watershed.[129] Nutrient, fertilizer, and pesticide pollution from animal manure from confined operations, runoff of excess fertilizers, and pesticide leaching and runoff. Solid waste disposal is an increasing concern with population growth and non-regulated dumps. Invasive species are a threat to biodiversity. Wildlife habitat loss is having a negative impact. Critical issues relating to infrastructure of water resources are as follows: lack of an efficient water distribution system to effectively conserve water; a loss of 35-45% of the treated water through transmission due to leaks.[130] The newly merged PPUC is implementing a leak detection and home metering program to better manage water. In 2013, Airai State drafted a Management Plan for the Ngerkiil Watershed.

Priority Actions[131] were identified to address gaps in order to achieve the goal of sustainable water security were as follows: Review and update existing water policy[132] to addresses climate change by 2015. The review should provide service and gap analysis. Each State is responsible to identify, protect, and manage their water sources. The EQPB test water quality and regulate, educate and raise awareness. The NEMO/MNRET establishes a drought early warning system. The BPS must enforce water restrictions through citations during droughts. The Ministry of Health, Division of Environmental Health (DEH), and the Palau National Youth Council (PNYC) were tasked to engage in education and

[124] During the Gaps and Needs Analysis Workshop towards the development of a CC policy framework, 6 main Goals were identified including Food Security, A working group focused on Food Security during the second day of the workshop on April 23, 2013
[125] A vulnerability deficient is when you are dealing with old infrastructure and need to upgrade in order to improve efficiency
[126] Hay et al 2007
[127] 2013 Second Nat Comm. on UNFCCC
[128] Ngerikiil Watershed Study NRCS
[129] Victor, S. et. al., 2004
[130] Hay et al 2007
[131] Priorities were identified through literature review and stakeholder meetings held in 2013
[132]The Water Policy for the Republic of Palau 2012

awareness.[133] The PUCC needs to establish its own water quality laboratory and research team to ensure water supplies are adequate for the planned water systems they are proposing.

The 2010 National Disaster Risk Management Framework (NDRMF) tasked the Bureau of Public Works (BPW)[134] to protect water resources from negative impacts. The Water Safety Plan (WSP) was developed to protect and manage water sources; ensure safe drinking water and strengthen capacity for water resource management. The National Drought Mitigation Plan and National Integrated Water Resource Management (IWRM) Policies also call for protection of water sources as a CC adaptation strategy. The NDRMF has provisions to upgrade facilities for disaster resistance and accessibility; and integrate Disaster Risk Reduction into the Integrative Watershed Resources Management Programs. As stated in the NDRMF there is a need for the following: water use and sanitation awareness programs and materials accessible to communities; contingency plans for service delivery systems of water and sanitation as a CC Adaptation strategy and for a State of Emergency or disaster As a CC adaptation and DRR strategy, risk assessments are needed for site location of water pumps, supply systems; drainage and sewage system, and sanitation facilities.

Addressing Water Sector Climate Change Vulnerabilities in the Out Lying States in Particular Angaur State -The Palau Public Utility Corporation (PPUC) hosted a Secretariat of the Pacific Community(SPC)-Global Climate Change Alliance (GCCA) Pacific Small Island States (PSIS) Adaptation Project Workshop to further develop a concept note into a full proposal for a 2-year, 500,000 Euro project. Key issues that arose during this workshop were the (1) quality and quantity of potable water; (2) the cost effectiveness of the water distribution and storage systems and (3) access to the community.

Gaps and Needs of the outlying states of Kayangel, Peleliu, Angaur, Sonsorol and Hatohobei were as follows: (1) information gap on the amount of available freshwater that can be tapped; (2) data gaps on the recharge rates of the freshwater lens to determine how much can be accessed by the community. (3) The Islands of Sonsorol and Hatohobei have old cracked storage tanks that need to be repaired and condemned fiberglass catchment tanks that need to be replaced. (4) There was a lack of knowledge by the Governors of national initiatives or reports about their water supplies. (5) The old and new water systems need to be compatible and functional; (6) A holistic approach to assess, procure and install appropriate systems in each State is needed. There is a communication gap between the national government, private sector, State and communities regarding their water resources needs and concerns.[135] Communities perceived that their ground water was being over pumped causing poor water quality and reduction in taro production in Kayangel.[136] There were perceptions among the working groups that the water systems being installed were either not cost effective or appropriate for their unique environments. There were issues with inappropriate installations or lack of follow-up with the water systems in the outer islands. The SWC assured the outlying States that building capacity to address water issues. There were also concerns about the potential contamination of the ground water from the sewage systems and the recommendation for compost toilets.

The **2002 and 2013 National Communications for the UNFCC** identified water resources as a top concern. The Ngerikiil Watershed supplies over 70% of the population's water and was used as a Case Study for Vulnerability and Adaptation (V&A) in both national communications. In 2002, adaptation options were presented that still need to be addressed: (1) upgrade the current system, (2) increase rain water catchment systems, (3) locate other sources of water, (4) increase public awareness and develop water efficient farm methods. There is still a need for land use plans, resources to conduct sedimentation studies, local data, awareness and proper sewerage management systems. The NIP called for immediate action by EQPB to establish Watershed Protection Law. There is still a need to (1) Strengthen protection

[133] Water Security Working Group Climate Change and Sustainable Development Workshop April 22-23, 2013
[134] The Palau Water and Sewer Corporation has now taken over the roles and responsibilities for water formerly under the Bureau of Public Works
[135] Carol Emaurois pers.comm. 2013
[136] Carol Emaurois pers. comm. 2013

of current groundwater resources through infrastructure guidelines (sewerage, wastewater management, solid waste management, and buffer zones); (2) Develop and implement effective stormwater management, harnessing, and storage plans; and (3) review potential for desalination technology.

Climatic Impacts to Water were addressed in the 2013 Second National Communication to the UNFCCC. During the 1997/1998 El Nino-La Nina event, rainfall was the lowest on record. Water supplies were depleted, agricultural production decreased by over 50%, and fires burned out of control throughout many islands. Water shortages are a frequent event in the main city of Koror, and rationing is implemented whenever a prolonged drought period occurs. Most climate models predict an increase in rainfall by 8-10% by 2050 and about 20% by 2100.[137] Infrastructure deterioration resulting in major leakage is common, and water pollution from soil erosion, herbicide and pesticide runoff, livestock waste, and liquid and solid waste disposal results in high costs.[138]

Actions taken towards implementation of the 2002 NIS of the First National Communication to the UNFCCC for water security were as follows: Water resources and potential infrastructure development options to manage and expand water storage capabilities have been assessed in part. There was an assessment of agricultural practices and identification of salinity resistant crops and potential agricultural sites to sustain nationwide food security during the ENSO event and associated drought. The US Civic Action Team installed water catchment tanks at schools in Palau. The Ministry of Public Infrastructure, Industries, and Commerce (MPIIC) worked with the States to identify water pipe leakages and water tank damage in the existing water systems, to identify additional water resources to be secured for severe drought conditions, and to create awareness on the importance of water conservation.

Gaps that need to be addressed in order to adapt to climate change: Water storage efficiency continued to be an issue. National water subsidies were reduced in order to decrease overhead and facilitate repair of expansion of current water treatment and distribution facilities. This policy motivated customers to stop leaks within their premises and practice water conservation. Yet current water pricing does not raise sufficient revenue to cover the total costs for the Koror/Airai system, requiring an ongoing subsidy by the National Government. Some customers do not pay their water bill, but remain connected to the system. Estimates suggest that revenue raised is about $500,000 against operating costs in excess of $1.5M.[139] The Palau Water Sector Improvement Program is a loan that was approved and funded by the Asian Development Bank (ADB) to help improve water operations and management. Gap identified were as follows: (1).Sufficient assessments of the water resource availability-a high priority need for planning new infrastructure and development. (2) Supplemental water supplies- increase residential water catchment tanks and water storage capacity through incentives(i.e. bank loans incorporate water storage and conservation systems and a building code for new homes); (3) Reliable alternate water sources and treatment systems (i.e. reverse osmosis systems in Peleliu); (4) Efficient existing water systems, (4) Adequate water resources for severe drought periods; (5) Low awareness on water conservation-except during a drought; (6) Programs to raise awareness and to educate people on appropriate watershed management; (7) Environmentally sound water usage systems for farming; (8) Effective land use planning and of land use zones**;** (9) Emergency management plan for all State Systems; (10) trained water management staff in States; (11) Drought and flood preparedness strategies in partnership with NEMO and (9) Sustainable land use plans within watersheds; (12) Riparian or buffer zones; and (13) comprehensive and holistic land use management plans that conserve upland forests and mangrove forests and the integrative planning and vulnerability assessments approach for each state.

[137] Burns 2002
[138] Hajkowicz, 2006.
[139] Hay et al. 2007

Appendix 4 Goal 4 Universal Clean Energy

The EU's North REP project is funding the development of an Energy Sector Framework to strengthen the institutional arrangements for energy regulation in Palau. The 2008 Energy Efficiency Action Plan aims to reduce national energy consumption in both the public and private sectors. This plan recommends specific energy efficiency and energy awareness activities to be implemented by the Energy Planner. The 2007 Energy Conservation Strategy provides an action plan to reduce governmental energy use. Energy efficiency activities range from the distribution of Compact Fluorescent Lights (CFLs) to energy efficiency and renewable energy subsidy programs. Energy efficiency activities will save at least $300,000/y in energy costs. Activities include energy efficient light bulbs, energy efficient demonstration buildings, energy efficient upgrades at Capitol Complex and government buildings, campaigns to phase out two stroke outboard gasoline engines, energy awareness campaign for OEK, replacing larger, inefficient generators in outer islands, community workshops, National Development Bank of Palau's Energy Efficiency Subsidy Program. Several grid-connected solar PV systems were installed at the Capitol Building, National Airport; National Hospital Solar street lights have been installed. The GEF-funded Sustainable Economic Development through Renewable Energy Applications assisted with an energy tariff review for PPUC, feasibility studies, marketing and bankable projects, providing training to the energy sector, creating standards for renewable energy installations and education and awareness programs.[140]

The **2013 Energy Working Group**[141] identified objectives to achieve the goal of Universal Clean Energy in order of priority as follows:(1) Import Standards either (A) Rebate or discount on smart appliances or (B) Tariffs on less efficient appliances, incandescent light bulbs, and imports from mainland China; (2) Building Code Standards; (3) Smart Grids- flexible electric rates depending on the time of day; (4) Read meters (i.e. no flat rates) ,especially in areas outside the urban center: (5) An Executive Order to insulate public buildings and install automatic door closures on air-con rooms. The working group developed the following policy statements: **Goal: Tariffs: Objective:** To address climate change with a tariffs for (1) imported appliances with a low efficiency; (2) incandescent light bulb (3) imported food to promote local food production and reduce energy waste in transport; (4) restrict trade with countries until they improve either their carbon footprint or human rights record (i.e. main land China); (5) on cars/trucks over 10 years old; And (6) Plastics. **Implementation** – (a) identify a sponsor in OEK ,(b) pass law in OEK, (c) Sign by president, and (d) enforce by customs office; **Target date**: 1 year; **Responsible Party:** OEK

Goal is to establish smart Grids in Palau. Objective: To decrease total energy production requirements by providing economic incentives to consumers; to adjust energy use to off-peak hours by offering flexible electric rate. **Implementation (a)** PPUC policy with permission from OEK if necessary; (b)Inform appliance retailers of product availability of smart appliances; (c) OEK can offer rebates to customers to upgrade their appliance; (d)Make housing loans dependent on purchase of EE/Smart appliance; (e) Building code requirement. Target: 50% new appliances purchased in Palau within 2 years will be smart

The 2002 National Implementation Strategy (NIS) [142]called for raising awareness about climate change and its impacts on all levels. An implementation activity was to develop and implement a strategy to

[140]Uludong et al. 2013 Second National Communication to the UNFCCC

[141]During the Gaps and Needs Analysis Workshop towards the development of a CC policy framework, 6 main Goals were identified including Food Security, A working group focused on Sustainable Livelihoods during the second day of the workshop on April 23, 2013

[142]2002 First National Communication to the UNFCCC

promote alternative modes of transportation and associated infrastructure. Activities to mitigation GHG were as follows: (1) Establish requirements for government procurement process to purchases only energy efficient products for the public sector infrastructures. (2) Promote energy efficiency through the establishment of building codes.(3) Establish an incentive measures for private sector to promote energy efficient products and (4) Identify and promote viable energy efficient public transportation. The **2013 Second National Communication to the UNFCCC** provided future options and needs indicating that. Palau has strong potential for solar energy, with large-scale grid-connected solar PV technology identified as the most economically feasible renewable technology. Site-specific solar measurements are needed to assess the economics of potential solar projects. Other renewable resources—including hydro, geothermal, and biomass—have limited feasibility. Landfill biogas and ocean thermal energy conversion (OTEC) technology should be studied and considered. The Palau Energy Office is currently involved in a three-year study to measure the wind as a future option (PIREP, 2004). The 2010 Energy Sector Strategic Action Plan (ESSAP) included a project pipeline of energy projects under consideration. Some of these projects are still in need of funding, including: (1) Upgrading the Airai to Ngchesar connection to reduce high load loss; (2)Upgrading the Koror substation to reduce distribution losses, and (3)Enhancing grid capacity and power distribution to Ngiwal and Ngaraard to reduce load loss.

Barriers to Mitigation include high upfront costs, lack of capacity, and high price of imported parts as barriers to renewable energy development in the Pacific.[143] Solar projects fail due to insufficient capacity and the lack of spare parts and technical support. Institutionally there a no clear channels for renewable energy project development, fragmented implementation of renewable energy projects, and lack of experience with renewable energy technology. Technical barriers to renewable energy include lack of knowledge of energy resources (especially wind resources) and a tropical marine environment, which can be damaging to mechanical and electronic equipment.[144] Palau has underutilized many multilateral and bilateral financing opportunities for climate change mitigation projects (i.e., Palau utilized only 33% of the $3.3 million GEF-4 allocation for climate changes activities.[145] Lack of information on available funds, long timelines, and varied requirements for project development, implementation, and reporting are some of the most challenging barriers.[146] The funding application process is often lengthy and complex and has been criticized as being "tortuously complicated.[147]"

Data collection is required in order to conduct a more detailed mitigation assessment using formalized modeling, specifically the Long-range Energy Alternative Planning (LEAP) system energy accounting model. The LEAP model simulates the effect of selected mitigation options on overall costs and emissions (SEI, 2006). The LEAP model is the simplest model, requiring less data and expertise than other modeling systems. As the data collection process for this type of modeling often takes a year to complete, Palau needs to launch a data collection initiative in the near future. This initiative should include relevant government ministries, Palau Public Utilities Corporation (PPUC), and private industry and businesses. Data sets required for the LEAP model (SEI, 2006) are (1) Macroeconomic Variables-; (2) Energy Demand Data- (3) Energy Supply Data- and (4) Technology Options. Training for the LEAP model is available.[148]

[143] International Renewable Energy Agency (IRENA) 2012
[144] PIREP, 2004
[145][145] GEF 2013
[146] Pacific Island leaders discussed barriers during the 2011 Pacific Climate Change Roundtable Maclellan, 2011.
[147] Hemstock & Smith, 2012
[148] Stockholm Environment Institute (SEI) model

Appendix 5 Healthy Productive Ecosystems

The2013 **Healthy Productive Ecosystems Working Group** identified objectives to achieve the goal of Healthy Ecosystems as follows in order of priority: (1) Planned sustainable development; (2) Enforcement ; (3) Funding; (4) National priority; (5) Land ownership, (6) Coordination between relevant agencies, (7) Adequate expertise (scientists);(8) manpower; and (9) Awareness. A policy statement was developed based as follows: **Objective:** Planned sustainable development**: Proposed Outcome**: Improved planning of State and National development to protect the natural resources and maintain healthy functional ecosystem. **Implementation:** for the state and national government propose performance standards for all land use to attain zero net increase of stormwater (any water) runoff. **Target Date and Action:** By December 2015, the national government is enforcing there in zero net increase of stormwater runoff standard. States are in compliance with the zero/net increase of stormwater runoff standard. **Responsibilities:** (1) The Environmental Quality Protection Board (EQPB) will enforce the standards (zero net increase of stormwater runoff)

The 2002 National Implementation Strategy (NIS) of the First National Communication to the UNFCCC calls for increased research and monitoring of Climate Change (CC) impacts on Palau's ecosystems and making scientific data available on the impacts of CC on Palau's fisheries, terrestrial ecosystems and human health. The 2013 Second National Communication identified critical information and research gaps as follows: (1) monitoring efforts, (2) documented information; (3) understanding and modeling climate processes and consequences at all levels; (4) support for research and observing systems for metrological/atmospheric, oceanographic and terrestrial variable in Palau, including the engagement of local observers and practitioners in the design and operation of climate observing systems; (5) baseline data on natural systems and impacts from climatic events such as temperature, rainfall, tropical storms (i.e. Bopha) trade winds and patterns of natural variability and predictions on change; (6)reliable projections of CC and predictions of climate variability on various time scales; (7) baseline information include physical, human, and built environments to better support monitoring and assessment studies at local, island, national and regional scales; (8) historical data sets that incorporate observations and insights from scientific and traditional sources to better document past climate variability and ecosystems; (9) an understanding of extreme events, form the frequency and severity of tropical typhoons and ENSO events to trends in heavy precipitation, include current patterns of frequency and severity and refine projections of change; and (10) effective integration of local knowledge of weather patterns into the modeling process.

The **2004 National Biodiversity Strategic Action Plan (NBSAP)** addressed climate change as a threat, during 1997/1998 El Nino/La Nina, at least one third of Palau's corals dies due to CC related weather events with coral mortality up to 90% in some areas.[149] The Jellyfish Lake experienced a complete mortality of the medusa stage of *Mastigias* sp. due to elevated water temperatures. There are concerns about species extinctions if adaptive capacity thresholds are exceeded.[150] In 2002 coral bleaching related to CC was considered one of the greatest threats to coral reef systems in Palau. Human induced stress such as pollution and habitat reclamation threaten marine systems. In 2002, coastal erosion was already a problem along many coastlines. Projections for Climate Change are increased sea water temperatures and acidification that threaten the viability of corals. **Identified Gaps**: (1) An updated and ratified NBSAP; (2) A NBSAP coordinator and subcommittee as part of the NEPC; (3) Implementation of the following priorities: (a) establish a local expert panel, (b) maintain strong links with relevant regional and international organizations; (c) set up a formal clearinghouse mechanism to form a national biodiversity data base to store information; (d) establish a monitoring and reporting component. (4) Information on terrestrial biodiversity, endemic, rare and endangered species, habitat studies, ecosystem processes and interactions; socio-economic issues, marine biodiversity, coral reef connectivity, and taxonomic

[149] Bruno et al. 2001
[150] Hughes et al. 2003

inventories. These gaps need to be filled in order to effectively address CC adaptation strategies for biodiversity and ecosystem functionality.

The 2010 Republic of Palau Statewide Assessment of Forest Resources and Resource Strategy that became the 2011 **Forestry Strategic Action Plan (FSAP**s to protect forests from coastal erosion, flooding, salt water intrusion and storm surge. The expert group identified six geospatial data layers that needed to be used to adequately conduct the spatial analysis. Although layers for contour elevation at 1 m and coastal erosion hazard areas were highly weighted for spatial analysis; there was is a gap in available geospatial data. There was also no endangered species geo spatial data available for analysis. Priority sites for mitigation of slope failure were ranked by the expert technical group. Areas where elevation contours were greater than 30% were prioritized for slope stabilization and mitigation. There was a lack of critical spatial data to conduct comprehensive spatial analysis. There is a need to reevaluate priority areas selected in 2010 based on updated geo spatial information. The objective for the 2010 FSAP was to restore and stabilize 4 failed slopes in critical areas by 2015 and to develop best management guidelines for slope stabilization for EQPB. To mitigate the impact of coastal erosion the long term strategy was to (1) plant trees and shrubs within 10 m of the high tide mark; (2) set erosion pins at 5 beaches to monitor coastal erosion and (3) develop best management practices to address coastal erosion.

Protected Areas Networks Management Plans identified Climate Change as a major threat and most plans have call for regulations to prohibit human threats (i.e. fishing, hunting, logging, fires) within these zones to build resilience to the ecosystems. Palau had established 40 protected areas covering 40% of near-shore marine areas and 20% of terrestrial areas.[151]**Gaps:** Step by step process of dealing with threats not taken. Gap is the needed geo spatial data to conduct an integrated vulnerability assessment for the State as a whole and then for the PAN site. The Management Plans address Climate Change but there is no clear way forward.[152] Need to further develop Conservation Action Plans into PAN management plans with Smart targets and develop State and Watershed Management Plans.[153]

Barber et al. (2004) addressed issues and strategies to secure protected areas from the impacts of climate change. The World Wildlife Fund (WWF) produced a comprehensive guide to building resistance and resilience to climate change into natural systems with practical implication for protected areas design and management (Hansen et al 2003) stressing three principles across all ecosystems: (a) protect adequate and appropriate space; (b) limit all non-climate stresses; and (c) use active and adaptive management and strategy testing. Guides for forests: (1) Reduce present non-climate related threats; (2) Avoid fragmentation and provide connectivity; (3) Maximize the size of management units;(4) Provide buffer zones and land-use flexibility; (5) Represent forest types across environmental gradients; (6) Protect mature forests stands; (7) Protect functional groups and keystone species; (8) Protect climate refugia; (9) Maintain natural fire regimes; (10) Actively Manage Pests; (11) Maintain genetic diversity and promote ecosystem health via restoration; (12) Assist migration with species introduction into new areas; (13) Protect the most highly threatened species.

Integration of Vulnerability Assessment in to State Master Planning- focus on the ecosystems
The Melekeok Planning Commission used the findings of a vulnerability assessment to finalize their land use plans. A pilot project in Melekeok called "Strengthening the Capacity of Developing Member Countries to Respond to Climate Change- ADB TA 7394-REG" was funded by the Asian Development Bank. This vulnerability assessment focused on the natural and built systems and described the potential impact of climate change effects on those systems. The findings and recommendations were used to inform the zoning and infrastructure development component of the land use plan.
Gaps: (1) Forest policy to guide the clearing of forested areas and other areas vulnerable to land slide/erosion and in key watersheds;[154] (2)Stormwater regulations enforced (EQPB and States, MPIIC and

[151] PCS 2012
[152] Community Strategy 2013 Palau Conservation Society
[153] Appendix 1
[154] 2010 National Disaster Risk Management Framework

PALARIS); (3) Mitigation of causes and negative impacts of land degradation on the structure and functional integrity of ecosystems through sustainable land management (National Biodiversity Strategic Action Plan, Economic Development Plan, National Environmental Management Strategy, Protected Area Network); (4) Mainstreaming CCA and DRM; (5) Risk-proof and monitor vulnerable areas; (6) Incorporation of CCA and DRM in the Environmental Impact Assessment (EIA) process. (7) Educated farmers on proper land use to prevent soil erosion; development and implement forest management plans (Bureau of Agriculture and 2010 Forest Strategy); (8) Updated and implemented quarantine regulations (BoA Strategic Plan) and (9) Rapid Response Plans for new introductions of pests and invasive species (Invasive Species Action Plan 2012); (10) Comprehensive assessment of lost terrestrial and marine ecosystems and Recovery Plans;(11) Recovery Plans for all coastlines; (12) Total estimated loss from potential ecosystems services in recreation for tourism industry from extreme weather events (i.e. site no longer available for diving, snorkeling sites, and eco tours. (13) Disaster Insurance-loss options from tourism industry that accounts for lost business and ecosystem services. The First National Communication to the UNFCCC: does not address potential ecosystem services and carbon trading. However the Second Communication to the UNFCCC addresses the ecosystem services of seagrass. However not cost estimates are provided for any ecosystems. Participants in the 2013 Inception Workshop for the Gap and Needs Analysis towards the development of a Climate Change Policy Framework did consider Carbon trading for forests and oceans with Palau's large Economic Exclusion Zone (EEZ).

Mangroves

Mangroves are critical ecosystems that include plants highly adapted to a variable environment. Potential ecosystem services include food security, water filtration, buffer from storms and a carbon sink. Palau has about 4,708 hectares of mangroves that provide many potential ecosystem services. National Mangrove Plans have been developed.[155] Rainfalls, air temperature, rise in sea level, and extreme weather events impact the growth and distribution of mangroves. Increased air temperatures along with drought conditions may contribute to poor growth and distribution. Tropical storms destroy mangrove habitats, opening habitat for invasive species. Sea-level rise and intense storm events will accelerate coastal erosion rates causing loss of mangrove habitat. Extreme weather event can cause coastlines to recede if not stabilized or supplemented. Saltwater intrusion into ground water, rivers, bays, and estuaries will increase. Changes in rainfall patterns and in temperature and modify salinity gradients in estuaries and alter rates of river delta sedimentation. Coastal currents and upwelling patterns are likely to shift geographically and change in intensity affecting the biodiversity. The 2000 Palau Mangrove Management Plan recommended establishing conservation and reserve areas under the Heritage Act. The Environmental Quality Protection Board (EQPB) proposed Marine and Freshwater Quality Regulations (Chapter 2401-11-09) in order to enforce buffer zones for the protection of coastal waters and mangroves. The Mangrove Management Plan was prepared for the Bureau of Marine Resource and Development but has not been implemented.

Gaps: (1) Updated, implemented and comprehensive State-wide mangrove management plans that account for current conditions and the impacts of CC; (2) Comprehensive and regular monitoring of mangrove forest health and status and land use; (3) Basic data such as a time series of the area of mangroves in Palau at least every 5 years;(4**)** A review of existing institutional capacities; (5) A responsible entity to collect, monitor, and manage mangroves data; (6) A sustainable finance mechanism to implement the program; (7) Pre and post monitoring for the EIA process to determine impacts to mangrove forests as a result of a large scale development Project (i.e. Compact Road[156], Capitol building. large-scale aquaculture or agriculture projects; (8) Long-term management planning of mangrove ecological systems; (9) Regular seminars or meetings to encourage and educate the public on the importance of mangroves for environmental quality and also for economic benefits with a community component to monitoring of mangroves.

[155] Appendix 2
[156] Department of Army 1998 Volume 1 and 2.

In order to integrate climate change into marine protected area (MPA) planning, management & evaluation the MPA the following gaps need to be addressed: (10) Planned MPA monitoring and research to test the efficacy of MPA design and management in the context of climate change; (11) Rapid response strategies to assess extreme events, such as typhoons and tropical storms; (12) Sites selected that are isolated from local anthropogenic stressors and areas with histories of exposure to different anthropogenic stressors to study of climate change impacts (13)Education and outreach programs to support community awareness of potential climate change impacts and ways to respond and (14) Stakeholder participation with MPA managers to build social resilience. (15) Management flexibility to apply dynamic management approaches that can be revisited and adjusted as new information becomes available.

Seagrass

Seagrass are the flowering plants of the sea with at least 10 species found in Palau having twice the potential ecosystem service value of mangroves and five times that of coral reef.[157]Sea grasses are marine flowering plants and at least 10 species are found in Palau. (Green and Short, 2003, Victor 2007a).Seagrass beds have twice the ecosystem service value, as that of mangrove complexes and five times the ecosystem service value of coral reefs (Costanza et al. (1997).Sea grasses are in global decline due to anthropogenic threats (Duarte 2002). The rate of loss may be as high as 7% of their total global area per year (Di Carlo and McKenzie, 2011). The loss of seagrass is largely due to increasing human populations and associated destructive activities in coastal regions (Green and Short, 2003). Climate change impacts may have an adverse affects of seagrass beds. Rising Sea Surface Temperature will change the growth rates and distributions of seagrass species; Ocean Acidification caused by higher levels of carbon dioxide (CO_2) in the oceans will alter the ecological balance between seagrass and its competitors; More frequent or intense extreme weather events may change the composition of seagrass communities: Heavier or more frequent precipitation in coastal areas may lead to increased runoff of nutrients causing eutrophication and death of seagrass beds. Seagrass Net is a global ecological monitoring program that investigates and documents the status of and threats to seagrass resources. Locally, this program is spearheaded by the Palau International Coral Reef Center (PICRC), which has nine sites and several years of data. The Micronesia Challenge and the Protected Areas Network (PAN) are currently-implemented adaptation strategies that are also applicable to seagrass. **GAPS:** Annual reporting on health of seagrass habitats; ongoing monitoring and education with a community based component; comprehensive damage assessment from the impact from Super Typhoon Bopha by PICRC and State Conservation Program Officers.

Coral Reefs

Palau has the most diverse coral fauna of Micronesia and the highest density of tropical marine habitats of comparable geographic areas around the world.[158] Environmental factors were identified that are predictors of greatest resistance and resilience to coral bleaching[159]Palau's coral diversity is comparable to the Philippines, Indonesia and Australia. Maragos et al. (1994) estimated Palau's coral diversity at 425 species belonging to 78 genera. More than 300 species of sponges were documented in Palau (Kelly-Borges and Valentine, 1995). About 200 species of Cnidarians, other than Scleractinia, are known to exist, with many other species yet to be documented. There are at least 21 species of crinoid fauna (Meyer and Macurda, 1980). Palau has the highest diversity of reef fish in Micronesia, with a total of 1,278 known species. Data gaps suggest that reef fish in Palau may number closer to 1,449 species (Myers, 1999). During the 1997-1998 El Niño-La Nina event, massive coral bleaching and mortality occurred. The bleaching event was widespread and variable mortality among sites (Bruno et al., 2001). In some areas, mortality was as high as 90%. For Acroporid corals (staghorn corals) Corals near estuaries have relatively higher survival rates (Golbuu, et al., 2003a). Less extensive coral bleaching events occurred since the 1997-1998event. Disease or other stress inducing phenomena's at the microhabitat level and

[157] See Appendix 2
[158] See Appendix 2
[159] West and Salm (2003)

increased sedimentation degrade reef habitats (Golbuu et al., 2003b). Corals thrive within a narrow temperature range. Increasing sea temperature will impact corals in the future. Continuing ocean acidification will cause coral loss, weakening and collapse of limestone reef structures. Reef recovery from such severe storms is slow, because fewer corals survive to colonize affected areas. An increase in severe typhoons will contribute to the degradation of reefs structures already weakened by coral bleaching and ocean acidification. In 2001 PICRC launched the National Coral Reef Monitoring Program to determine (1) the status of coral reefs (2) and spatial and temporal changes (3) To access recovery after the 1998 coral bleaching event; and (4) To provide information to stakeholders to be used for management and policy development. The program started with 14 sites but currently has 21 sites. Site selection was based on geographic location, reef type and level of human impact. The Micronesia Challenge (MC) and the Protected Areas Network (PAN) are adaptation strategies to address Climate Change impacts.

Gaps: (1) Comprehensive damage assessment for coral reefs from the impacts of Super Typhoon Bopha. (2) The 2012 Protocol for Monitoring Marine Protected Areas calls for Temperature data loggers that a strategically located to address CC impacts. (3) Quantification of carbon sequestration of the ocean. (4)Integration of marine ecosystem management strategies into adaptation programs[160] that are proactive approaches to (a) enhance ecosystem resilience to climate change impacts (i.e. reduce impacts existing stressors & other factors that disrupt marine and terrestrial ecosystems; (b) Protect naturally resistant or resilient areas; establish more highly protected marine zones; develop a MPA Network; and (c) support research on connectivity & effectiveness of existing networks of highly protected zones.

Carbon Sinks

Gaps that need to be addressed in order to promote carbon sinks are as follows:(1) Real time data on forestry activities; (2) Comprehensive and standardized reporting of terrestrial Protected Area Network sites[161] by the State and PAN technical committee.[162] (3) Updated information on forest cover and type provided by the Forestry Division. Land use plans that apply cost benefit analysis to development and potential ecosystems services (i.e. carbon sequestration) provided by the State and EQPB. (4) A national connectivity design to guide allocation of technical and funding resources. (5) Public awareness on the ecosystem services forests and mangroves provide in climate change adaptation. (6) Cost Benefit Analysis (CBA) of small scale firewood and charcoal processing and its impact on deforestation in Palau.[163](7) Comprehensive damage assessment and recover plan from the impact of extreme climate events such as Super Typhoon Bopha. (8) Quantified land use change to accurately determine $C0_2$ sequestration provided by Bureau of Agriculture (BoA) and PALARIS. In 2005, the uptake of CO_2 by forests and biomass was estimated to be 98.57 Gg-CO_2.[164]

[160] US Climate Change Science Program 2006
[161] Appendix 1
[162] As of 2011, Palau had established 40 protected areas covering 40% of near-shore marine areas and 20% of terrestrial areas.[162]
[163] David Idip, 2013 Vulnerability Assessment as part of the 2nd National Communication for the UNFCCC.
[164] 2005 GHG Inventory

Appendix 6 Goal 6 Good Governance

The Pacific Plan-A 2013 a round table meeting with representatives of civil society and the private sector[165] raised the following gaps and needs for Palau: good governance, better communication and coordination between the national government and the private sector; high fuel cost, access to clean energy technology in the region and lack of awareness on the trade negotiations that are taking place. The **2013 Good Governance Working Group[166]** identified objectives to incorporate into the CC Policy Framework under the goal of Good Governance as follows in order of priority: (1) Enforcement; (2) Zoning; (3)Energy Efficient appliances, and fuel efficient vehicles, import control;(4) Building Codes; (5) Emissions control; A Strategy to build institutional capacity; (6) Aid coordination; (7)Relocation Strategies. The Good Governance Working Group developed the following policy statement to achieve the Objective of Emission control: The Republic of Palau (ROP) emissions are reduced by75%. Time Line: By Jan 2015. Specific Action: Develop and Implement a regulation that all vehicles be inspected annually and have installed proper emission control equipment and meet the emission control standards. The implementing agencies are the Bureau of Public Safety (BPS) and the Environmental Quality Protection Board (EQPB).

Super Typhoon Bopha (STB) Recovery Process has led to the development of policies to ensure equitable benefits to those impacted by STB.[167]**Gaps** were as follows:(1)Guidelines and policies for public infrastructure/traditional structures, agriculture, ecosystems damage, and health impacts; (2) An EIA, SIA and HIA for STB; and (3) Comprehensive assessments of all impacts of STB with financial budget.

During validation workshop for the 2nd National Communication in 2013 the following gaps and needs for UNFCCC National Communication Reporting were either identified or validated in the draft report**.**[168]Policies and Regulations-The 2002 National Communication to the UNFCCC identified the following for policy and regulatory gaps: land use planning; building codes; incorporation of Climate Change into the Environmental Impact Assessment (EIA) process, a strengthening of the Environmental Quality Protection Board (EQPB) Act; enforcement of air emission standards and discharge standards for waste water; and regulations on solid waste disposal. Implement Forest and Mangrove management plans. Implementation of the 2012 Sustainable Land Management policy will address many of these gaps.

Guidelines for CC Policy Framework-To optimize benefits from building resilience within the community, Climate Change Vulnerability, Adaptation and Mitigation and Disaster Risk Management (CCVAM-DRM) needs to mainstreamed into comprehensive land use planning on a state-by-state basis. The national and state guidelines need to ensure that resource use activities build safe and resilient communities in a changing climate. The guidelines need to address master and resource use state plans that include CCVAM- DRM; (2) zoning systems that incorporate CCVAM (i.e. protect carbon sinks and reduced GHG emissions), and (3) building codes need to CCVAM-DRM based upon real time CC projections (i.e. storm surge events, rainfall). Planning needs to mainstream CCVAM- DRM to provide assurance to all stakeholders, protect natural, cultural and built resources, and enable intra and interstate coordination as states progress through their planning process. Lessons learned from the Super Typhoon Bopha need to be incorporated into the planning processes. Zoning systems or codes need to be developed to provide in-depth guidance and harmonization at all levels. All zoning systems need to classify and distinguish between residential, agricultural, industrial, commercial, conservation, and cultural usage. (e.g., Melekeok State incorporated vulnerability assessment into their zoning process). The permitting processes need to be reassessed on a regular basis to incorporate updated information on

[165] Participants in Pacific Plan Round table on May 13, 2013- Members from the Chamber of Commerce, Palau Community Action Agency and private entrepreneurs were present.
[166] Working Group for the 2013 Gaps and Needs Analysis towards the development of a Climate Change Policy April 23, 2013
[167] Appendix 1a
[168] Gaps identified by participants from the Validation workshop for the Second National Communication for the UNFCCC held on April 11, 2013

CCVAM- DRM. National funding and technical support through a national coordinating body and Climate Change donor round table discussions should ensure that these three elements of nation-wide planning are implemented.
A national certification program for inspectors is needed for CCVAM-DRM assessment should build capacity in each state to ensure compliance to traditional, state and national laws that mainstream CCVAM- DRM Environmental Assessment. The EQPB regulations (EA, EIA) need to include CCVAM-DRM requirements that can be built upon the Bopha Relief Guidelines. National and Private financial lending institutions need to provide incentives to purchases disaster insurances similar to other CCVAM incentives for energy efficiency and farm loans for food security.

State Action-As part of the CCVAM-DRM planning and zoning process, Stats need to take the following actions: (1). prioritize good agricultural lands for local food production for food security (2). Work with the newly established PPUC[169] to protect of water sources (upper watersheds, ground water, springs, catchments) and development of storage, distribution and treatment system that provide adequate, high quality water supplies and identify alternate water sources for water security (3) Develop and maintain of wastewater and solid waste management systems to build protect public health and the environment and reduce stress to ecosystems functionality in order to build community and ecosystem resilience; (4) Climate and Disaster Proof the historic and cultural sites and cultural landscapes (5) Provide state wide incentives for energy efficient and climate and disaster proof infrastructure and develop contingency plans for public services (health care, law enforcement and fire protection); (6) CCVAM-DRM strategic planning and zoning; (7) Implement CCVAM-DRM Best Management Practices based upon shared lessons learned from local practices and knowledge, demonstration projects for PAN sites, farm sites, taro gardens, energy projects, and recovery projects from Typhoon Bopha.
State Responsibility-The States and their respective traditional leaders and communities, should have the primary responsibility for establishing and implementing development guidelines that have integrated CCVAM -DRM. The National Coordinating Body for CC Policy and Joint National Action Plan for CCVAM- DRM need to assist the State Planning Commissions and State Public Land Authorities to drive these processes. The national government through the proposed NEPC and CC and DRM subcommittee need to provide states with resources, training, and support to establish and implement these development guidelines. The National Government needs to provide an annual budget (i.e. PANF, CC and DRM Trust Fund) for a certified national planner to assist each State in their specific technical needs to develop their plans and ensure that communities, state and national planning priorities are aligned with each other and have mainstreamed CCVAM- DRM into their policies and regulations.

Gaps identified from the 2nd National Communication to the UNFCCC were as follows:

Good Governance

- Accessible data to met reporting obligations to the UNFCCC National Communication (Good system of information sharing is critical for timely access to information and reports each sector
- Capacity building to prepare National Communications in country
- Five year national census data
- Official (or published) GHG Inventory local data.
- Data collection for the Land Use Change and Forestry (LUCF) for the different vegetation types is needed
- Accurate real time data for lime production, soda ash usage, and food and drink consumption, and fertilizer usage needs to be collected.
- Collection and use of local data for Vulnerability and Adaptation Assessment (i.e. Melekeok Vulnerability Assessment Case Study)
- More accurate estimations from country/category specific factors that reflect Palau's circumstances are needed

[169] Utilities Consolidation Act RPPL 9-4 signed into law in June 2013: Appendix 3

Livelihoods

- Funds to train staff from the Ministry of Natural Resources, Environment, and Tourism (MNRET) to run the LEAP model for the next mitigation assessment
- A comprehensive assessment on the effects on the Compact Road (completed in 2007) on population distribution, development, and transportation
- A bottom up approach as a long-term goal.

Energy

- A more accurate methodology for estimating the amount of fuel imported between 1994 and 1998 and a revision of density data for each fuel type used into tons.

Functional Ecosystems

- Waste Annual population growth is needed to determine waste generation
- Data on the fraction of type of wastes.
- Official hospital data on the amount of waste incinerated
- Sources/sinks were estimated using mainly default emission factors/parameters;

Gaps identified for National Weather Service[170]were as follows:(1) monitoring efforts, documented information, understanding of model climate processes and consequences at local, island, and national levels; (2) adequate support for research and observing systems for meteorological/atmospheric, oceanographic, and terrestrial variables, including the engagement of local observers and practitioners in the design and operation of climate observing systems; (3) data on the nature and consequences of climate conditions such as temperature, rainfall, tropical storms, and trade winds, and patterns of natural variability and how they might change; (4) Reliable projections of climate change and predictions of climate variability on various timescales; (5) accurate baseline information on the physical, human, and built environments, to support monitoring and assessment studies at local, island, national and regional scales; (6) accurate historical data sets that incorporate observations and insights from scientific and traditional sources to document past climate variability and ecosystems; (7) comprehensive understanding of extreme events, from the frequency and severity of tropical cyclones and ENSO events to trends in heavy precipitation, including current patterns of frequency and severity and improved projections of how those patterns might change; (8) accurate data on patterns of resource use, ecosystem change and species diversity at local, island and national levels, and data from local practitioners on habitat changes and resource availability in areas traditionally used for subsistence gathering and fishing; (9)data for comprehensive assessment of the process and impacts of anthropogenic climate change; (10)financial and technical support to expand the geographical scope for data collection where vulnerabilities to existing climate stresses are high due to the island topography and economic dependency; (11)Adequate budget for technical, logistical, and personnel.

Terms of Reference for the Climate Change Coordinator towards the development of a Climate Policy Framework- The Climate Policy Framework will require nationwide coordination. The OERC National Environmental Planner serves as the Climate Change Coordinator that will need to support the establishment of a subcommittee within the NEPC. The CC Coordinator will need to implement the following: (1) Facilitate and ensure communication and coordination between stakeholders; (2) Collect and disseminate climate change information; (3)Support the development, implementation, and coordination of GHG Inventory and A and V standards and Disaster Risk (e.g. emissions standards, land use change, (4) Provide a central point of access for climate change and disaster risk information to the public; (5) Work with the NEMO to develop and implement an Climate and Disaster Management Action Plan; (6) Prepare annual reports based upon implementation of work plans and reporting regularly from members of NEC and the CC Subcommittee; (7) Assist all entities involved in climate change and disaster risk planning and management to develop and report to the coordinating body on their progress in implementing their strategic plans and annual work plans that include activities, tasks, key personnel, budget, time lines and updated data; (8) Refine, coordinate, and monitor the implementation of a Climate

[170] Second National Communication for UNFCCC 2013

Change and Disaster Risk Finance Plan; (9) Refine the plan based upon detailed consultation with agencies involved with CC and DR to identify, quantify, and implement ideas to increase revenues, increase efficiencies, and reduce costs; (10) Report to an NEPC and the Climate Change Policy Framework Advisory Committee (CCPFAC) tasked with oversight of the nationwide implementation of the CC Policy Framework. The CCPFAC will represent the OEK, the traditional leaders, state governments, national agencies and communities responsible for land management, and key non-governmental and private sector organizations.

Sustainable Finance for CCAVM and DRM

Gaps for sustainable finance are the following: (1) adequate budget; (2) a mechanism to raise revenues and (3) enabling environment to raise revenues. Policy measures identified to address these gaps were: (1) charge market rates for local services, to create a larger and more stable revenue base for their activities; (2) provide authority, incentives and direction to achieve needed revenue increases. In order to sustain financing there is a need to: (1) amend laws or policies to enable price setting that reflects current market prices (i.e. the 2013Utilities Consolidation Act streamlined administrative costs and enabled the Palau Public Utility Corporation (PPUC) to charge market rates);(2) Enable agencies to access to their fees by legislative intervention authorizing an agency access to their fees to support their budget or require the National Treasury to track revenues raised by different agencies, maintain those revenues in separate accounts, and distribute those revenues (or a portion of them) to those agencies.(e.g., registration fees used to purchase air quality equipment for EQPB and BPS). As part of the implementation of Palau's Climate Change Policy Framework, the National Congress should task the CCPFAC to refine, coordinate, and monitor the implementation of a CC Sustainable Finance Plan through a more comprehensive consultation with agencies involved with CCAVMDRM to identify, estimate, and implement ideas to increase revenues and efficiencies, and reduce costs (i.e. a CC Tax on second hand energy inefficient cars). Developing these estimates would provide the OEK with greater justification to direct such revenue increases and better data with which to plan future budgets. [171]

SLM Policy and Climate Change Adaptation Strategies

The 2012 SLM Policy calls for an Action Plan to implement and develop Climate Change Adaptation Strategies to "mainstream" climate change adaptation strategies into all aspects of land use planning, disaster risk management, economic development plans, and environmental management plans including those related to health, well-being and safety, food security, and sustainable livelihoods. At the same time strengthen institutional capability to understand the effects of climate change for Palau, the degree of vulnerability, the national capacity to adapt and to develop and implement appropriate response strategies to climate change. This strategy requires the following (1) Implement the National Disaster Management Framework; (2) Strengthen PALARIS capacity as a coordinating body to implement the sustainable land use policy; (3)Develop integrated methods to assess the effects of climate change (i.e. An Integrated Planning and Vulnerability Assessment Approach (AIPVAA)successfully applied in Melekeok State); (4) Improve communication and dissemination of useful and relevant information to key stakeholders on CC vulnerabilities and adaptation; and (5) Implement full scale adaptation and mitigation projects based upon successful pilot programs (i.e. AIPVAA) funded through Global Environment Fund for climate change, biodiversity and land degradation. Responsible authorities/collaboration agencies include: MPIIC, National Public Land Authority (NPLA), MNRET, OERC, NEMO, State government, State public land authorities and State planning commissions.

Gaps: (1) Disaster Risk Management integration into National Communications to the UNFCCC**.** (2) Implementation of recovery plans for extreme climate events. (3) Lessons learned built into the NDRMF. (4)Sectoral response plans and standard operating procedures (SOPs) for extreme climate events. (5)Regular training for initial and comprehensive assessments; (6) standard reporting for extreme climate events; (7) Multi-sector assessment teams, trainings and refresher courses; (8) Standard rapid assessment tools; (9) Guidelines for the use of emergency funds; (10) Prioritization process for support such as debris clearance and removal processes; (11) Training that harmonizes the assessment format and its

[171] 2012 Sustainable Land Management Policy

socialization in close partnership with development partners (i.e. United Nations Development Program (UNDP), United Nations International Children's Emergency Fund (UNICEF), Asian Development Bank (ADB), World Bank (WB), and Secretariat of the Pacific Community (SPC); and (12) Raise awareness about new tools through workshops and training to build local capacity.

"Palau can take Super Typhoon Bopha as a wake-up call to improve its disaster risk management policy, institutional mechanism, capacity at all levels and include disaster and climate risk management as part of regular development planning, implementation and monitoring/ evaluation processes."[172]

STRATEGIES: To sustain the development gains in the country and to reduce future disaster risks, all development activities including post disaster activities (response, relief, rehabilitation, reconstruction, etc.) must include disaster risk reduction/ management measures in the development and post disaster planning, implementation and monitoring and evaluation. Super Typhoon Bopha (STB) occurred during a period of transition in the national leadership. Super Typhoon Bopha (STB), earthquakes in Solomon Island and in Papua New Guinea heightened the awareness and interest of local people and development actors in Palau. This provided an enabling environment to strengthen the disaster management policy, mechanisms, and capacity. The newly elected government was keen to initiate some meaningful activities in this sector.

Based on the Hyogo Framework for Action (HFA), Regional Framework for Action (RFA) and the National DRM Framework (2010), the strategies for DRM are based around the gaps and needs in the following key areas:

- Review the National DRM Framework and its implementation plan. Based on the revision, propose to improve the policy, institutional mechanisms and capacity at all levels;
- Strengthen NEMO to effectively fulfill its mandates[173];
- Multi-hazard risk assessment based on GIS and strengthen early warning system;
- Inclusion of DRM in school and college curricula; (WITH CC)
- Safety nets and risk transfer; and
- Strengthen disaster preparedness for effective response.

Implementation Strategy of Recovery Plan Institutional Arrangements:

Gaps: (1) clear roles and responsibilities; (2) trained and motivated participants, (3) adequate financial resources and (4) regular monitoring and evaluation of implemented activities; (5) as a nodal coordinating body, the National Emergency Committee (NEC) acts as an overall coordinator of all recovery activities and prioritize actions. (6) Comprehensive assessments led by Bureau of Agriculture (BoA), Ministry of Natural Resources, Environment and Tourism (MNRET) and PHA and Capital Improvement Project (CIP), Ministry of Public Infrastructure, Industry and Commerce (MPIIC). The NEC needs to regularly review the progress and challenges with assistance from NEMO who assist NEC in coordinating and implementing the decisions made by the NEC.

Joint National Action Plan

In order to integrate Disaster and Climate Risk into a Joint National Action Plan (JNAP), [174] two gaps that need to be addressed are (1) An accurate assessment of existing and future risks[175] and (2)Coordination of responsibilities for DRM and CCA&M. The strategy that needs to be implemented in order to develop a JNAP is similar to what is needed to develop a Climate Change Policy Framework as follows:

[172] Office of the President 2013 Recovery Plan for Super Typhoon Bopha
[173] Appendix 7 provides a budget for this
[174] A Roadmap towards a Post 2015 Integrated Regional Strategy for Disaster Risk Management and Climate Change Adaptation & Mitigation - Strengthening Coordination in the Mainstreaming of Disaster and Climate Risk into Planning and Decision-making Processes at Regional, National and Sub National Levels in the Pacific PREP 22SM/WP 8.2.1/Att.1
[175] Strengthen Climate Change Adaptation through Disaster Risk Reduction: Briefing Note 3, UNISDR 2010.

- A bottom-up approach to combine disaster risk reduction and climate change adaptation, a people centered strategy/policy that is cost-effective and equitable that enhances access to and understanding of information and promotes livelihood diversification; and likely to provide a robust defence against a number of stresses, not just those related to extreme weather and climate events[176]
- A community-based adaptation and community-based DRM and ecosystems-based approaches to adaptation (i.e. LEAP[177]).
- Use of existing social networks to integrate adaptation and risk reduction into ongoing development efforts at the community level.
- Policy that is grounded at the local level and place ownership with local civil society.
- Use of local-level case studies to develop national CC strategies and sectoral CC policies.[178]
- Use of lessons learned from extreme climate events like Bopha Super Typhoon to develop a JNAP and a CC policy framework
- Use of local knowledge and practices in building, land use and master planning
- Build capacity of risk governance so sustainable strategies for Risk Reduction and Management are factored into planning and public investment.
- Ensure that planning for adaptation looks comprehensively at CCA&M and DRM all levels and focuses on developing the institutional and legislative frameworks, risk assessments and institutional capacities.[179]
- Develop funding mechanism for adaptation and mitigation in the Pacific that does not compromises other aid commitments to alleviate poverty and promote development;
- Conduct a feasibility study to establish either a Pacific Regional Climate Change Fund; a Pacific Catastrophe Risk Financing initiative
- Mainstream DRM and CC into macroeconomic and fiscal policy and budgetary processes (e.g.budget for NEMO director and Climate Change Coordinator positions).
- Develop a regional strategy that integrates DRM, CCA&M to provide a firm foundation for the better coordination, if not consolidation, of donor support in these areas.

[176] Adaptation to Climate Change by Reducing Disaster Risks: Country Practices and Lessons. UNISDR Briefing Note No. 2, UNISDR, 2009.
[177] Micronesia Conservation Trust and US Coral Triangle Initiative Support Program. 2012
[178] Ibid.
[179] Strengthen Climate Change Adaptation through Disaster Risk Reduction: Briefing Note 3, UNISDR 2010

Appendix7An Integrated Planning and Vulnerability Assessement Approach (AIPVAA)

The AIPVAA **of Melekeok State,[180] is a**n integrated approach to climate change adaptation and development planning . The methodology defined a project scope; conducted a baseline assessment; determined the climate change threats; undertook an impact and vulnerability assessment; and developed adaptation measures.[181] Four categories of climate threats were identified (a)**Storm surge,** waves of greater than 1m; (b**High intensity rainfall and flooding** – Rainfall event of extreme intensity, resulting flash and pooling flooding; (c) **Sea level rise** – Incremental increases in sea level by 2100 (estimate: 59cm); (d) **Typhoon**– A combination of intensive rainfall, storm surges, and high winds; (e) **Extreme drought** – Periods of unusually low rainfall; and (f) **Temperature increases** – A projected increase in air temperature of more than 2°C by 2050 and sea temperature of more than 1°C. The Climate Change threats listed above were also listed as the top natural hazards in the 2010 NDRMP with the exception of temperature increases.

Based on the Vulnerability Assessment, seven adaptation actions were defined with the following expected results: **Coastal Area: (1) -** Melekeok State had a climate resilient wastewater treatment system; (2) Resiliency to coastal erosion is increased for protection of manmade and natural assets. **Upper Area (3)**– CC strategies that promote sustainable tourism and economic self-sufficiency were integrated into the management of the Reserve and surrounding area; (4)– Adaptive capacity is increased for Melekeok State's water supply infrastructure and watershed management; **Institutional Context**- (5) Develop Palau's national climate change policy framework and strategies to promote integration of adaptation action by sectors and states (6) Support the Melekeok to prepare a climate change adaptation strategy addressing economic sectors such as tourism, agriculture, and fisheries as an integrated component of the next state master development plan; (7) Implement national climate change adaptation strategies by replicating the adaptation planning methodology in other States in an exchange and learning process and develop basic baseline information for Palau. This project developed and demonstrated a Palau-specific methodology for CC vulnerability assessment and adaptation planning using the data, resources and capacity available. The approach used the best available science, field surveys, GIS analysis and local knowledge in conjunction with expert judgment. **Gap:** Implementation of the AIPVAA tool for all State planning processes in Palau. **Need:** to conduct a comprehensive disaster assessment using the findings of the AIPVAA and existing Melekeok Plans to refine the current land use plans and adjust the assessment based upon local data post Bopha.

[180] David Idip. 2013. Vulnerability Report for the Second National Communication to the UNFCCC
[181] Uludong et al. 2013. Second National Communication to the UNFCCC

Appendix 8The Micronesia Challenge and Protected Areas Network

Climate Change Adaptation- The Micronesia Challenge (MC) is to effectively conserve at least 30% of near-shore marine resources and 20% of the terrestrial resources across Micronesia by 2020. **The 2003 Protected Areas Network (PAN**) Act provides a framework for Palau's national and state governments to collaborate and establish a nationwide network of terrestrial and marine protected areas of biological significance including areas of high biodiversity, critical habitats, and areas with resources essential to the future social, cultural, economic, and environmental stability and health of Palau. The PAN Act enables the national and state governments to work together to build upon an existing suite of protected areas and to develop a PAN that meets the objectives of protecting the country's terrestrial and marine biodiversity, ensuring sustainable use of the natural resources and is resilient to climate change impacts. The PAN Fund provides a sustainable financing mechanism to management critical habitat.

The **Protected Areas Network (PAN**) act, RPPL 6-39, was passed in 2002 that created a nationwide system to support States' efforts in protecting their natural resources. This support included technical assistance to the states from the national government through the PAN Office. The PAN office works with states to nominate and develop management plans for PAN sites and technical assistance to implement, monitor and evaluate the progress of the implementation of each management plans. In 2011, the PAN Technical Committee was formed to provide technical assistance to the Minister of the Ministry of Natural Resources, Environment &Tourism (MNRET), specifically to review State nominations and management plans. In order to support the work of PAN, sustainable financing was necessary to maintain PAN sites and therefore a financial mechanism, through the legislation RPPL 7-42, was created. In Palau, the Green Fee—a fee paid by non-residents departing Palau—funds the PAN. The Green Fee monies collected are directed to PAN Fund—a non-profit organization with the purpose to administer, manage, invest and disburse all funds for PAN. Funds are disbursed by the PAN Fund on a quarterly basis to each PAN State, based on their management plans. These funds are then used to implement the activities as set by each States' management plans for the purpose of protecting their natural resources.PAN leads Palau's national effort to support the Micronesia Challenge. Under the Micronesia Challenge, each jurisdiction has committed to conserve at least 30% of the near-shore marine resources and 20% of the terrestrial resources by 2020 (MC, 2012). States, communities, and private entities can apply to register a protected site under the PAN. A PAN site must have a detailed management plan and must establish a use category—restricted non-extractive use, non-extractive use, or sustainable use

Protected Areas Network Summary of State PAN Management and Climate Change

The outlying State of Kayangel is already experiencing impacts to sea level rise and **s**alt water intrusion into taro patches and shoreline erosion are examples of impacts of climate change that are being felt now. A conservation target for Kayangel is the mesei (taro patch) because its ahs very limited area and capacity for taro production. The Micronesian Megapode (*Megapodius laperouse senex*) is being threatened by sea level rise and predation by invasive species that prey on them and their eggs[12]. In Melekeok **Ngardok Nature Reserve** Plan includes a goal to maintain the ecological integrity of these habitats. The Reserve faces significant threats from human disturbances (both permitted and overuse), poaching, fire, water use, erosion, invasive species, and climate change. Management activities are designed to minimize or reverse threats. Fire is identified as a major threat to the Reserve it destroys flora and fauna, organic matter and fertile soil with subsequent erosion after heavy rainfall with either no or little recovery. **Ngchesar State Protected Area System Management Plan** for the Mesekelat Watershed includes Enforcement, research, restoration, and education were addressed but no specific actions to deal with climate change.[10]**Ngardmau's Ongedechuul System of Conservation Areas Ecosystem Based Management Plan** ranked Climate Change as a high threat because intense rainfall could cause increased sedimentation.[9]**Ngaraard's Kerradel Conservation Network Management Plan** objectives include development of a Vulnerability Assessment and Action Plan. Measureable targets identified were as follows.[3]**Ngiwa**l **State PAN** Natural Resource Management Plan identified climate changes as a high threat, specifically sea level rise and unpredicted weather conditions that cause high wave actions that

result from the overall effects of climate change is the highest concern for the people who live along the low lying coast where sea level rise and wave can affect their properties, houses, farms, and taro patches. Alteration of the coastline due to impact from rising sea level was identified as a threat because it will expose properties, farms, and taro patch to sea level rise. Their plan has a specific goal to build a resilient community to adapt to sea level rise by 2015. Objectives are as follows (1) Secure assistance to conduct vulnerability assessment of the coastline to sea level rise by 2013. (Indicator: Vulnerability assessment report with recommendations) (2) Provide awareness materials to the people about climate change impacts on sea level rise and potential impact on low lying coastal communities by 2011. (Indicator: >50% of citizens understand impact of sea level rise to them); and (3) Establish guidelines based on recommendations vulnerability assessment for development activities along the coastline by 2015. (Indicator: Number of developments that incorporate ecosystem based adaptation). Ecosystem-based adaptation includes a range of local and landscape scale strategies for managing ecosystems to increase resilience and maintain essential ecosystem services and reduce the vulnerability of people, their livelihoods and nature in the face of climate change. Specie Actions, personnel, time line and budgets were identified for climate change in the plan.[14]**Koror State Rock Island Southern Lagoon** is now an inscribed World Heritage site.[182] The Rock Island Southern Lagoon (RISL) World Heritage Site has a Management Plan that includes monitoring its terrestrial species, especially its endangered endemic species such as the megapode and the rare palm, *Ponapea palauensis* that is restricted to the Ngermid Rock Island Complex.[183] Within the RISL, Koror State has two PAN sites, the Ngerukewid Reserve, the second oldest reserve in Micronesia and the Ngerumekaol Channel, an important grouper spawning area. An objective of the plan is by 2016 strategies are developed to enhance the resilience of ecosystems in the RISL to climate change. Actions include ongoing research on key stresses and threats from climate change, research on resilience of ecosystems to climate change, reduction of non-climate stress and identification of best management practices for addressing shoreline erosion.[4] The regional organization SOPAC did a coastal assessment to address erosion in 2012.[184]**Hatohobei State Helen Reef Management Plan** has Goal to restore, maintain, and understand the biological resources including ecosystem health, key species, habitats, and biodiversity. One of the l Objectives was to create a Climate Change Adaption Plan or actions by end of 2012. Actions to achieve this outcome include adaptation to climate change in their management plan after learning about climate change adaptation by attending trainings and networking with experienced countries and programs.[1] **Sonsorol State's Fanna** Island is a PAN site because it is an important breeding site for birds. This PAN site team is developing a management plan[185] with actions to increase capacity to monitor the health of their resources, awareness and education. Specific skills needed are species identification, implementation of marine protocols[15,] development and implementation of terrestrial[7] and socio-economic[6] protocols, data collection, management and analysis; and report writing.

PAN Sites managers work closely with their partners (Ministry of Natural Resources, Environment and Tourism (MNRET), Ministry of Public Infrastructure, Industry and Commerce (MPIIC), Palau International Coral Research Center (PICRC), Coral Reef Research Foundation (CRRF), Palau Community College (PCC), Palau Conservation Society (PCS), Association of Governors, State Governments, Council of Chiefs, Association of Conservation Officers and Palau Visitors Authority, and regional (SPC, SPREP) and international partners to implement their PAN management plans. A rapid assessment of vulnerability related to livelihood sectors, health and sanitation, food resources and security, energy resources and security, level of adaptive capacity and feasibility for 6 states was conducted. Kayangel, Ngaraard and Ngardmau States were selected for demonstration climate change adaptation initiatives. The rapid assessment was completed prior to Super Typhoon Bopha (STB). It was recommended that preparedness, impact and recovery efforts in relation to STB be addressed during the subsequent Vulnerability and Adaptation assessments are conducted in these three states[2]. The 2012 assessment did not target PAN sites. The impacts of STB affected many States with PAN Sites.

[182] Olkeriil, I, 2011.
[183] Costion. 2013
[184] Olkeriil. I. pers. comm. 2013
[185] Ierago, L. pers. comm. 2013

Appendix 9Palau Automated Land and Resource Information Systems (PALARIS)

The **Palau Automated Land and Resources Information System (PALARIS)** under the Ministry of Public Infrastructure, Industries and Commerce (MPIIC) is designed to be a source of information to all agencies. PALARIS uses Geographic Information System (GIS) technology to collect, manage, analyze, store and disseminate information in many formats.[186]The Executive Order creating PALARIS recognized that GIS was a tool to be used by all government agencies at all levels and non-government users in Palau. The Medium-Term Development Strategy (MTDS) recommended that PALARIS address capacity planning for States."[187] The Office of PALARIS through the Executive Orders 163 and 203 has a clear mandate yet often is used only in map making rather than in modeling or GIS analysis. The PALARIS budget is inadequate to perform its functions and is operated at less than 75% capacity. There is a need for a senior GIS Analyst; updated elevation (contour) layers were urgent; and clear legislation is needed to assist them in gathering updated data from other agencies. Six strategic issues were identified to increase PALARIS effectiveness and efficiency: decision-makers need proper information to understand importance of PALARIS and clients need update of services offered and product availability; neither was occurring efficiently. A revised strategic plan was needed and the ability to seek funds by strategic alliances; grant writing, or proper pricing for its products. There was a disconnection between the leadership and new policies; procedures were not being documented. Its function as a clearing house for data was inadequate: of its four components: data collection, storage, analysis and dissemination; only data storage met required standards. PALARIS was performing at less than 75% capacity due to a lack of training and equipment. PALARIS had a great competitive advantage due to investment in its services that over 30 agencies and 75 professionals have utilized. Improved agency management, political will, and the right structure would enable PALARIS to reach its full potential.[188]

Appendix 10 Health

Palau is overall a healthy society with decreased crude death rates, increased life expectancy at births, and consistent zero maternal mortality ratio. Sanitation has improved with the entire population having access to excreta disposal facilities. Changing lifestyles have resulted in different health patterns, and an emergence of non- communicable diseases. Increasing development will lead to more environmental problems. Water pollution is a major concern due to the lack of sufficient land area for proper waste disposal. Progressive development will continue to worsen both air and marine quality. Marine life and reefs will be affected by the pollution.[189] Many small island states suffer severe health burdens from climate-sensitive diseases, including morbidity and mortality, from extreme weather events, certain vector-borne diseases, and food- and water-borne diseases.[190] Tropical storms, storm surges, flooding, and drought have both short- and long-term effects on human health, including drowning, injuries, increased disease transmission, decreases in agricultural productivity, and an increased incidence of common mental disorders.[191]

[186] Assessment and Planning for PALARIS Long-Term Goals, Jerrold E. Knight, 2008, Appendix 4
[187] Article 371, 3.9.2, Key Problems and Priorities, MTDS 2008
[188] SIUL 2012. Sustainable Land Management Policy Project
[189] 2013 Second National Communication on Climate Change
[190] Ebi et al. 2006
[191] Hajat et al., 2003

Appendix 11 Final Meeting on Climate Change Policy Gaps – Perceptions, Issues, and Priorities

June 21, 2013 at 9:00 – 11:00 am, Pala International Coral Reef Center (PICRC)

Names in Bold attended the meeting.

Confirmation List- 39 Attendees

	Relation to CC	Name	Agency/phone	Email
ok	Lead for ongoing CC project – EU Global Climate Change Alliance (GCCA) via University of the South Pacific	**Carol Emaurois**	PICRC/488-6950	cemaurois@gmail.com
ok	Lead for ongoing CC project – Vulnerability Assessment & Local Early Adaptation Planning (VA LEAP)	Wayne Andrew	HOPE/488-4408	wayne@palaunet.com
ok	Lead for ongoing CC project – Pacific Adaptation to Climate Change (PACC) via SPREP	Thomas Taro	PCC/CRE 488-2746	tarothomas@yahoo.com
ok	Rubekul Belau	Dilmei Olkeriil	488-3350 or 488-5313	coc@palaunet.com
ok	Koror State Government	Ileb Olkeriil**& Maggie Antonio/Princess Blailes**	488-2439 775-1331	koror.rangers@gmail.com
ok	State-based Group – CCA Community Rep – Ngardmau	**Ngardmau Government (c/o** Kambes) **Mercy Beketaut**	488-1401 or 747-2967 775-2003	ngardmaugovt@palaunet.com okkesolei@gmail.com
	State-based Group – CCA Community Rep- Ngaraard	**Ngaraard Gov**	824-4490 or 4499	demok@palaunet.com

ok		**Nikita Espangel**		
	Aimeliik State	**Wilbur "Olu" Williams**	488-1941	olu.medorm@gmail.com
ok	Hatohobei State - Helen's Reef Project	**Rosania Theodore,** Albino Fernando, **Tracey Marcello, Gloria Patris; Hanna Muegge**	488-8044	helenreefa@palaunet.com
	Palau Water Sewer Corp. (PWSC) now merged under the umbrella of the Palau Public Utilities Corporation	Maireng Sengebau Clarissa Adelbai/J. Kintaro	488-8760 or 775-8779	jmsengebau@palauwsc.com adelbai@palauwsc.com jkintaro@palauwsc.com
	PPLA (Palau Public Land Authority)	Jason Kesolei/Allison Philip	488-3951/1951	jkesolei@gmail.com
ok	PNYC (Palau National Youth Council)	Hadden Seklii **Verlyn Meresbang**	Pres., PNYC 488-2626	haddenseklii@gmail.com cc: lulu lmtechur@gmail.com meresbangverlyne@gmail.com
	Tri-Org Palau Visitors Authority (PVA):	Eyos Rudimch Melson Miko Darin De Leon	Chairperson, Board of Directors Managing Director 488-2793 or 1930	Attn: Celine Oiterong celine.pva@visit-palaunet.com ddeleon.pva@visit-palau.com
ok	PCOC (Palau Chamber of Commerce)	**Jennifer Gibbons**	488-3400	palaucoc@gmail.com

	MOH-(DEH) Ministry of Health- Division of Environmental Health	Gregorio Ngirmang **Charley Simeon** **Sylvia Tmodrang**	Minister of Health/488-2552 488-6073	ngirmang@gmail.com moh@palau-health.net,tmodrang@yahoo.com
	MOE (Ministry of Education)	Emery Wenty Linda Ngotel/Sarah Sugiyama/Debbie Rebluud	Dir., Bureau of Education/488-2547	ewenty@palaumoe.net lindangotel@palaumoe.net
ok	EQPB (Environmental Quality Protection Board	Siual Blesam	Director/488-1639	florox99@yahoo.com
ok	BoA (Bureau of Agriculture/ Forestry Division)	Fred Sengebau Joel E. Miles Alice Pangelinan/**Pua Michael**	622-1040 or 544-5804	ffms@palaunet.com palauforestry@palaunet.com joelmiles52@gmail.com
ok	BMR (Bureau of Marine Resources)	Dave Orrukem &**Percy Bip Rechelluul**	Director / 488-3997 or 2897 or 3125	daorrukem@gmail.com/pbrechelluul@gmail.com
ok	PCS (Palau Conservation Society)	Dr. Otto/ **Yalap Yalap** **Ngelechel Etpison**	Acting Director 488-3993	oraringei@gmail.com yyalap@palauconservation.org setpison@palauconservation.org
ok	Office of the President	**Judy Dean,** Grant Coordinator	767-8681	judyd@palaugov.org
ok	Energy Office	**Nick Kloulubak**	488/1281 or 779-1355	bpw@palaunet.com Attn: Nick Kloulubak or Nyk@palaunet.com
ok	PCAA (Palau Community Action Agency)	Leonard Basilius	488-1170/779-6029	lbasilius@pcaa.org
	NDBP (National Development Bank of Palau)	Ms. Mincer Karla T. West	587-6327/2578 587-3955	sdmincer@ndbp.com kwest@ndbp.com
ok	PPUC (Palau Public Utility Corporation)	Kioni J. Isechal Ken Sugiyama	GM/CEO, PPUC/488-2232	kji@ppuc.com

	BNM (Belau National Museum)	Pia Morei Allan Olsen Sandy Sechewas	Director/488-4079 488-2265	bnm@palaunet.com ATTN: Pia Morei kerallang@yahoo.com
Ok	PALARIS (Palau Automated Land and Resources Information Systems)	**Madelsar Ngiraingas/Asia Frederick, Maria Rechuld**	488-6838/6654	madelsar.ngiraingas@gmail.com
	PAN-F (Protected Areas Network-Fund)	Clarinda Ziegler	488-1313/1314	cziegler@palaupanfund.org
Ok	OEK Olbiil er a Kelulau (Senate)	Mason N. Whipps Lekelong Secharaimul	Chair, Com. on resource, Commerce, Trade & Development/767-2522 or 775-1144	mason@surangel.com or rctdcommittee@gmail.com lekelongs@yahoo.com
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