GCCA+
THE GLOBAL CLIMATE CHANGE ALLIANCE PLUS INITIATIVE

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AIRAI STATE DESKTOP REVIEW, PALAU

Global Climate Change Alliance Plus
Scaling Up Pacific Adaptation (GCCA+ SUPA)
USP Component

Pacific Community
Communauté du Pacifique

SPREP
Secretariat of the Pacific Regional Environment Programme

USP
THE UNIVERSITY OF THE SOUTH PACIFIC

Contents

Tables

Figures

Acronyms and Abbreviations

ASPC	Airai State Planning Commission
ASPLA	Airai State Public Land Authority
CRRF	Coral Reef Research Foundation
DRM	Disaster Risk Management
DURP	Department of Urban and Regional Planning, University of Hawaii
EEZ	Exclusive Economic Zone
GCCA + SUPA	Global Climate Change Adaptation Plus Scaling Up Pacific Adaptations
GCF	Global Climate Fund
GEF	Global Environment Facility
KB	Koror-Babeldaob
KBUDSAP	Koror Babeldaob Urban Development Strategic Action Plan
MPA	Marine Protected Area
NBSAP	National Biodiversity Strategy and Action Plan
NDBP	National Development Bank of Palau
NDRM	National Disaster Risk Management
NEMO	National Emergency Management Office
PACC	Pacific Adaptation to Climate Change
PAN	Protected Areas Network
PCC-CRE	Palau Community College Cooperative Research Extension
PNMS	Palau National Marine Sanctuary
ROP	Republic of Palau
RPPL	Republic of Palau Public Law
SDG	Sustainable Development Goals
SGP	Small Grants Programme
SNC	Second National Communication (to UNFCCC)
SOE	State of the Environment
SOP	Standard Operating Procedure
SPC	South Pacific Commission
SPREP	South Pacific Regional and Environmental Program
UNFCCC	United Nations Framework Convention on Climate Change
USP	University of South Pacific
VNR	Voluntary National Report (to the SDGs)

1.0 BACKGROUND

This Desk Top Review is being executed by the University of South Pacific (USP) as part of the Global Climate Change Alliance Plus + Scaling Up Pacific Adaptation (GCCA + SUPA) project funded by the European Union. The project has three (3) major outputs: 1) Knowledge Management delivered by SPC, 2) Capacity Building delivered by USP, 3) Scaling Up Resilient Development Measures in Specific Sectors delivered by SPREP. The implementation plan for this project is to utilize previous experiences, efforts and knowledge to scale up climate change adaptation measures in specific sectors supported by knowledge management and capacity building. The project is 4.5 years with the specific objective to strengthen the implementation of sector-based, but integrated, climate change and disaster risk management strategies and plans. The project is implemented by the Pacific Community (SPC) in partnership with the Secretariat of the Pacific Regional Environment Programme (SPREP) and the University of the South Pacific (USP) in collaboration with ten countries, Fiji, Tonga, Cook Islands, Niue, Tuvalu, RMI, Kiribati, Palau, Nauru and FSM. The three (3) implementing organizations will coordinate their efforts together to make sure the project activities involve all relevant stakeholders and is carried out utilizing a gender sensitive/rights-based approach.

The Palau's original project design included an assessment of five (5) local government / states in Palau, namely Ngardmau, Ngaremlengui, Ngatpang, Airai and Aimeliik. The USP project in Palau based on limited budget, made a decision with consultation with the Palau Office of Climate Change to limit the focus of the USP project to a single site. Airai State was selected as suitable site for the USP project because of its demographic profile, and existing number of major development projects. The implementing office for the project in Palau is the National Government Office of the Climate Change. The office is staffed by the National Climate Change Coordinator, Xavier Matsutaro, Joe Aitaro, Climate Change Policy Coordinator and Keizy Shiro, 3rd National Communication Coordinator/Database Manager.

'The Palau GCCA + SUPA emphasis is on health specifically water borne diseases and water security. The Palau project proposes to build capacity and resilience to water and vector borne diseases, drawing up from previous experiences and at the same time improving communities' access to climate change resilience and health information. Health and water security measures will include installing water storage systems in community evacuation shelters, training vulnerable households to monitor, treat and maintain supplementary water storage systems, and vector control and management training at the state level. Lastly, to strengthen community readiness the project will develop a national radio communication plan for climate resilience and purchase communication equipment to help improve access and sharing of climate resilience and health information to communities and schools.' (Source, Palau GCCA+SUPA project application).[2]

[2] Palau GCCA + SUPA Project

2.0 INTRODUCTION and CLIMATE IMPACTS IN PALAU

2.1 Introduction to Republic of Palau

The Republic of Palau (ROP) became an independent nation in 1994 with the arrangement of Compact of Free Association with the United States. Republic of Palau is situated North of Equator 7°20'23" N latitude, 134°28'23" E longitude. Palau is made up of 16 states and has a total land mass of 187 square meter miles counting in the Rock Islands. These 16 states have their own constitutions that govern governmental matters. About 80% of the populations live in Koror State.

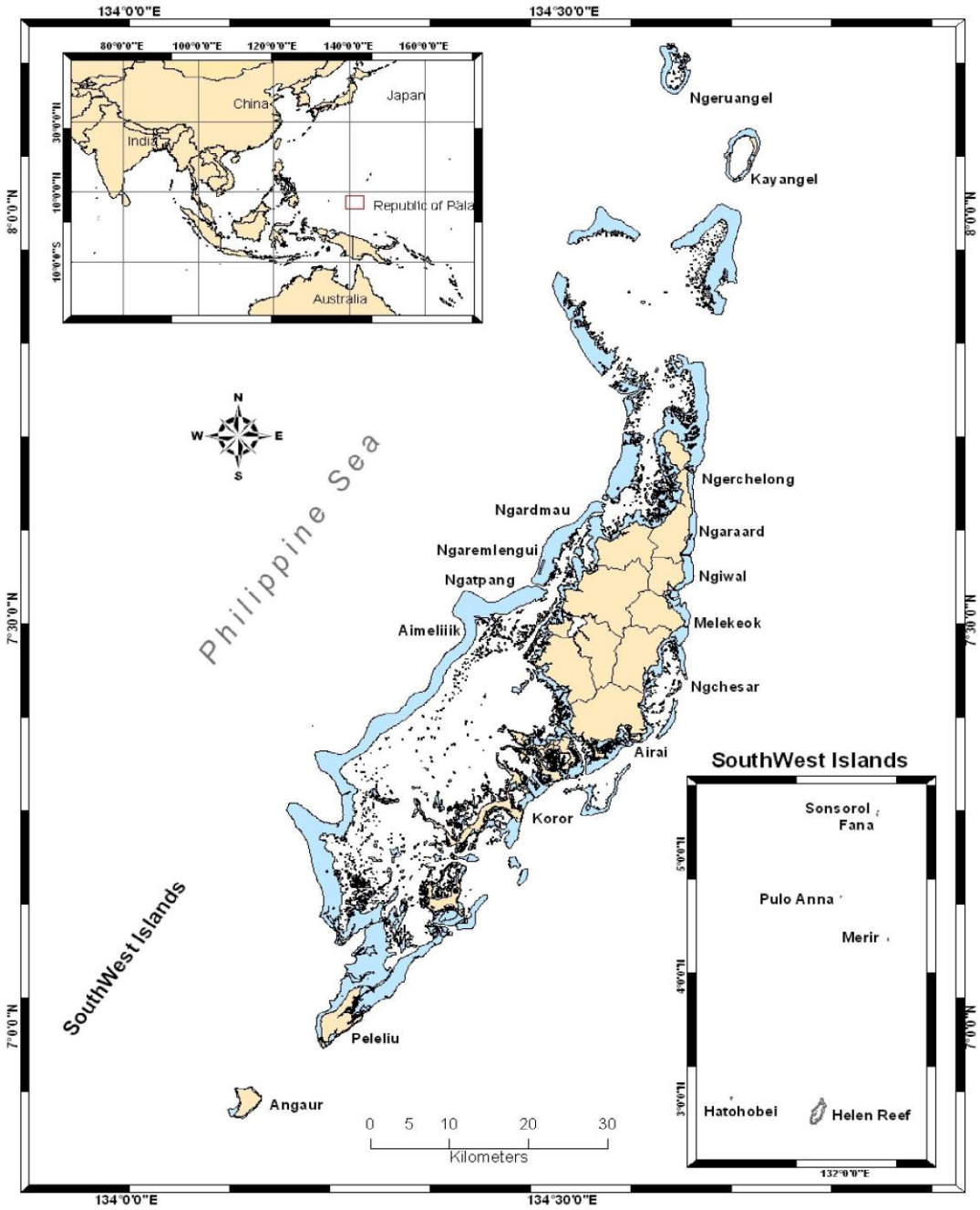

Figure 1. Map of Palau. Source: PALARIS.

2.2 Climate Change projections and impacts (emphasizing Airai where possible)

Information on Climate Change projections came from the 2019 State of the Environment Report, Republic of Palau (2019 SOE) which compiled information from a wide variety of sources including Coral Reef Research Foundation (CRRF), PACCSAP (Pacific-Australia Climate Change Science and Adaptation Planning Program), the University of Hawaii Sea Level Center, Palau International Coral Reef Center, and published studies. Information on Climate Change's expected impacts came from the PIRCA Climate Science Summary Update (2020) and published studies.

Air Temperature:
Palau climate is mostly dry from January to May and June to December with most rains. Palau's future climate projections indicate an increase of 0.7-1.7°F (0.4°C-1.0°C) of air temperature with increasing variability. Palau's weather station and one of the weather gauges are located in Airai, giving the State the most accurate weather data in the country.

Human impacts:

- Older persons, those with chronic diseases, and persons with disabilities may be more vulnerable to extreme heat days.
- People who work outdoors (tour guides, farmers, construction workers, etc.) may be exposed to high heat days, both at a risk to their health and with potential loss of productivity.
- Children in schools without air conditioning may suffer heat-related loss of learning.
- Economic losses from crop losses may occur.
- Economic costs and carbon emissions associated with cooling and air conditioning may increase.
- Warming may increase the activity of disease vectors, such as dengue-carrying mosquitos.
- Hotter days will increase water demand.

Environmental impacts:

- Increasing temperature is associated with increased incidence of plant diseases and increased likelihood of pests, including in staple crops such as bananas.
- Higher temperatures will increase evapotranspiration affecting the amount of water that crops require and the amount of water available in soil. This may enable crop expansion in some areas, but may also require more irrigation.
- Seasonal planting and harvesting patterns may change as a result of changing temperatures, thus needing adjustment.
- Higher temperatures combined with drier dry seasons increases the likelihood of fire.
- Higher temperatures may be associated with increased spread of invasive species.

Sea surface temperature and Ocean acidification:
Temperatures at multiple reef depths (shallow to deep) indicate an upward trend in water temperatures of about 0.03◦ per year (or 0.3°C per decade). Trends for deeper depths have greater variability. Projections for annual sea surface temperature are for a continued increase. By 2030, under a very high emissions scenario, this increase is projected to be 0.6-1.0°C (2019 SOE). Coral reef bleaching can occur when temperatures exceed 30 degrees for days to weeks. In mid-2019 there was no bleaching trend expected for Palau, but that is highly variable. By 2040 predictions suggest Palau will have widespread bleaching occurring annually.

Declining coral reef health is associated with lower reef fishery productivity and may negatively impact Palau's tourism industry. Combined with ocean acidification, declines of more than 50% are predicted under a business-as-usual scenario by 2100 for most of the islands in the central and western Pacific.

Ocean water acidity (declining pH) has been steadily increasing in Palau's waters and is expected to continue to increase in the 21st century. Many areas in the Rock Islands are naturally more acidic, and coral reefs there are more acidification-resistent due to chronic exposure.

Human impacts:

- Both nearshore and offshore fisheries have declined and are expected to decline more due to climate change, in all habitats. Reduced supply of fish and invertebrates will hurt income and food supplies.
- Costs and carbon emissions associated with accessing fishing and gleaning areas will likely increase.
- Combined with acidification, coral health is expected to decline, and Palau's reefs and unique marine habitats (such as Jellyfish Lake) will not be able to support high numbers of tourists, with loss of income and negative impacts on Palau's branding and value.

Environmental impacts:

- Coral reef health is expected to decline.
    - Eastern reefs (Airai's reefs are on the East) were heavily damaged by typhoons in 2012 and 2013 and were still in poor condition in 2016.
- The importance of coral refugia, such as resilient reefs in Ngermid, will increase.
- Nearshore and reef fishery availability and catches are expected to decline. Combined with the impact of ocean acidification and typhoons, reef fish abundance is predicted to decline by 23% by 2040, even under a best case scenario. Other scenarios predict a decline in reef fishery productivity by as much as 76%.
    - Reef fisheries declined by approximately 18% in Ngerumekaol Channel (in Koror) between 1991 and 2014, despite its status as a protected area, likely due to the long-term effects of bleaching in 1998.
- Offshore fishery productivity – especially tuna – is expected to decline in Palau's EEZ by 25% in the next few decades. Projected declines range by species, with declines 12-28%. Biomass north of Palau is expected to decrease by as much 43% (south of Palu it may increase by 15%).
- Increased sea surface temperature may increase the potential for aquatic animal diseases and harmful algal blooms.
    - This may negatively impact tourist sites.
    - This is expected to decrease the productivity of aquaculture. Increased sea surface temperature may decrease the availability of wild seed.
- High water temperatures can negatively impact Palau's unique marine lakes. Airai has several marine lakes, all of which have unique assemblages of flora and fauna, including different species of jellyfish.
- Outside of the Rock Islands, coral skeletal bioerosion is expected to increase as waters become more acidic.
- Lower pH-tolerant coral reefs (refugia) will become more important.

Sea level rise

Sea level projections vary widely, ranging from 1.6 to 7 inches (4 to 18 cm) by 2030. Palau's sea level is rising at the global rate when yearly rates are considered (SOE 2019). However, sea level rise is variable, with

some years seeing drops in sea level associated with El Nino. Since 1993, sea level in Palau has increased by approximately 9 mm/year. Using Palau's yearly rate, sea level rise by 2030 is expected to be around 90 mm (9 cm; 3.5 inches).

Human impacts:

- Homes near the coast are vulnerable to damage and loss from sea level rise, coastal erosion, or from flooding during storms.
- Many cultural and historical sites are in low-lying areas and risk being damaged or lost due to sea level rise.

Environmental impacts:

- Salt water intrusion into low lying taro patches, farms, and water sources is a growing problem, with loss of crops. An estimated 6% of taro crops are lost annually due to salt water intrusion.
- Coral reefs are not expected to be highly impacted by sea level rise, as shallow reef flats are able to grow at pace with sea level rise. Drops in sea level can lead to mortality of some corals.
    - The importance of resilient coral refugia will increase.
- Mangroves generally have low vulnerability to sea level rise, as they are able to grow at pace with the rising seas.

Stronger Typhoons and Storms

20 typhoon strength storms passed through Palau's EEZ between 1945 and 2013, averaging 1 typhoon every 3 years. Kayangel was the most often the closest point to the typhoon. Predictions are not clear on the expected future frequency of typhoons, although some models predict a decrease in the number of typhoons. However, those that will occur are expected to be of higher intensity, with an increase in wind speed of 2-11% and increase in rainfall intensity of 20%.

Figure 2. Damage from Typhoon Bopha. Picture by Dr. Ann Kitalong.

Human impacts:

- Storms can cause power outages and require evacuation for safety. Older adults and persons with disabilities, foreigners without support networks, and children are particularly vulnerable to storm impacts.
- Economic impacts from storms also disproportionately impact poor and vulnerable populations through lost income and recovery costs.
- Mental health impacts are associated with strong storms, especially in coastal populations.
- Storms can disrupt communications, transportation networks, food supply, housing, and infrastructure (including water, electricity, and sewer) which carry health and safety risks.
- With a high reliance on imported foods, typhoons can disrupt food security. There was a 3-week delay in resuming imports after typhoons in 2012 and 2013.
- Coastal flooding is expected to negative impact coastal properties and infrastructure.

Environmental impacts:

- Storms can cause significant damage to coral reefs and marine environments. Some shallow coral reefs have lost nearly all live coral cover.
    - Recovery of damaged reefs takes over a decade.
    - Deeper reefs (30-150 meters deep) have also declined due to the effects of storms sending sediment and rubble downslope.
    - Algal blooms on reefs in Palau have been documented after typhoons.
- Seagrass cover declined by 20-30% from 2011 levels after typhoons in 2012 and 2013. In Airai seagrass declined 5-6% from 2011 to 2015, both inside and outside their protected area.
    - Seagrass extent is expected to decrease by 5-20% by 2035.
    - Fish biomass declined significantly in Airai between 2011 and 2015 (to near zero grams/square meter) and invertebrate biomass has been historically low.
- Shorelines are susceptible to erosion and landward movement due to storms. Shorelines in Palau have generally stabilized due to new vegetation, but in some places, a steady loss of beach has been seen. Airai's shorelines is well protected in most cases, either by mangrove or within a bay.
- With much of Airai's land at a slope of 12% or higher, much of Airai is at high or medium risk of slope failure following intense rainfall events.

Increasing rainfall, Rainfall variability, and Extreme weather

Total annual rainfall appears to have increased by 7.6 cm (~3 inches) between 1948 and 2011. It is difficult to project exactly how rainfall will change, except that rainfall variability is expected to increase. Rainfall in the wet season is projected to increase by 2% by 2030 and up to 8% by 2090. Projections show extreme rainfall days are likely to occur more often and be more intense, with rainfall lasting longer days (wetter wet seasons and drier dry seasons). However, the number of months with high rainfall shows a decreasing trend, suggesting increasing frequency of possible drought.

Human impacts:

- Droughts are associated with water shortages and water rationing. This disrupts the local economy as well as food security.
- Intense rainfall after a drought is associated with higher sediment and pollution loads in water supplies, increasing the likelihood of water-borne disease and ill health. This also stresses the public utility.
- Warming may increase the activity of disease vectors, such as dengue-carrying mosquitos

Environmental impacts:

- Increased rainfall and increased intensity of storms and typhoons is associated with higher rates of erosion and sedimentation.
- Accelerated erosion from forests may result in loss of topsoil, organic matter, and nutrients.
- Some trees in Palau's forests are not well adapted to dry seasons, and may be stressed by more frequent droughts.
- The risk of fire significantly increases during the dry season.
- Prolonged rainfall (wetter wet seasons) are associated with loss flowers and less fruiting in forest trees.
- Airai is highly dependent on agriculture, and 18% of its farms are irrigated.

3.0 PROJECT SITE DESCRIPTION – AIRAI STATE

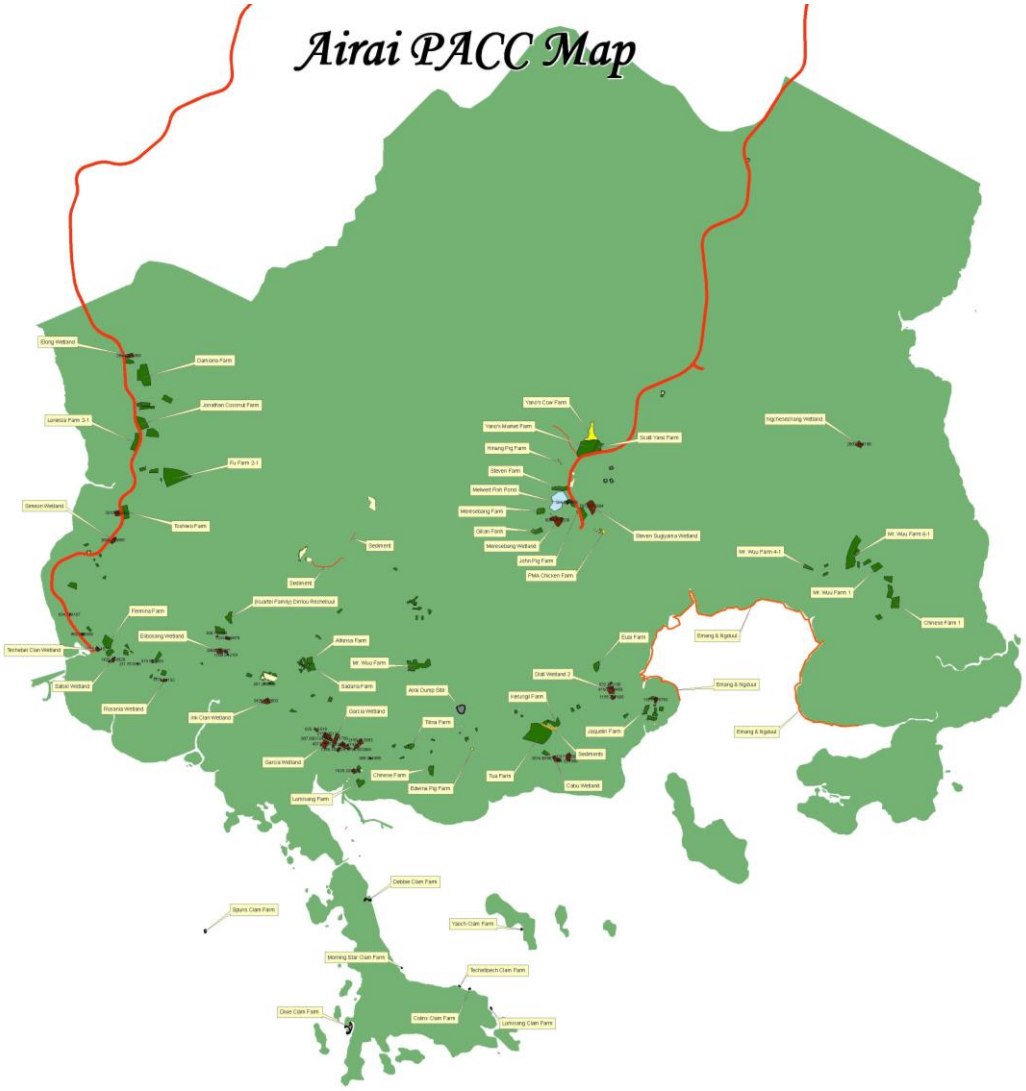

Figure 3. Map of Airai, showing locations of farms. Source PALARIS and the PACC Project.

Airai State is one of the 16 states that make up the Republic of Palau and is located in Babeldaob. Babeldaob is the largest island in Palau and home to ten (10) of the 16 states. Airai state occupies the southern tip of Babeldaob Island, Palau's largest island. Airai is bounded by its neighboring states: on the north is Ngatpang, to the northeast is Ngchesar state, on to the northwest is Aimeliik state.[3] Airai has the second largest population in Palau behind Koror State. Based on Ministry of Finance 2017 Yearbook, Airai had 2455 people or 50.1 people per km^2. However, the migration rate was 3.2% of the population, with individuals and families migrating out to other places like Guam, Hawaii and United States of America seeking better opportunities for themselves and their families. According to Airai State household survey in 2014, roughly

[3] RMDSS Report, January 2003

60% of the population is between 20-25 years old to 46-54 years of age[4], possibly reflecting new housing subdivisions that are owned by large number of young working families.

The state is the third largest in Palau with approximately 5,700 ha (14,100 acres)[5] of land. Airai topography is composed of mostly hills in the south and west and in the northeast ridges and steep stream valleys are found. The coastal areas are commonly fringed by mangrove forests.

Most parts of Airai and all of Koror receive public water piped in from sources in Airai. Two of Palau's major watersheds are located in Airai: the Ngerimel and Ngerikiil Rivers. The public water system pulls water from the Ngerikiil River and the Ngerimel has a water storage dam. During the dry season, especially during El Nino, the dry season can last two to three months causing water shortages. The Ngerimel dam has been known to dry up and the Ngerikill River's water level can drop below the intake valve. The Ngerikiil Watershed covers over 28,466 hectares (70,341 acres) and supplies approximately four million gallons of water per day (Hay et al., 2007).

Figure 4. KB Bridge, photo by C. Emaurois

Airai is closely linked to Koror by utilizing the same resources; water, parks, docks, and many other amenities. The Palau International Airport is located in Airai and the Japan-Palau Friendship Bridge (aka "KB Bridge"), completed in 2002, provides convenient access between the two states and the rest of Babeldaob. Palau National Communications Corporation (PNCC), provider of telephone, internet and TV services, has its main office and satellite facilities in Airai.

Airai has a community health center providing basic health care. Airai Elementary School provides curriculum for 1st-8th grade. Airai State has 5 separate sites for major housing development projects: Kesebelau, Ikoranges, Ngebudel, Ngerikiil and Tekaol. The available registered public lands are administered by Airai State Public Land Authority (ASPLA) and are leased out to individuals from Airai, individuals from other states, and foreigners. These land lease arrangements have made it possible for many young families who do not own land to build homes. Many new homes can be seen lining new streets.

The northeast corner of Airai, Oikull, is not connected to public infrastructure and the few residents rely on catchment water and solar power, if used at all.

Stakeholders have repeatedly experienced the impacts of sea level rise, especially during king tides, particularly with flooding of taro patches. The El Nino in 2016 lasted almost three months and water shortages were a major problem for the entire nation.

[4] Airai State Household Survey, 2014 (unpublished)
[5] Ministry of Finance, Statistical Yearbook 2017

3.1 DEMOGRAPHICS, GOVERNANCE, AND SOCIAL SYSTEM

Airai is the second most populous State in Palau and the second largest State on Babeldaob Island. Airai is growing (population, especially since new home subdivisions opened after 2015) and developing (construction). Its proximity to the economic and political center of Koror, plus its proximity to the Capital in Melekeok and the National Airport make it a very desirable location for residential and commercial development.

Population, Land Area, Densities and Plans

	Area (km2)	Pop'n 2017 Yearbook	Pop'n Density (per km2)	Pop'n Change (2012-15)	Master Plan (year)	Land Use Plan (year)	Planning Authority (Yes/No)
Aimeliik	37	334	9	18.9	None	None	No
Airai	49	2,455	50.1	-3.2	2010	2012	No
Melekeok	25	277	11.1	-7.4	2012	2012	No
Ngaraard	29	413	14.2	-8.8	2005	None	No
Ngarchelong	8	316	39.5	12.5	None	None	No
Ngardmau	30	185	6.2	-5.1	None	None	No
Ngeremlengui	61	350	5.7	13.3	None	None	No
Ngatpang	35	282	8.1	9.7	1986	None	Yes
Ngchesar	38	291	7.7	1.4	None	None	No

Table 1: Source, Ministry of Finance, Statistical Yearbook, 2017

Airai has many young families who work in Koror or Melekeok. A growing number of families work in Airai. In addition, many individuals in Airai are foreigners employed in agriculture.

Airai State Age Distribution

0 to 5 yrs. old	189
6 to 12 yrs old	268
13 to 19 yrs old	290
20 to 25 yrs old	455
36 to 45 yrs old	449
46 to 54 yrs old	406
55 to 60 yrs old	172
61 and up	242

Table 2: Source, Airai State Household Survey, 2014

3.1.1 Traditional Structure

Palau's traditional governance is based on a traditional kinship and it is both social and cultural values that give rise to all social relations in our society today. When you are born to a family, your family through its kinship provides you with pre-defined role, status and behavioral pattern. The relations in Palauan society are based on kinship and either one is kin or non-kin. A mother and her children form the single social unit of a kinship. From the single mother, all her children forms families and these families together make up a unit we call Telungalek, and this Telungalek are member of a pre-defined clan through their mother. So clan

is made up of many related families through mothers. In Palauan society, a community or a village is made of ten clans that provide the social, cultural, economic and political management of each village. The clans are set up in hierarchy order high clan to low clan. The highest ranking clan or number one clan rules the village, and is a male who was pre-determined by birth to take this post sometimes in his life and is given a title high chief. The high chief is chosen by women who are strong members based on their ancestral kinship and their contributions to their clan. All the rest of the clans through strong women members also select their chiefs; together with the High Chief forms the ruling unit of the village. All the ten (10) chiefs have strong female counterparts. The selection of these female counterparts is made by the same group of strong female members of each clan respectively. (See table below.)

Traditional Chiefs and Female Counterparts

Name of Hamlet	Name of Council of Chiefs (Klobak) & 1st Traditional Chief	Name of Council of Female Counterparts (Klobak'l Dil) & 1st Traditional Female Counterpart
Ordomel	Ngarairrai headed by the 1st Traditional Chief Ngiraked	Ngasekebui headed by 1st Traditional Female Counterpart Ebil
Ngerusar	Ngaraimiich headed by the 1st Traditional Chief Tuchermel	Ngarabiich headed by the 1st Traditional Female Counterpart Ebil ra Klai
Oikull	Ngarauchebungel headed by the 1st Traditional Chief Ngirachitei	Ngaracholdiang headed by the 1st Traditional Female Counterpart Dirraurak
Ngcheschang	Ngaratkobel headed by the 1st Traditional Chief Spis	Ngarabungelkelau headed by the 1st Traditional Female Counterpart Uodelchad ra Esel
Ngeruluobel	Ngaruluong headed by the 1st Traditional Chief Iechaderteluang	Ngaraiemedil headed by the 1st Traditional Female Counterpart Ebiledil
Ngetkib	Ngaramiich headed by the 1st Traditional Chief Techedib	Baumeliik headed by the 1st Traditional Female Counterpart Uodelchadremelkii

Table 3: Source , Airai Master Plan, January 2010

3.2 New Constitutional Government

The Airai State current organizational structure is shown above published on 15 April 2020, reflecting existing positions of the state office. Governor is the chief executive of the State of Airai under Airai Constitution created and signed into law on January 22, 1990. Governor is elected every four (4) years and can serve only 2 terms consecutively. Governor is given authority specified in the Constitution to administer and manage all public matters pertaining to Airai State.[6] There are two (2) boards established by Airai State laws with members representing various organizations and interests of the community and serve under the office of the Governor. Airai State Public Land Authority (ASPLA) possesses power and authority to manage all registered public lands of the state in collaboration with the Governor. ASPLA is authorized by Airai State law to lease the state registered public lands out to individuals and companies from Airai, other states and foreigners. The other board is the Airai State Planning and Development Commission (ASPDC) is vested with duties to guide the state development. There are 15 civil organizations representing the hamlets and specific groups within the state directly collaborating with the Office of the Governor on a regular basis on many social, cultural and traditional matters, however, their existence is not reflected in the organizational structure. These organizations or groups provide the state with critical support in numerous state functions and events that otherwise would be impossible for the state to accomplish.

[6] Source, Constitution of the State of Airai, January 1990.

The Council of Chiefs is made up of traditional chiefs representing the 6 hamlets of Airai State.
Culturally through ancestral traditions, Odomel Hamlet is the main central hamlet with High Chief Ngiraked, the highest ranking chief of Airai State. The other hamlets traditionally are considered "Osebek" or wings and are divided into Despedall and Ngerkedam regions. Despedall consists of Oikull and Ngchesechang hamlets. Ngerkedam consists of Ngetkib, Ngeruluobel, and Ngerusar hamlets. The Airai Council of Chiefs provides the Governor with advice on customs and traditional laws. Basically they serve only in advisory capacity and have lost most of their traditional power in managing their villages.

There are thirteen (13) traditional civil organizations and two (2) new ones of both male and female groups representing the villages. [7] Traditional functions of men's organizations remain relevant but not limited to public roads and piers clean up, constructions of public buildings and participation of sports competitions representing the state. Women groups' traditional functions include preparations of food for many state functions, dance competitions and sport competitions too. Based on observations, Airai State relies heavily on these organizations to provide products and services on behalf of the State. Traditionally the High Chief or the highest ranking chief and the collective group of 10 chiefs would be responsible for governing all matters pertaining to the state and their villages. However, the new constitutional government based on United States government structure has replaced the traditional government. At the village level, the chiefs and the members of their clans now have a limited scope of traditional functions in managing their village.

3.3 Hamlets and Traditional Organizations (cheldebechel)

	Name of Hamlet	Name of Men's Club	Name of Women's Club
1.	Ordomel Hamlet	Ngarabras	Ngaraseseb Ngarayaml
2.	Ngerusar Hamlet	Ngaraklasekl	Ngaraulekelakel
3.	Oikull Hamlet	Ngarcholechodech	Ngarakerisebsub
4.	Ngcheschang Hamlet	Ngaratemring	Ngarangmui
5.	Ngeruluobel Hamlet	Ngaracheleatel	Ngarachemerdil
6.	Ngetkib Hamlet	Meliwei	Prekork

Table 4: Source , Airai Master Plan, January 2020

Today all matters originating from the National government and from outside Palau are communicated directly to the Governor's Office. Information for the community is distributed by the Governor's office to people utilizing 1) written and distributed to all households; 2) meetings with the head of the civil organizations; and 3) radio announcements or telephone calls. Governor's office is supported by an Administrative Officer, Assistant Administrative Officer and a Secretary. These staff provides daily contact and management of all communications with public on behalf of Governor's office.

[7] Source, Airai Master Plan, January 2020

4.0 AIRAI STATE ORGANIZATIONAL CHART

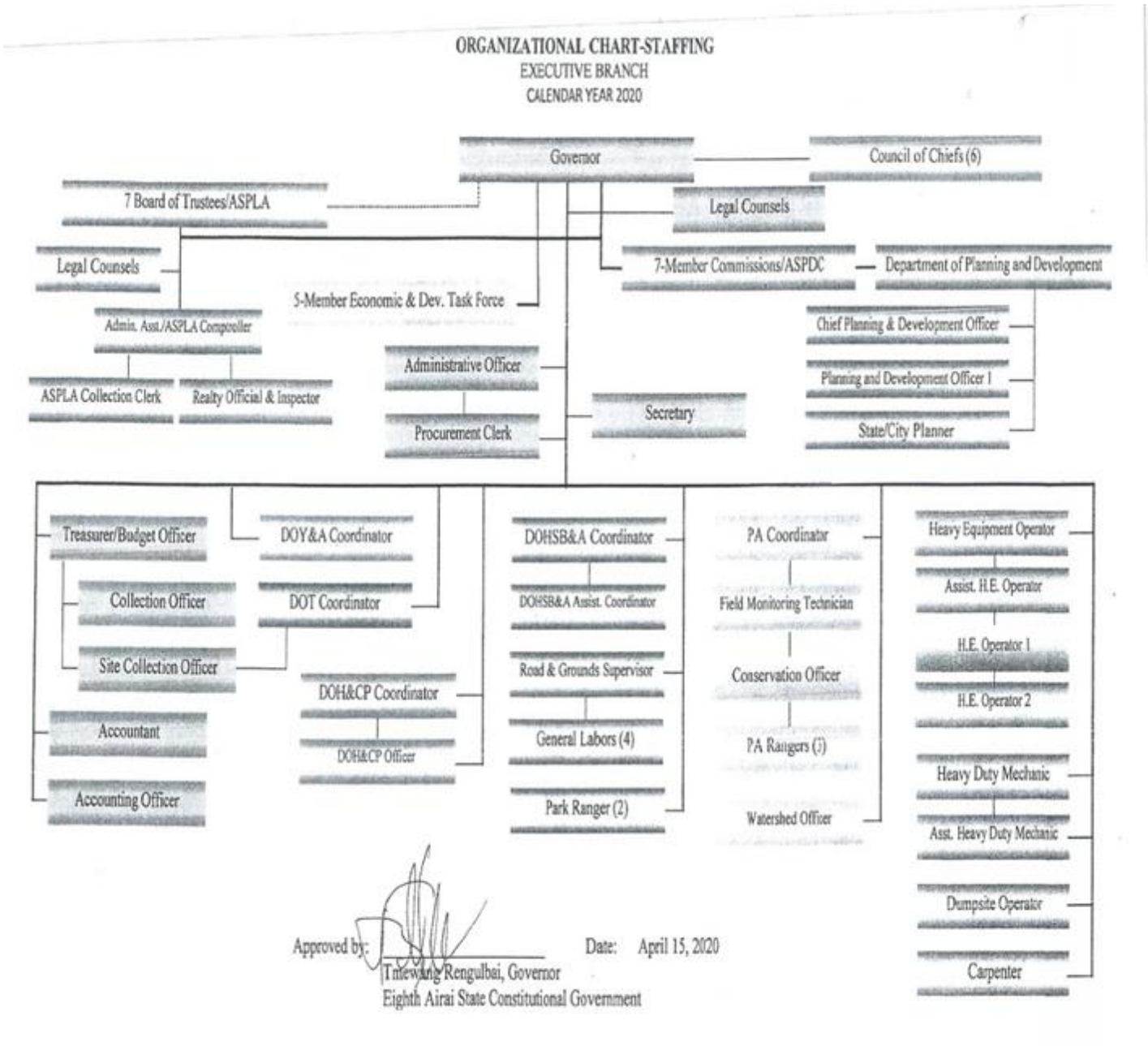

Figure 5. Airai State Organizational Chart. Source Airai State.

Although the Airai State Organizational Chart includes a Department of Planning and Development, Airai does not employ any of Palau's trained Land Use Planners. Some of the planning positions may be vacant; Airai continues to rely on planning assistance from NGOs such as Palau Conservation Society for updates to its plans.

5.0 AIRAI STATE LEGISLATURE

The legislative power is with the Olbiil ra Ngerchumelbai or Airai State Legislature and is not reflected in the organizational structure. The legislature is responsible for promulgating laws for the state. The composition of the Airai State Legislature consists of 6 legislators representing the 6 hamlets and nine (9) at Large representatives. The six (6) hamlets are 1) Ordomel 2) Ngetkib 3) Ngerusar 4) Ngeruluobel 5) Oikull 6) Ngchesechang. The Legislature is headed by a Speaker and a Floor Leader with seven (7) committees headed by a chairman assigned to other legislators. The election of the legislators is every four (4) years without any specified terms; meaning anyone could run for this position as long as they wish. A legislator can hold a full time job concurrently and is allowed to earn two (2) separate wages; an attractive position for many.

6.0 AIRAI STATE AUTHORITY

The table below is the state reserves/conservation areas designated by Airai state laws. These are important seascapes and landscapes for the state to provide environmental safeguards.

ASPL No. A-2-04-94	Designates the Ngchesechang Mangrove Conservation Area
ASPL No. A-2-25-97	Designates Ngeream Conservation Area
ASPL No. A-2-27-97	Protection and preservation of historical and cultural resources of the state
ASPL No. A-3-03-99	Provide for control of subsistent and commercial fishing
ASPL No. A-4-02-02	Designates Oikull Mangrove Conservation Area
ASPL No. A-5-01-07	Provide for protection and conservation of trees and vegetation in mangrove and other wetland areas

Table 5: Source, Airai Master Plan, January 2010

7.0 COMMERCIAL DEVELOPMENT

Given Airai's strategic location, relatively large and urbanized population, and availability of land, it is rapidly developing. Develop is of all kinds: residential (subdivisions as well as homes), commercial, industrial, and infrastructure. The table below lists many of the largest development projects in Airai.

MAJOR DEVELOPMENT	HAMLETS (LOCATION)
Palau National Water Treatment Plant	Ngeruluobel
Airai View Hotel	Ngeruluobel
Airai State Government Office	Ngerusar
Palau International Airport	Ngerusar
Palau National Communication Center	Ngerusar
WCTC Airai Mini-Mart/Gas Station	Ngerusar
Seventh Day Adventist Church	Ngerusar
National Development Bank	Ngetkib
United States of America Small Business Development Center	Ngetkib
Aqua Water Bottling Company	Ngetkib
KB Bridge	Ngetkib
KB Shell Gas Station	Ngetkib
Surangel & Sons Mega Shopping Center (under construction)	*Ngetkib*
Palau Funeral Home (under construction)	*Ngetkib*
National Prison (under construction)	*Oikull*
Resort (just starting construction)	

MAJOR DEVELOPMENT	HAMLETS (LOCATION)
Commercial Park (planned)	*Ngetkib*
New subdivision homes (planned)	*Kesebelau*
Red Cross Office (planned, land endorsed by Governor's Office)	*TBD*
Jehovah Witness Church	Ngetkib
Airai Health Center	Ordomel
Papago Hotel	Ordomel
Yelch Baseball Field	Ordomel
Evangelical Church	Ordomel
Assembly of God	Ordomel
Catholic Church	Ordomel
United States of America Embassy	Orodomel
Korean Church	Ngeruluobel
Korean Church	Ngetkib
Palau True Value Hardware	Ngetkib
Airport Solar Panels	Ngerusar

Table 6: Source, Carol Personal Field Observations, June 25, 2020; and Babeldaob JCB Meeting, September 23, 2020.

8.0 FOOD SECURITY AND RESOUCES

Airai State has the largest farms for root crops and vegetables production in Palau. These food crops are also economic crops and produce most of vegetables sold in Koror markets. Tapioca is cultivated mostly by women and is the main economic root crops that support many livelihoods in Airai. Other main root crops include purple taro, yellow taro, and sweet potatoes. Vegetable farming is mainly commercial and provides most of all vegetables sold in Koror markets. The vegetables are mostly local favorites and include kangkum, eggplants, okras, squash, Napa, beans, bitter melon, and radish. Fruit trees are cultivated mostly by families and include banana, papaya, lemon, and pineapple. Bigger trees like avocado, mango and tropical almond are cultivated as well.

Figure 6 Tapioca Farm, photo by C. Emaurois.

These commercial farms range from an acre to 3 acres in sizes. All these commercial farms are using Airai State public lands that are leased out to individuals or company and men run these farms. Family farms are small plot of mostly agroforestry types and are mainly cultivated by women. The farms have many different crops like taro, tapioca, pineapple, papaya, banana, sugar cane, avocado, mango, and bitternut. Most families have these small farms at the back of their houses and would commonly sell the produce if they have more than they need. Airai residents fish on daily basis to support family meals and subsistence livelihood. Important economic non-fin species are mangrove crabs, ngduul, sea cucumbers, clams and sea urchins. The fin fishes are rabbit fish, parrot fish, surgeon fish and snappers. There are four (4) livestock farms in Airai with about 40 pigs per farms. Chicken farm that produce local eggs has closed due to the increased price for importing the feeds. Farmers are important climate change adaptation stakeholders in

Airai due to the use of large amount of water in their daily operations. During long drought season, most farms are impacted and farms productions are reduced.

9.0 NATURAL RESOURCES

Most of the lands in Airai approximately 2/3 thirds still untouched and maintain its natural vegetation cover. About 1/3 is occupied by housings, roads, docks, offices, airport, and farms. However, these untouched areas are commonly burned down during dry season by unplanned fires during months of December, January, February and March. The burning destroys the crops, habitats, and exacerbated soil erosion and lost incomes too. In Palau, invasive species is a big issue and creates threats for habitats and environments. Some of these invasive species are predominant in Airai State.

10.0 DISASTER RISK MANAGEMENT

Disasters have struck Palau before, and recently Super Bopha Typhoon in 2012, Super Hayan Typhoon in 2013, and El Nino Drought in 2016. At the time of all these disasters, Palau and the communities involved were not well prepared for the impacts of these natural disasters. Palau's climate projections with the global warming projected impacts necessitate the urgency to prepare communities with measures to reduce the risk of future natural disasters. At the national level, the National Disaster Risk Management Framework (NDRMF) 2016-2030 provides direction for strategies and actions at every level for Palau. The Airai State lacks the DRM at the moment. However, to build capacity in managing future disasters and reducing the impacts, Palau conducted community trainings across all the states using the toolkit Palau Community Based Disaster Risk Reduction (CBDRR). In Airai, Ngetkib Hamlet received the CBDRR toolkit training and developed Disaster Risk Management Plan for the community. The CBDRR toolkit targets the grass root level of disaster risk management. "The Community Based Disaster Risk Reduction toolkit supports and strengthen the global and national effort to reduce the effects of disaster risks at the community level. Likewise, the tool kit must also support other plans or policies such as building code, zoning code, fire code, and urban development plans."[8]

11.0 ASSESSMENT OF LOCAL AREA DEVELOPMENT PLANS FOR MAINSTREAMING OF CLIMATE CHANGE AND DISASTER RISKS

Airai State has several local area development plans, although its key guide for development – the Airai Master Plan and Land Use Plan – expires this year and needs to be updated to include climate change and disaster preparedness. **There is a clear need to mainstream climate change and disaster risk management into an updated local area development plan (Airai State Master Plan).** In addition, climate change should also be mainstreamed into Airai's Medal Ngediull Conservation Area Management Plan. An expired Watershed Management Plan had good mainstreaming of climate change, and could serve as a framework for updating the Airai Master Plan. However, there remain gaps for disaster preparedness. National Plans and Policies have relevance to Airai, and many of them have already mainstreamed climate resilience and disaster risk reduction. Thus, local area development plans should mainstream these National priorities in addition to climate and disaster considerations.

[8] Palau Community Base Disaster Risk Reduction Toolkit, June 2003.

1) Airai State Master Plan and Land Use Plan

Airai State is one of two States in Palau that has a Master Plan and a Land Use Plan. The Airai State Master Plan was developed by Airai State Planning Commission and adopted on January 27, 2010. The master plan expires this year, 2020, and will be up for review and update sometimes in the future.

Airai State Vision:

"An Airai with a healthy environment, a transparent leadership, an open Government, and a stable and developed human resources – a united Airai."

The following are key Elements of the Vision for the future of Airai, which this Land Use Plan aims at achieving:

1. Protection and conservation of Airai's natural resources
2. Protection and preservation of historical sites
3. Perpetuation of Palauan cultural heritage
4. Vibrant Town Centers that mix residential, commercial, and recreational uses
5. Residential areas that are comfortable, healthy, and conveniently located
6. Promotion and support of agriculture – both subsistence gardens and large-scale farms
7. Provision of the most appropriate infrastructure and land designated to attain sustainable economic growth

The Master Plan addresses six key sectors:

1. Community & Housing Design
2. Infrastructure (Capital Improvement Program) (Roads, Landfill[9], Training Center)
3. Historic Preservation Plans & Program
4. Conservation Plans & Program
5. Economic Development Plan (Tourism Sites & Activities; Education & Training)
6. Land Use Plan (with zoning code).
    a. Detailed maps and plans delineate areas for the following zones: conservation, agriculture, development, industrial, coastal & marine, and historical & cultural preservation.

The Airai Master Plan played a key role in guiding development and other activities in the States after it was first adopted in 2010. However, in recent years the Master Plan has played less of a role in guiding development. For instance, housing has been encroaching into the Ngerikiil Watershed Conservation District, and there is mixed development and housing in areas zoned for agriculture.

[9] No longer relevant, as the landfill was eventually built in Aimeliik.

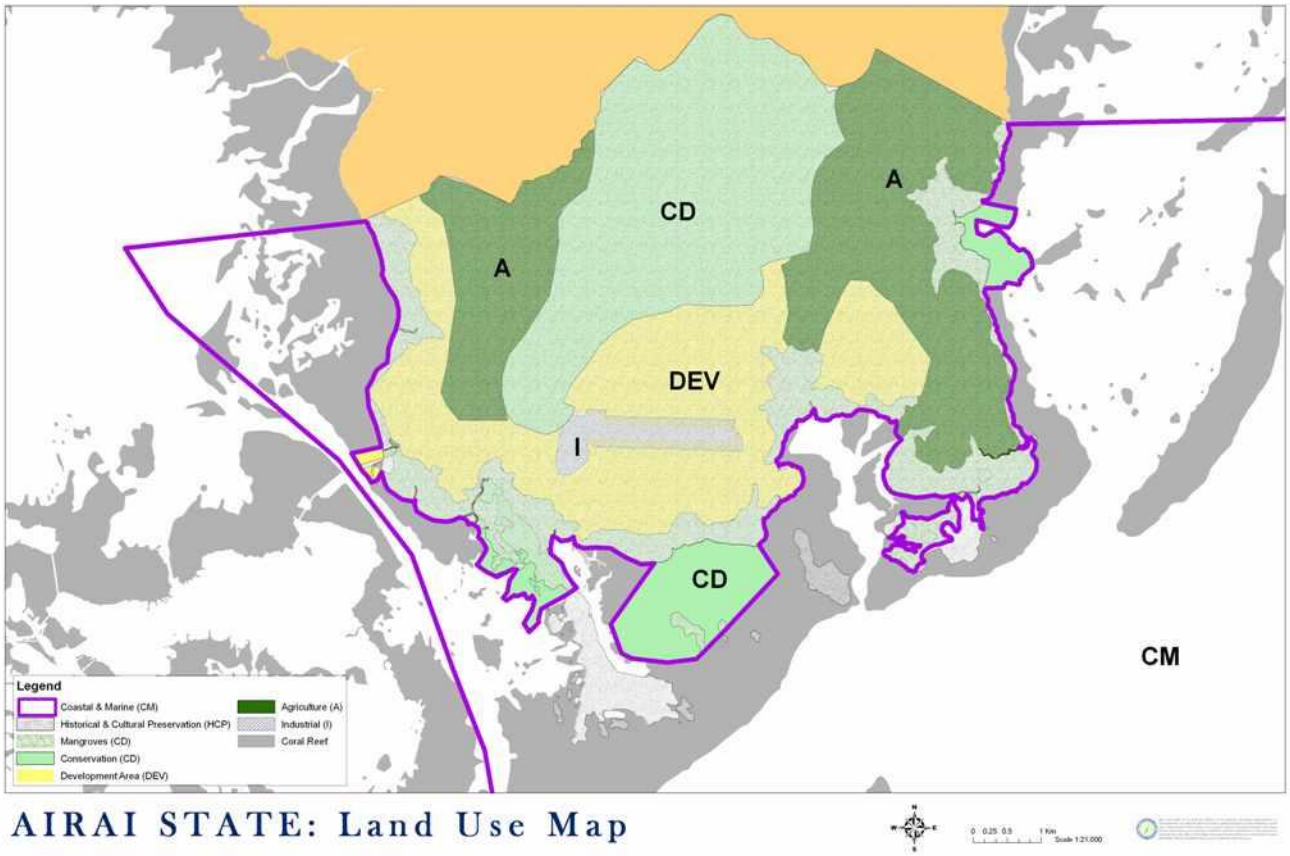

Figure 7. Adopted Land Use Plan, Airai State Master Plan. Source: Airai Land Use Plan (2010).

Integration of Climate Change and Disaster Risk Management into the Airai Master Plan

The Airai Master Plan was developed in 2009-2008 prior to the development of key climate policies: National Climate Change Policy for Climate and Disaster Resilient Low Emissions Development (2015), National Disaster Risk Management Framework (October 2010), Achieving Resilient Agriculture and Aquaculture Policy (2015), Second Communication to the UNFCCC (prepared 2013, submitted 2019), Energy Policy (late 2010), 2nd NBSAP (2015), and numerous projects geared to address the impacts of climate change (GCF, GEF, SGP, etc.).

Thus, Climate Change and Disaster Risk Management **were not explicitly integrated** into the Airai Master Plan or the Airai Land Use Plan. The only explicit mention of climate change is in a section title "Climate Change" that refers users to Palau's National plan on Climate Change: "First National Communication (1st NatCom) to the United Nations Framework in Convention on Climate Change 2002." Prepared in 2001, the 1st NatCom was written before much of the Palau-specific scientific research on climate impacts was conducted and relied heavily on community consultations and input. Thus, the 1st NatCom included fairly generic activities, such as "adaptation planning." There was guidance in the 1st NatCom to reduce vulnerability, but it was based on the best available data at the time: "Discourage development below 10 meters above sea level." Many of the development projects and industrial areas in Airai are below the 10-meter mark (30 feet, which would have excluded much of Airai from development).

A notable gap in the Airai Land Use Plan is that there was no map of project sea level rise or disaster risk used to develop the zones. This is despite explicit mention of a "Sustainable Land Use and Environmental

Design Study; State of Airai, Palau" conducted by the University of Hawaii's Department of Urban & Regional Planning (UH DURP) in 2009 and published in 2010. This DURP Study included maps of projected sea level rise (using a 1-meter contour) and maps of tsunami/disaster vulnerability. Even newer data on elevation can be used to map sea level rise on a finer scale.

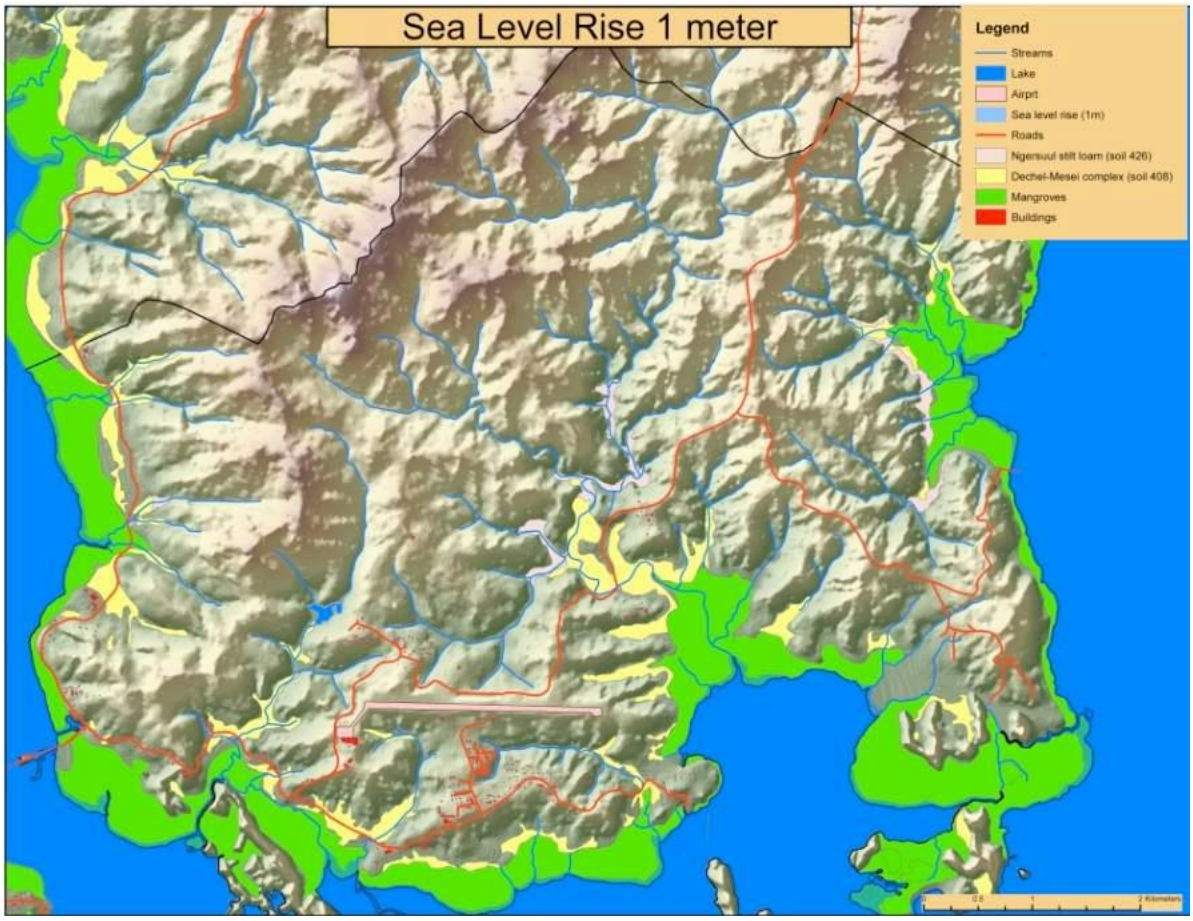

Figure 8. Sea Level Rise map prepared to guide planning. Source: DURP Study (2010).

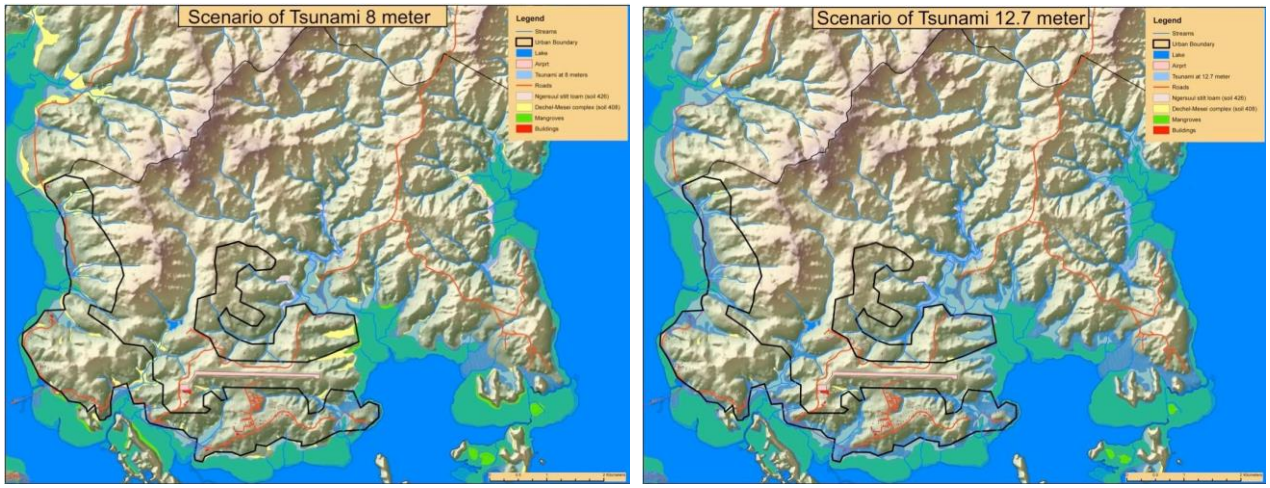

Figure 9. Tsunami risk maps. Source: DURP Study (2010).

Despite lack of explicit mention, **some climate adaptation, mitigation, and disaster risk strategies were integrated into the Airai Master Plan** and Land Use Plan:

- Priority actions included planning and regulations for sustainable water use, recognizing the variability in water availability.
- Strategies to avoid areas of slopes higher than 12%, to minimize slope failure, especially associated with heavy rains.
- Advocating for research into use of alternative energy.
- Acknowledging that in 2010 Airai had "no designated Emergency/Disaster Centers;" however, the strategies presented **did not** include development of an Emergency Center.
- Safety strategies included "Research and explore possibilities of international funding supports for public services including geriatric, child care and disability service" and "Work with the National Government on extending available public services to the residents of Airai including fire and rescue as well as policing services."
- Recogniation that several State laws from 1994 to 2007 designated mangroves as Conservation/Protected Areas.
- An infrastructure strategy was to "Establish road maintenance programs and identify funding" with particular mention of roads damaged by heavy rains.

Development projects in Airai continue to be at risk of climate impacts and disasters. The Airai Master Plan did not consider sea level rise or other coastal hazards associated with climate change, and thus an important and rapidly development commercial center is located directly next to the coast, on land that is just a few feet above sea level rise. Land on both sides of the KB Bridge is being developed as a "Commercial Park". Given that there are no State or National requirements for climate-resilient construction, these development projects rely on the developer to ensure safety and resilience.

Assessment: The Airai State Master Plan needs to be revisited, and new data and information used, to include climate change, climate adaptation and mitigation, acknowledge climate risks, and plan for disasters. Some of the findings and recommendations from the DURP Study, updated with new data, can be incorporated into a new Airai Master Plan. A better guide, however, is the 2018 document for Melekeok State entitled "Climate Smart Resilient Development in Melekeok State," which provides guidelines for development.

2) Medal Ngediull Conservation Area Management Plan (2014-2019; prepared in 2013)

Airai's Medal Ngediull Conservation Area is a relatively small area with rich habitat diversity, and includes mangroves, limestone rock islands, shallow reef basins, reef flats and sediment bottoms. It is a critical habitat for juvenile Napoleon Wrasse, Humphead Parrotfish, and Rabbit Fish. The plan is guided by 5 goals:

1. Goal 1: Medal Ngediull is restored to a healthy reef the way it is remembered by senior community members over 30 years ago.
    - Actions are focused on reducing land-based sedimentation and clearing encroaching mangroves (which follow sedimentation).
2. Goal 2: Medal Ngediull Conservation Area offers an engaging and interactive learning platform in both environmental and social science studies for students and general public at all levels.
3. Goal 3: Protected Area is supported by improved Rules & Regulations and full enforcement.
4. Goal 4: A monitoring plan is in place and implemented by protected area staff but also allows community members to participate and engage in some of the monitoring activities.
5. Goal 5: A fully operational protected area management unit is in place and effectively managing Medal Ngediull Conservation Area.

Having expired in 2019, the plan is currently being revised with the assistance of the Palau Conservation Society.

Integration of Climate Change and Disaster Risk Management into the Medal Ngediull Management Plan
The Medal Ngediull Management Plan has only **one explicit mention of climate change or associated terms**:

- A section on knowledge and skill-building includes an action for Airai's Conservation Department to build capacity in "Understanding Climate Change."

Although there are no mentions of resilience, much of the Medal Ngediull plan is designed to improve the ecological condition and thus climate resilience of the site.

Assessment: The ongoing/current update of the Medal Ngediull Management Plan should include specific mention of climate change. Additionally, the Medal Ngediull Plan incorporates aspects of the Airai Master Plan, which as discussed in the previous section, also needs to be updated to consider climate change and its risks.

3) 5-Year Airai State Watershed Management Plan (2013-2017)

The purpose of the Airai State Watershed Management Plan is to promote sustainable development by creating a policy framework to guide management of rivers and related lands throughout the state. The plan is intended to promote economic growth while also maintaining or improving important natural resources, cultural heritage, and environmental quality. This plan was mandated in order for Airai to receive allocations from the National Government based on RPPL No. 8-40, §3413(b)(2)(i)(ii) and (c)(2), from funds generated from collection of green fee for improving water and sewer system of the Republic, which were designated by law to the Airai State Government for the sole purpose of the protection and preservation of water source and its ecosystem in Airai. After completion of this plan, Airai received its first disbursement of $200,000. However, annual disbursements did not continue and there are currently no plans to update this Management Plan.

- There are specific objectives for smart growth and climate resilience.
- Climate characteristics and impacts from climate change were considered in the scientific rationale for activities.
- A dedicated section on Climate Change assesses potential effects and implications of climate change, and proposes watershed management responses; which fed into the plan's priorities.
    - Many of the plan's strategies and activities are tied directly to a climate change effect.

Assessment: Climate Change was highly integrated into this plan, and this plan should be a key resource used to guide further planning and implementation of climate-resilient development. Most of the effects and implications are still relevant, although some could be updated with new climate data. The framework of tying climate effects to implications (similar to the projections and impacts presented in Section 2.2) and then developing specific management recommendations should be used in updates of the Airai Master Plan. **One remaining gap is in Disaster & Emergency Preparedness.** The Watershed Plan includes little on disaster preparedness, calling for the development of disaster preparedness policies. Disaster preparation requires more information and planning.

4) Sustainable Land Use and Environmental Design Study: State of Airai (DURP)

This report was prepared by the Fall 2009 Practicum of Planning Course 754 (Urban Design and Planning Studio) at the University of Hawaii at Manoa (Department of Urban and Regional Planning, University of Hawai'i at Manoa). The report provided research findings and recommendations for uptake into Airai's

Master Plan and Land Use Plan, but is not an officially adopted plan. The DURP Study influenced the Airai Master Plan, but its section on climate change was not included. However, much of the climate-related information in DURP is now outdated and many of the recommendations are generic.

Assessment: Not relevant as a local area development plan. Some of the climate-related information and recommendations are still relevant, and should be considered in an update of the Airai Master Plan. However, it is no longer relevant as a key data source for an updated Airai Management Plan.

6.1 NATIONAL DEVELOPMENT PLANS WITH SPECIFIC MENTION OF AIRAI

Because of Airai's strategic importance and location, many National plans on climate change include explicit mention of plans, priorities, and strategies for Airai.

1) **National Climate Change Policy for Climate and Disaster Resilient Low Emissions Development (2015)**

The National Climate Change Policy provides a national framework for addressing Adaptation and Disaster Risk Management, plus low emission development, with a sector-by-sector approach. Although the Climate Change Policy only includes specific reference to the Ngerikiil Watershed in Airai, it should still be a guiding framework for updating Airai's Master Plan.

Assessment: The National Climate Change Policy is highly relevant and its approach to Climate Adaptation, Disaster Risk management, and Low emissions development should guide local area development plans. Specific plans for the Ngerikiil Watershed are relevant. The framework of the National Climate Change Policy should guide local area development plans.

2) **Second National Communication to the UNFCCC (SNC; prepared 2013, submitted 2019) focused on the Ngerikiil Watershed and its importance as a water source.**

The SNC no longer has an entity tasked with implementing the plan (it was OERC). Regardless, it was a National Government Plan. However, many of the recommended actions are relevant to Airai:

- Improve collecting and monitoring of water data, and Building capacity to effectively identify sources of water, how much volume is available, and the ability to measure recharge levels. Currently, water resource managers at the Palau Water and Sewage Company (based in Airai) to identify and evaluate risks for water shortages, and to translate those risks into water management plans.
- Developing an emergency management plan that includes a section on water.
- Taking measures to avoid contamination from entering water systems. Riparian or buffer zones should be implemented around the watershed to protect it from sedimentation from roads, farms and other development; plus land use restrictions to avoid pollutants from entering water reservoirs used for drinking.
- Energy-related: Upgrading of the Airai to Ngechesar power grid connection to reduce high load loss.

Assessment: Some elements of the SNC are still relevant to Airai and incorporate climate change. The sections specific to the Ngerikiil Wateshed can be incorporated into an updated Airai Master Plan to guide local development. However, the 5-year Airai State Watershed Management Plan should take precedence as it was a more detailed, state-based plan for managing the same area.

3) Koror-Babeldaob Island Urban Development: Strategy and Action Plan (KBUDSAP)

The KBUDSAP is currently under development through a partnership with ADB. The Vision and Goals of the KBUDSAP specifically include mention of the word "resilience." A key element of the Terms of Reference for the development of the KBUDSAP is "Environment/Sustainability, Climate Change and Disaster Resilience." Particular emphasis was given to the impacts of climate change on tourism and housing. Strategies and actions proposed in the KBUDSAP with relevance to Airai include:

- Relocation of hospital services to Airai or Aimeliik, particularly as the existing hospital is close to sea level and to improve access especially during disasters and emergencies.
- Promoting tourism in Airai, with tourism product development of several cultural sites.
- Extending public transporation (bus services) to Airai, with provision of terminals and bus stops.
- Utilizing the Airport as a site for business development.
- Better managing the Public Water System, based in Airai.
- Improving sewerage collection in Airai.
- Increasing density and providing new housing.

Assessment: When complete, this plan will be relevant to Airai, and has incorporated climate resilience and disaster preparedness. Most Airai-specific sections of the KBUDSAP can be incorporated into an updated Airai Master Plan to guide local development by the State Government. The KBUDSAP is currently a National Government plan. Suitability criteria for identifying resilient development land is updated and uses more relevant data.

4) Other National Plans

- The National Development Master Plan 2020 is outdated and did not include climate change.
- The Resource Management and Development Suitability Study (RMDSS, aka MWM) did not include Climate Change. It's suitability identifications were based on slope, proximity to ports and docks, and distance to infrastructure. While underlying data and maps can be used to guide an update to Airai's local area development plans, the suitability criteria may no longer be relevant.

12.0 FINDINGS OF PREVIOUS CAPACITY ASSESSMENTS & IDENTIFICATION OF GAPS AND TRAINING NEEDS TO MANAGE CLIMATE CHANGE AND DISASTER MANAGEMENT

There have been no dedicated capacity assessments of Airai to determine gaps and training needs. There have only been sporadic capacity assessments in Airai associated with specific projects. There have been numerous capacity assessments of Palau in general, often focusing on the National Government but spilling over to civil society and communities as well. Capacity assessments that have been conducted have often been "high-level" and have not been tied to specific training needs, especially at the community level.

Airai Specific Capacity Assessments

The Airai Master Plan reported that in 2010 Airai had "no designated Emergency/Disaster Centers." Only Ngetkib Hamlet in Airai developed a Disaster Risk Management Plan for the community after receiving training on the CBDRR toolkit.

The 2015 PAN Report found that in Airai's PAN Site, staffing is below optimum and training and skills capacity could be improved to move its "Planning" Score to "Effective." The no-take no-entry PAN Site faced

illegal extractive activities in 2015, needing more enforcement capacity. Infrastructure and equipment were scored "Poor" in 2015.

The Medal Ngediull Management Plan identified several areas for knowledge and skill-building: Coral reef monitoring, fish monitoring, bird monitoring, search and rescue, wildlife rescue, oil & chemical spill response, knowledge of legal frameworks and national policies, understanding biodiversity, understanding climate change, understanding ecosystems and ecosystem services, and species management.

The 2012 Initial Environmental Examination Report for the Koror-Airai Sanitation Project found the following areas that were in need of institutional strengthening and training:

- The Palau Water and Sewerage Corporation (PWSC), based in Airai, was new in 2012 and then did not have much experience with environmental management or monitoring of the sanitation infrastructure.
- EQPB was under resourced (and still is) to administer and enforce all provisions of the Marine and Freshwater Quality Regulations, EIS Regulation, Earthworks Regulation, Air Quality Regulation and Toilet Facilities and Wastewater Disposal System Regulations.

The 2010 SOPAC Economic Assessment of Drinking Water Safety Planning, Koror-Airai Palau noted that the capacity of the Ngerimel Reservoir was low and needed to be increased. It also needed better filtration systems to remove suspended solids. Training in the use of Standard Operating Procedures (SOPs) and monitoring equipment was needed for water system operators.

Nationwide Capacity Assessments

It is important to note that Palau's Office of Climate Change has a small staff, one of whom is dedicated to international negotiations. The national entities that take part in climate adaptation, planning, and monitoring do not have close links with the Office of Climate Change. The Ministry of Natural Resources, Environment, and Tourism, which does have a mandate to work directly with States (like Airai) does not have the words "climate" or "disaster" in its mandate. There is no single entity responsible for climate change in the Palau government and no entity tasked with implementing the 2015 Palau Climate Change Policy. When the Policy was written, it stated that "The Ad Hoc Climate Change Committee will continue to serve as the National Climate Change Committee." It does not appear that the National Climate Change Committee is active.

A 2012 Review of the PACC Project found that Palau had developed good capacity to demonstrate climate-resistent agricultural development, had good knowledge of resistant taro varieties and use of them in planning and adaptation, and good integration of climate considerations into Agricultural policy (e.g. the "Food Policy").

Palau's 2019 6th National Report to the Convention on Biological Diversity found the following capacity gaps:

- Difficulty to enforce and plan for endangered species, especially the impacts of climate change (which may negatively impact populations).
- There is little understanding of genetic resources, with even less understanding of the role of climate change on genetic resources.

The 2019 Voluntary National Report (VNR) on the Sustainable Development Goals (SDGs) identified several capacity gaps that apply nationwide:

- Country-specific climate data is still inadequate and closing this gap is a priority.

- Planning for disasters often fails to include the special needs of women in emergency situations.
- Palau does not have a climate-informed building code, and there are no mandated build codes to withstand adverse weather, sea level rise, promote energy efficiency, reduce water use, mandate water harvesting or storage, or enhance accessibility.
- Land use plans are needed nationwide.
- Although mainstreaming is improving, climate adaptation and disaster risk management still need to be mainstreamed into national, state, and private sector plans and policies.
- Communities are not well prepared for climate change or for disasters.
    - There is little viable discussion about relocating low-lying communities or buildings.
- The number of skilled personnel able to manage and maintain climate responses is low.
    - The VNR reported that Palau's Ministry of Education had revamped its science curriculum in 2015 to include climate change and disaster risk reduction, with the explicit goal of equipping future generations to deal with challenges, be resilient, and live sustainably.
- Funding for climate change adaptation and disaster risk management is very low, when compared to other Pacific islands, and is a constraint to implementation of the Palau National Climate Change Policy.
- Public Safety entities need to improve procedures for the emergency evacuation, especially for vulnerable populations (sick, elderly, disabled, and foreigners (who don't speak the local languages)).
- Enforcement capacity in the EEZ (and PNMS) is still a gap.
- Community and youth engagement with the National Climate Change Policy and National Disaster Risk Reduction Policy is not full, thus some people are "left behind."
- Palau does not have the human resources needed to revitalize all taro patches being impacted by climate change. Capacity to study prioritize taro farms, move taro farms upland, move to climate-resistant varieties, and prevent intrusion is a gap at the community level. Capacity gaps are both in terms of human resources and in skills and expertise.
- Dependence on imported foods is high.
- There is a shortage of agricultural labor and growing gender imbalances in the agriculture workforce.
- Planning and outreach to communities is need to address and minimize the risks of vector-borne diseases and other health impacts, including mental health.
- Many schools (although not in Airai) are in locations vulnerable to sea level rise or climate change.
- Low income populations are the most vulnerable to economic shocks and the less likely to have resilience techniques. There is insufficient capacity to incorporate climate resilience into poverty prevention and alleviation strategies.
- Capacity to diversify economic opportunities, especially in tourism, is limited.
- Although access to water systems has improved, there are still individual homes in the urban areas with water safety issues and without access to public water.
- Rural communities lack assurance of safe drinking water from their public water systems.
- Capacity to remove, manage, and transition all remaining "benjo" type toilets is limited.
- In general, understanding of water conservation and water treatment is low.
- There is little understanding of underground water sources, including what levels of withdrawals are sustainable.
- There is insufficient capacity to manage future droughts, because of low levels of water redundancies (e.g. individual catchment tanks in addition to public water sources).

- There is still limited bandwidth in country to reduce energy consumption – due to a wide variety of conditions such as existing power grid limitations, costs of energy efficient appliances, distance between locations, etc.
- There are gaps for recycling beyond beverage containers. E-waste and junk cars are priorities and legal gaps exist making it difficult to recycle these materials. Recycling capacity is centered in Koror and declines with distance from the urban center.
- There is inadequate understanding or monitoring of sedimentation, erosion, and runoff.
- There is inadequate understanding or monitoring of coastal fish harvests and consumption, and inadequate capacity to manage coastal fisheries – particularly to limit catch.
- Information on land (including biodiversity) is a major gap – few research projects or monitoring protocols are aimed at land-based targets.
- Lack of awareness on the impacts of individual actions (e.g. lighting fires, skipping earthmoving permit conditions, unknowing importing invasive plants) remains an issue.
- Impacts of climate change on forest ecosystems is not as well understood as impacts on the marine environment. Thus, there is little climate-informed land use planning.
- Women do not participate adequately in disaster planning and response.

The 2019 State of the Environment Report (2019 SOE) found the following capacity gaps:
Coral Reef Management capacity gaps, with particular emphasis on Airai:

- Inadequate protection of channels, back reef, and reef flats, all of which are important for coastal fisheries. Airai's one MPA (Medal Ngediull) protects some areas of mangrove, seagrass, mud flat, and patch reef; plus some limestone rock islands.
- Airai's Eastern Reefs were damaged after typhoons in 2012 and 2013 and still have not recovered, many are in poor condition.
- Understanding of deep coral reefs is minimal throughout Palau, with little understanding of the status of such reefs in Airai.
- Most of the work on resilient reefs has been done in Koror. However, Airai also has Rock Islands and thus identifying and protecting coral refugia in the state remains a capacity gap.
- There is still little capacity to monitor marine water quality.

Fishery Management:

- In general, across Palau fishers have adapted very slowly to the reduced productivity of coastal fisheries.
- There are not enough nearshore MPAs that are large enough to support near-shore fish and invertebrate species. Medal Ngediull is relatively "small." Further, Medal Ngediull was selected for reasons other than fishery productivity, thus it does not contribute to all of Airai's fishery needs.
- The domestication piece of the Palau National Marine Sanctuary is progressing very slowly, and fishers have little access to offshore fisheries.

Land-based Management:

- Airai's Master Plan inadequately protects its shoreline – indeed mangroves are targeted for possible removal.
- Adaptation responses on land are slow.
- Capacity to enforce and respond to fires is very limited. Understanding of the negative impacts of fire, ways to mitigate, prevent, and suppress fire, and restore land after a fire is low. There is also not enough labor to restore all areas negatively impacted by fire.
- Data analysis of forest data is minimal, there is little to no capacity on-island to fully analyze existing data sets (forest and birds).

- There are few Best Practices or SOPs for post-storm responses, especially as relates to environmental management or tourist sites.
- There is still inadequate monitoring of Agricultural production, local use, and local demand, including inputs, outputs, and losses.
- Capacity to address, prevent, control, and eradicate invasive species is low in communities.

Gender and social inclusion:

- In 2017, on average individuals working in the Conservation Community did not feel well-prepared to implement projects with a gender and socially inclusive lens.
- Climate Change appears to be disproportionately negatively affecting women. Young men are also highly vulnerable.
- Rural households are more likely to have limited access to varied habitats because they own smaller boats with less gear. Urban residents have more flexibility and are able to adapt to change; following typhoons in 2012 and 2013 urban fishers—mostly male—were able to access fishing grounds far from home; whereas rural fishers did not have that same flexibility. This flexibility means that urban fishers were able to catch and sell excess fish to markets by a factor of 4:1 to rural fishers, who utilize their catches to meet subsistence food needs.

A 2017 Environment Statistics and System of Environment-Economic Accounting (SEEA) - National Assessment Report by the Ministry of Finance found that Palau did not have a body that was responsible for ensuring the consistent and reliable collection and production of environment statistics. There was a lack of central data repository for environment and GIS data, including data associated with climate change. The report made several recommendations for improving partnerships and data sharing within the Palau Government.

The 2015 National Climate Change Policy identified several capacity gaps, many of which still apply:

> "Engagement by communities in building climate change resilience has been limited by competing interests, minimal capacity and understanding, and confusion arising from ad hoc government and partner projects on climate change that have not been aligned or coordinated. The absence of a central focal point for climate change and disaster risk programming has resulted in a limited ability to keep key stakeholders engaged over a sustained period of time, while the absence of core budget support from government for climate change programming has resulted in understaffed institutions with inadequate resourcing (human, technical, and financial) to effectively manage pressing climate change and disaster risk management priorities. Capacity assessments determined that within sectors:
>
> - There is some understanding on vulnerabilities to risks from climate change or disasters.
> - There is limited understanding of mechanisms/strategies to manage risks.
> - There is limited information on energy efficient or renewable energy technologies.[10]
> - There is limited understanding of how to transition to energy efficient or renewable energy operations.
> - Mainstreaming of climate change and disaster risk management into sector planning, development, and operations has been limited.
> - There are limited institutions and tools at sector and site specific levels to manage risks.
> - There are limited resources (human, technical, financial) and social capital available."

[10] Capacity in renewable energy has increased since then.

A 2009 Capacity Assessment on Palau's Energy Sector found that in 2009, capacity at the National Development Bank of Palau (NDBP), among local vendors and contractors, and PPUC (and thus likely representative of others in Palau) to be:

- Minimal understanding of solar infrastructure and equipment, including installation.
- Little experience with energy efficiency loans
- Little understanding of net metering regulations
- Good understanding of energy efficiency benefits

Since 2009 the level of capacity in solar installation has increased significantly – for instance in 2009 there was 1 vendor installation PV systems; in 2020 there were at least 5 vendors.

A 2007 National Capacity Self-Assessment by the Palau Government found that Palau had numerous constraints addressing climate change, ranging from lack of human resources to lack of expertise. The low level of climate funding and lack of a national body charged with coordinating the climate response was identified as a constraint in 2007.

13.0 EXISTING TRAINING PROGRAMS IN AIRAI

There have been few training programs on climate change or disaster risk reduction, and even fewer in Airai. The majority of training programs have focused on management of the conservation area for biodiversity purposes, and few have focused specifically on climate change or disasters. Capacity for planning is high due to persistent engagement by the Palau PAN and the Palau Conservation Society and continued emphasis on management planning and Results-based management. This existing capacity can be capitalized on to focus on inclusion of climate change and disasters into existing and new plans.

- Many training programs in Airai focused on conservation needs, especially those related to their marine protected area. All of the Airai Conservation Officers as of 2016 had been trained in biophysical monitoring protocols for their site by the Palau International Coral Reef Center (marine) and the Belau National Museum (birds). They were able to enter the data and use the information to adapt their management plan. The PAN Office has also conducted trainings and networking in Airai in management planning and reporting to the PAN. Similarly, PAN Site Managers have received trainings in Results-Based Management from Palau Conservation Society.
- The National Emergency Management Office (NEMO, based in Airai) launched the Community-based Disaster Risk Reduction (CBDRR) Training Program in 2017. The Ngetkib Hamlet in Airai was trained in the CBDRR Toolkit and developed a Disaster Risk Management Plan. Additional training provided by the Government of Japan – aimed at NEMO and the Palau Weather Service Office – was provided in 2020 on the use of goods for the capacity for preparedness to hazards.
- Numerous training programs have taken place in Airai to introduce economic diversification options to hamlets, communities, and women's groups. These have included trainings on tourist site and tourism product development, use of technologies for food processing and product development, and small business development, many driven by the goal of increasing adaptive capacity to deal with the loss of income associated with climate change. These trainings have been offered by the Small Business Center, Palau Visitor's Authority, Taiwan Technical Mission, Belau Tourism Association, and the Palau Community College Cooperative Research Extension (PCC-CRE).
- Capacity in installation and maintenance of solar energy and energy efficiency has increased significantly since the capacity assessment was completed in 2009. Capacity to install solar panels is now relatively high.
- The Ministry of Education has included climate change and disaster risk management into its school curriculum.

14.0 PRIORITY TRAININGS NEEDS

Considering that most capacity assessments were done at the national level, training needs are clearest at the national government and nationwide civil society level. Identified trainings needs for all climate-related subjects, with particularly emphasis on Airai when possible, are:

1. Incorporation and mainstreaming of climate change and disaster risk reduction into Master and Land Use Planning. This need cannot be met solely with a training course, but needs more in depth mentoring and facilitation, as well as "Training the Facilitators" type capacity courses. This is very important in Airai, which is about to undertake an update of its Master Plan and which is experiencing rapid development, much of it in vulnerable, low-lying areas. **This is a top priority for Airai State Government, with an expired Master Plan, involvement in island-wide land use planning efforts, and rapid, extensive development already underway.**

2. Disaster Risk Management, with special consideration of the needs of vulnerable people, women, and youth. There is little understating of the links between climate projections and potential disaster risk, little knowledge of ways to reduce vulnerabilities, and little acceptance of way to identify and manage risks. In fact, there are contrary views about risks – for instance, many communities and developers support hardening of shorelines, even though this creates higher climate risks for those elsewhere on the shore. **This is also a priority for Airai State, which is currently experiencing rapid development, including in low-lying areas. Only one hamlet has used the CBDRR toolkit, despite the fact that Airai has Palau's second-highest population.**

3. **A third priority for Airai State Government is training in climate-informed building codes and climate-resilient subdivisions.** Combining climate projections and disaster risk into actual action the ground – vis-à-vis construction – is a major capacity gap and is an immediate need in Airai. Construction in Airai is progressing rapidly, with many projects built in vulnerable locations or otherwise contributing to an increase in vulnerability or disaster risk.

4. Airai State Staff – indeed all State Government Staff – could benefit from training programs on ways to better enforce and monitor permit conditions. This could reduce vulnerabilities associated with development.

5. Improving general understanding of climate projections and climate impacts by sector would be beneficial to the Airai State Government and the public in general. Training is needed so that operators in key sectors such as tourism, fisheries, agriculture, forestry, and construction know what to expect and what some of the adaptation strategies may be by sector. There is still limited knowledge about climate change and disaster risk. Youth are receiving a general education on climate change in the school curriculum, but there are still wide disparities in understanding and knowledge in the adult population.

6. Training programs on public water systems are needed with particular emphasis on disaster risks; however, this training should be targeted to the water operators (PPUC) and to Airai State's Land Use Planner (when this position is filled). This includes planning for droughts, understanding how supply may change with various projections, making predictions, and calculating sustainable withdrawals. This applies to surface as well as groundwater sources.

7. Palau is strongly emphasizing food security, nationwide, and given Airai's heavy investment in agricultural areas, training in climate-smart and climate-resilient agriculture (upland, taro, and livestock) is a perpetual need. Agricultural capacity building programs need more than a one-time

training, but rather investment into long-term and comprehensive educational and professional development programs. In the meantime, though, farmers need spot training in climate risk reduction. **This is a training priority for stakeholders, though not necessarily for the Airai State Government.**

8. There are continued needs for training in climate data management, particularly in analyzing collected data and using it in adaptive management. In addition to training programs, improvements to data sharing systems are necessary to ensure that States, like Airai State Government, are able to share and access data and information collected by national government and NGO entities.

9. All stakeholders would benefit from training programs that increase understanding on the role of gender in climate adaptation and disaster risk management. This would need to be specific to Palau's cultural context and in Airai there would need to be specific stakeholder mapping in order to be effective.

10. Understanding and managing for vector-borne diseases under various climate projections is a training need for State Governments and the National Government.

11. The National Government could benefit from training, mentoring, and facilitation to ensure that the Office of Climate Change and various Ministries (MNRET (natural resources), MOH (health), MPIIC (infrastructure), MOJ (public safety)) are able to respond to climate change and disasters. In addition to raising national government capacity, these national government offices could benefit facilitation to determine who the focal point on climate change in country should be, in order to best respond to community and State needs.

15.0 CONCLUSIONS

This assessment of the State of Airai's local area development plans and its training needs show that significant investment is needed in the State in order to improve resilience, reduce climate vulnerabilities, and manage disaster risks. The Airai State Master Plan, which expires this year, does not include climate change and a new Master Plan to guide the rapid development in the State is needed. This new Master Plan should fully incorporate climate change and disaster risk. There are good models and frameworks, especially in the Airai Watershed Plan and the Palau National Climate Change Policy, to guide planning sector-by-sector.

The three highest priority training needs in Airai all arise out of the rapid development the State is currently experiencing. Construction is visible in all areas of the State, and many of these projects are large-scale commercial and government investments. Many of these are also in low-lying or otherwise vulnerable areas. Priorities are thus to raise capacity to fully integrate climate change and disaster risk into local area development plans (including zoning and land use plans); to develop Disaster Risk Management plans for the whole state with stakeholders representing the hamlets, civil organizations, new subdivisions of homeowners, farmers, and traditional leaders; and strengthen implementation of the Master Plan by improving for various development activities through climate-smart building codes. Nationwide, there is a clear need to increase understanding and knowledge – including knowledge management – of climate change projections and their expected negative impacts on important sectors in Palau.

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