PRIORITIZED ROAD INVESTMENT AND MANAGEMENT ENHANCEMENTS (PRIME) PROJECT

And

STRATEGIC CLIMATE-ORIENTED ROAD ENHANCMENTS (SCORE)

Federated States of Micronesia

BASELINE RESOURCE REPORT

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Appendix A Gap Analysis Table

Appendix B Detailed Asset Maps

ABBREVIATIONS

ABS	Areas of Biodiversity Significance
AOI	Area of Interest
CEDAW	Committee on the Elimination of Discrimination Against Women
CIU	Central Implementation Unit - DOFA
cm	Centimetres
COM	College of Micronesia
DHSA	Department of Health and Social Affairs
DOFA	Department of Finance and Administration
DoTC&I	Department of Transportation, Communications and Infrastructure
EEZ	Exclusive Economic Zone
ENSO	El Nino Southern Oscillation
EPA	Environmental Protection Agency
E&S	Environmental and Social
ESA	Environmental and Social Assessment
ESF	Environmental and Social Framework – World Bank
ESMF	Environmental and Social Management Framework
ESS	Environmental and Social Standards – World Bank
EWS	Economic Social Wealth
FSM	Federated States of Micronesia
GBV	Gender Based Violence
GDP	Gross Domestic Product
GIS	Geographic Information Systems
GoFSM	Government of FSM
ha	Hectares
HIES	Household Income and Expenditure Survey
HT	Human Trafficking
IHE	Institute of Higher Education
KIRMA	Kosrae Island Resource Management Authority
Km	Kilometers
MDG	Millennium Development Goal
NCD	Non-Communicable Disease
NDOE	National Department of Education
NGO	Non-Government Organisation
NRCS	Natural Resources Conservation Services

ODA	Overseas Development Assistance
PMA	Protected Managed Areas
PRIME	Prioritized Road Investment and Management Enhancement Project
SCORE	Strategic Climate-Oriented Road Enhancement Project
SDG	Sustainable Development Goal
SEA	Sexual Exploitation and Abuse
SH	Sexual Harassment
SOP	Standard Operational Procedures
US	United States of America
USDA	United States of America Department of Agriculture
UXO	Unexploded Ordnance
VET	Vocational Education and Training
WB	World Bank
WHO	World Health Organisation

1. Introduction

1.1 Environment and Social Assessment Overview

The Government of Federated States of Micronesia (GoFSM) has applied for financing from the World Bank (WB) for the Prioritised Road Investment and Management Enhancement (PRIME) and Strategic Climate-Oriented Road Enhancements (SCORE) Projects to improve the climate resilience of FSM's road network,

Part of the PRIME and SCORE Projects includes the assessment of environmental and social risks including:

(i) Environmental and Social Assessment (ESA);

(ii) Preparation of environmental and social instruments in accordance with the WB Environmental and Social Framework (ESF);

(iii) Support stakeholder consultation activities; and

(iv) Provision of technical environmental and social advice as required to the GoFSM as part of project preparation.

The GoFSM through the Department of Transportation, Communications and Infrastructure (DoTC&I) with assistance from the FSM Department of Financial Administration (DoFA) Central Implementation Unit's (CIU) safeguard team and external consultants has undertaken the preparation of the instruments required for WB appraisal including development of an Environmental and Social Management Framework (ESMF) incorporating both PRIME and SCORE Projects. In addition, an environmental baseline report was prepared as part of the PRIME project as a supporting document to the PRIME ESMF.

The PRIME ESMF including the baseline assessment report project preparation was undertaken in 2020 and appraised by the bank in early 2021, whilst SCORE project preparations were undertaken in late 2021 to be submitted to the WB for appraisal and subsequent disclosure in early 2022. As both projects are associated with primary and secondary strategically important road network in the FSM which are intrinsically linked, it was jointly agreed by the GoFSM and the WB to combine the projects safeguard instruments and as such a combined PRIME and SCORE ESMF and baseline environmental report have been developed. The rationale supporting this conclusion centered around the benefits in time and costs of a single set of instruments for both projects decreasing the work requirements and related costs for DoTC&I, CIU and stakeholders to manage the projects respective components separately. This document (herein) has been updated to reflect both PRIME and SCORE project baseline environmental data and as such the combined bassline report supersedes the original PRIME only baseline report.

1.2 Project Background and Rationale

The *Prioritized Road Investment and Management Enhancements (PRIME)* and Strategic Climate-Oriented Road Enhancements (SCORE) Projects will provide funds for technical assistance and institutional strengthening to improve the management of the road network in relation to potential climate change impacts for the FSM. PRIME will focus on the priority road networks whilst SCORE will focus on strategic priority secondary roads in each state. In addition, the Projects will fund the feasibility, design and construction of physical works

on priority primary and secondary road assets to improve resilience to climate-related hazards or events.

FSM faces significant challenges related to its small size, remoteness, geographical dispersion, environmental fragility and sensitivity to external shocks. Climate projections predict elevations in air temperature, frequency of days of extreme, increased rainfall and rising sea levels. Sea level rise combined with natural year-to-year changes will accentuate the impact of storm surges and coastal flooding.

FSM's transport network is of critical importance to the country's economy and economic development through supporting trade and promoting commercial activity by facilitating the movement of goods and services, and providing safe and efficient access to social services including schools and health facilities. Critical climate resilient road, bridge and/or drainage improvement works to be implemented urgently to maintain a basic level of land transport connectivity in each state will be identified as part of the Projects. The extent of these works for both projects are described and shown in the projects ESMF.

While some initial road works have been identified as requiring urgent works (refer Component 2 of each project), the design of the required works has not yet been undertaken and the full extent of impacts are not yet known. The additional works that will form the PRIME and SCORE Projects will be identified as part of the Vulnerability Assessment (VA) and Climate Resilient Road Strategy (CRRS) studies funded under the PRIME project. As part of these studies a multi-criteria assessment will be undertaken to prioritize the urgency of works and works that will be funded by the projects. Environmental and social risk screening will be part of the multi-criteria analysis

In general, there is only one primary, circumferential route on each of the four main FSM Island states. In addition, most of the population in FSM lives close to the coast, and critical infrastructure including roads, schools, places of employment, port facilities, tourist facilities, power plants and airports, are located primarily in the coastal zone.

1.3 This Report

1.3.1 Background

This combined PRIME-SCORE Baseline Resource Report presents a compilation of the ecological resource (terrestrial, freshwater and marine habitat) and socio-economic information and data available for the FSM States acquired from primary and secondary sources. Locally based sub-consultants in each State have been used to collect primary source information though field survey under the direction of the CIU environmental team with assistance from external international environmental and social specialist.

Initially, an analysis of available information was undertaken[1] where gaps in information were identified to focus the baseline data collection phase of the PRIME Project. This information was used for both projects to develop this report. Appendix A identifies where gaps in this baseline data still remain.

This baseline resources information will be used to assist with screening proposed activities to be funded under the PRIME and SCORE Projects in terms of Environmental and Social (E&S) risk management.

[1] Gap Analysis Report. Prioritized Road Investment and Management Enhancements (PRIME) Project (P172225). Federated States of Micronesia. August 2020.

1.3.2 Project Area of Influence

The initial description of both Project's Area of Influence (AOI) is based on the definition provided in the Guidance Note to ESS1, to which the Project is to comply. Specifically, this Guidance note states that:

"*….Where the project involves specifically identified physical elements, aspects, and facilities that are likely to generate impacts, the collection and analysis of environmental and social baseline information and data, at an appropriate level of detail for the project, are essential to define the project's area of influence and describe relevant physical, biological, ecological, socioeconomic, health, and labor conditions, including any changes anticipated to occur in the foreseeable future (including projected variability in climatic and environmental conditions due to potentially significant climate change or that would require adaptation measures that could occur over the life of the project), along with current and proposed development activities within the general project area but not directly connected to the project to be financed…..*"

The area considered for assessment of baseline conditions (the Project "Area of Influence" or "AOI") consists of the:

- Road corridor adjacent to the 'PRIME and SCORE Roads' (and works where it is a bridge, causeway, etc) and immediate adjacent environment either side of the road alignment;
- Road users as well as communities, sensitive receptors and sites of cultural/heritage significance connected to and adjacent to the PRIME and SCORE roads;
- Any temporary structures (such as bridges, causeway replacement structure, etc);
- Receiving environment downstream (and upstream when considering fish passage) if the works are a bridge (or causeway) or works are related to drainage, culverts etc;
- Contractors yards, lay down or stockpile areas and any other works related facilities; and
- Quarry locations and immediate surrounds.

Table 1-1 outlines the guidelines that have been followed to determine the AOI for the PRIME and SCORE Projects which is based on a precautionary approach. All PRIME and SCORE project data was obtained by desktop study and field survey conducted between July and October 2020 and October 2021, respectively.

Table 1-1: Project Area of Influence (AOI) delineations and conditions

Environment	Project AOI
Local villages / communities	Adjacent to PRIME and SCORE Road alignments and works locations. Connected to and by the PRIME and SCORE road network.
Road users (motorists, cyclists, pedestrians and other modes of transport).	Users of the road that may have access or transportation restrictions from the works if they are not adequately managed. Users that will benefit from improved infrastructure.
Important species and ecological habitat.	Sensitive ecological areas in close proximity to the PRIME and SCORE road alignments and works locations potentially receiving runoff during construction / operation.

Environment	Project AOI
Streams & inshore waters (adjacent to coastline).	Assuming a precautionary approach, an area directly adjacent to the PRIME and SCORE road alignments and works locations potentially receiving stormwater runoff during construction / operation.

The AOI extent considered in the project combined ESMF is broader than the area in which possible physical works/interventions will occur as Component 2 works for both PRIME and SCORE projects will only be undertaken along small discrete section of the 'primary and secondary roads' identified a part of the PRIME and SCORE Roads'. However, all road users that rely on the road networks for work, education, markets, community and social connectivity will potentially be affected by, and benefit from both Projects

The broader AOI has been applied for the E&S baseline, impact and risk assessment in the projects ESMF in order to ensure the process captures anticipated impacts.

Any site-specific environmental and social assessment to be prepared, if required, are to define the AOI specifically for those works, based on the works footprint including all ancillary components and potential impacts on environmental, economic and social resources.

1.3.3 Methodology & Limitations

The following methodology was adopted to compile of baseline information provided in this Report:

- Primary data collection including in country consultations with relevant Government Departments/Agencies and NGOs, and
- Secondary data collection including internet searches of information repositories and data requisition from relevant Government Departments / Agencies

All data was obtained by desktop study and field survey conducted between July and October 2020 (PRIME project) and October – November 2021 (SCORE project). Every endeavour has been made to identify and refer to the most recent data available. However, some of the data is old and may be out of date.

2. Federated States of Micronesia

2.1 Physical Environment

2.1.1 Location & Geography

FSM is located near the equator about 4,000 km southwest of the Hawaiian Islands in the Western Pacific Ocean and within the Caroline Islands group. The largest nation in the Micronesian sub-region, FSM is made up of four semi-autonomous states (Kosrae, Pohnpei, Chuuk and Yap) (see Figure 2-1) located between Marshall Islands to the east, Palau and the Philippines to the west and Guam north.

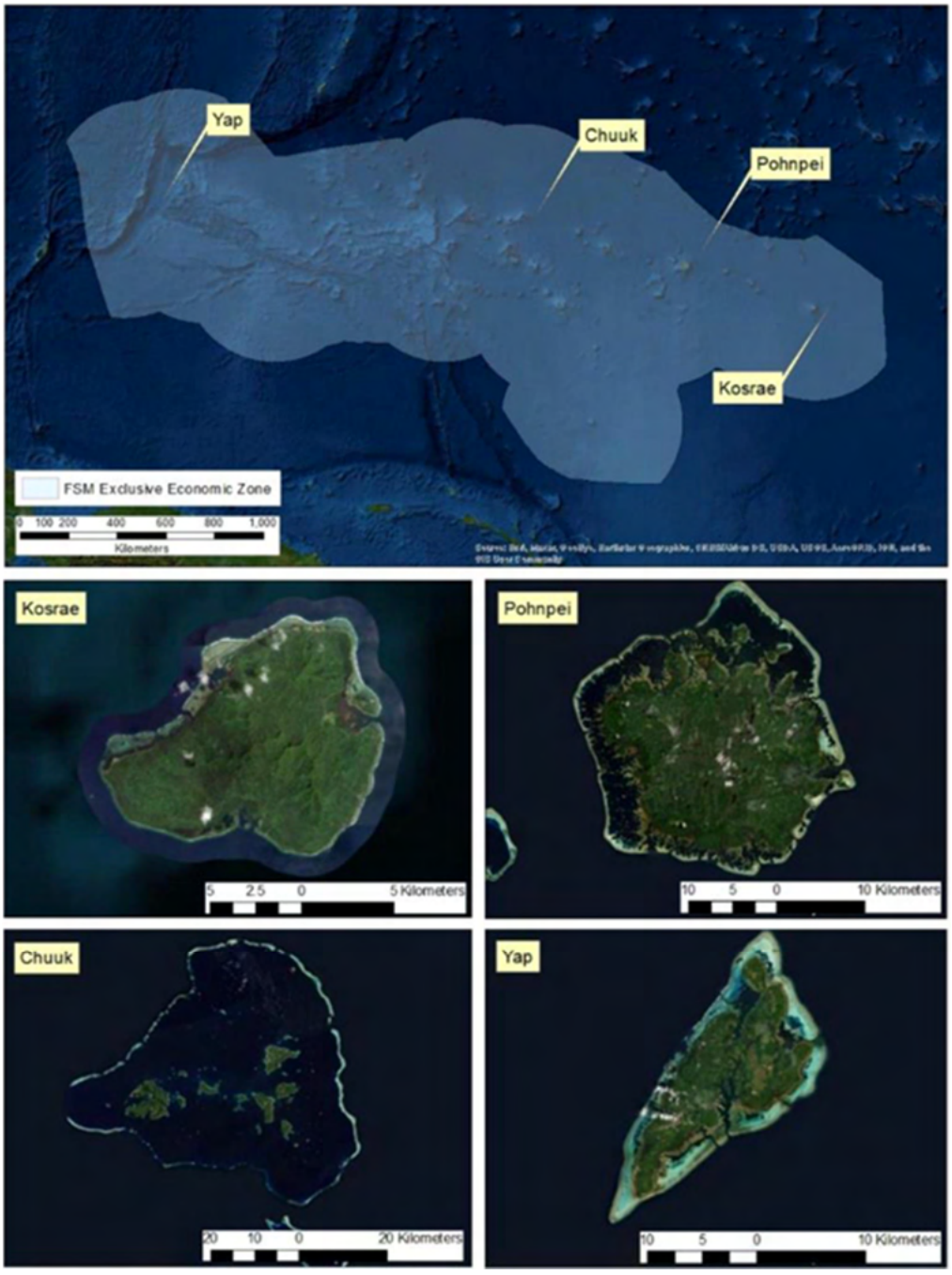


Figure 2-1: Location of FSM States: Kosrae, Pohnpei, Chuuk and Yap

FSM is made up of 607 islands scattered over an area of about 2.6 million km^2, including its Exclusive Economic Zone (EEZ), in the western Pacific Ocean. The total land area of FSM is 704.6 km^2, with 7,192 km^2 of lagoon area. The islands vary from small islets, which are inundated at high tide, to atolls and large volcanic islands with land area of more than 80 km^2. Approximately 65 (approx. 10%) of the islands are inhabited.

2.1.2 Climate

General

FSM has a tropical climate that varies with seasonality of rainfall influenced by the two distinct ecoregions (see Section 2.2 for more detail). The climate is tropical marine with daily temperatures ranging from about 24 to 29°C with little average variation throughout the year (Wortel *et al.* 2003). Annual rainfall ranges from 304 cm for drier islands like Yap to over 1,016 cm per year in the high mountains of Pohnpei and Kosrae. Humidity averages over 80 per cent. Northeast trade winds prevail from about November to May when conditions may be drier on western islands of the FSM.

The region is affected by storms and typhoons, which are generally more severe in the western islands and by periods of drought and excessive rainfall associated with the "El Nino" (ENSO) phenomena. In recent times, the droughts of 1982-1983 and 1997-1998 were especially severe.

The West Pacific Monsoon affects the western states of Chuuk and especially Yap more than the eastern states of Pohnpei and Kosrae. It tends to be farther east during El Niño, bringing higher rainfall, and in a more western position during La Niña, resulting in less rainfall.

Climate Change

Long- term average rainfall in FSM is projected by almost all models to increase with a greater increase projected in May to October than in November to April rainfall (ABM & CSIRO 2013). However, annual variability is still the same or larger than the projected change even in the highest emission scenario in 2090. Between 1979 and 2006 mean rainfall has increased in the western states of FSM but models do not project this will continue at this rate into the future. This indicates that the recent increase may be caused partly by natural variability and not due to global warming.

Extreme temperatures for the western FSM states are projected to increase by 0.8 Degrees Celsius (^{0}C) by 2030 under the very high emissions scenario, and the frequency and intensity of extreme rainfall events are projected to increase by about 14 mm by 2030 in the very high emissions scenario (Figure 2-2) (ABM & CSIRO 2014).

Satellite data indicates that sea level has risen in FSM by over 10 mm annually since 1993, which is above the global average of 2.8- 3.6 mm per year. This higher rate of sea level rise may be related to natural fluctuations that take place on a yearly or decadal basis caused by phenomena such as the El Niño –Southern Oscillation. By 2030, under a very high carbon dioxide emissions scenario, this rise in sea level is projected to be in the range of 41 – 90 cm (Table 2-1). Values represent the 90% of the range of model results and are relative to the period 1986-2005. The sea level rise combined with natural yearly changes will accentuate the impact of storm surges and coastal flooding.

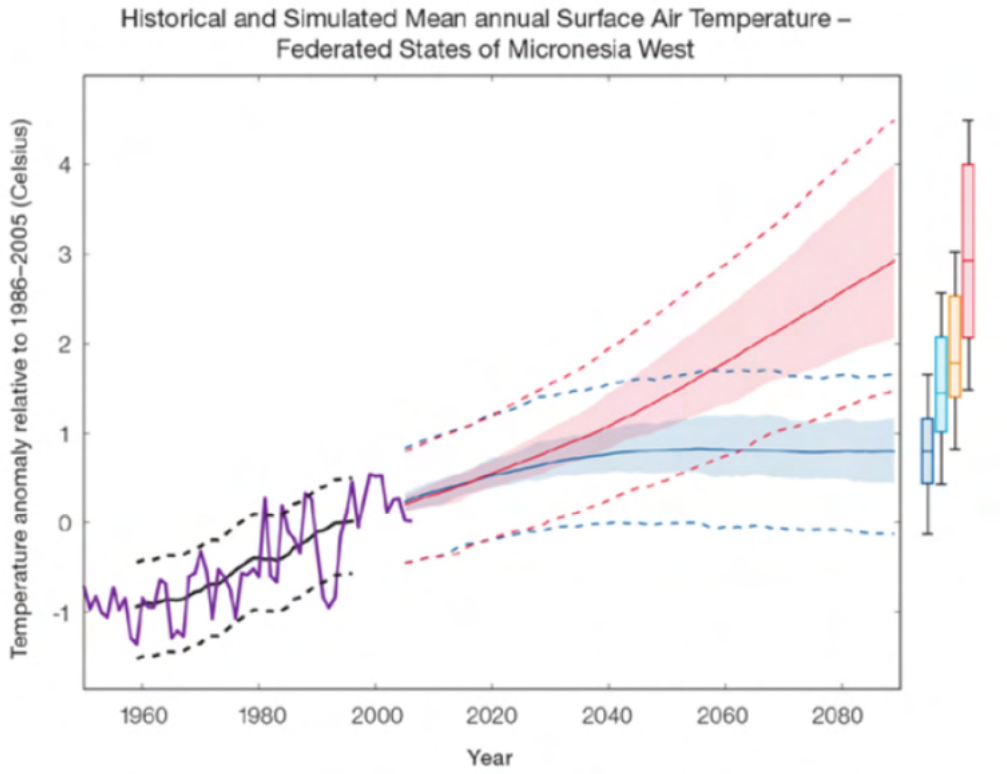


Figure 2-2: Historical & simulated mean annual surface air temperature – FSM West (from ABM & CSIRO 2014)

Table 2-1: Projected changes in annual mean sea level rise for FSM (from ABM & CSIRO 2014)

	2030		2050		2070		2090	
	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)
Very low emissions scenario	3.1–7.1	8–18	5.5–11.8	14–30	7.9–17.7	20–45	9.4–23.6	24–60
Low emissions scenario	3.1–6.7	8–17	5.5–12.2	14–31	8.7–19.3	22–49	11.8–26.8	30–68
Medium emissions scenario	2.8–6.7	7–17	5.5–11.8	14–30	8.7–18.9	22–48	12.2–27.2	31–69
Very high emissions scenario	3.1–7.1	8–18	6.7–13.8	17–35	11.0–23.2	28–59	16.1–35.4	41–90

2.1.3 Topography

The Islands of Kosrae, Yap, Chuuk and Pohnpei are known as ‘high’ islands, which are of volcanic origin. Geologically, Kosrae in the east is the youngest island, and the islands gradually become older as they move toward the western end of the Caroline island chain (USDA SCS 1982).

These islands range from islets barely above sea level – the majority of the islands - to the high islands – of which Pohnpei, which reaches 791 m above mean sea level (Nahnalaud), and then Kosrae (Mt. Finkol at 635 m) and Chuuk (Mt. Uinipot on Tol Island at 443 m) follow, in order (TNC 2002).

The unique forests of the high islands are known to protect watersheds and prevent erosion.

2.1.4 Hydrogeology

Approximately 60% of water resources in FSM exist as surface water in the form of small, intermittent streams that drain catchment areas of limited aerial extent (Johnston 2011).

The remaining 40% exist as groundwater in small, dispersed zones of sedimentary deposits, weathered volcanic and schists.

Kosrae and Pohnpei have perennial stream flow and serve as invaluable, nearly infinite resource as most of the water that does not run-off is absorbed through the soils and rock and sits as underground fresh water lenses in basalt caves created by earlier lava flows and geologic formations.

2.1.5 Seismology & Earthquakes

Most of the islands in FSM are situated in a relatively quiet seismic area (e.g., Pohnpei is located in a seismic Zone 1 as classified by the Trust Territories of the Pacific Islands Design Criteria 1970). The exception is Yap, which is situated close to the Pacific "ring of fire" (Figure 2-3). These tectonic plate boundaries are extremely active seismic zones capable of generating large earthquakes and, in some cases, major tsunamis that can travel great distances.

While significantly damaging earthquakes have not been observed in recent times, FSM is subject to large tsunamis, as evident by the large tsunami run-ups of 1837, 1849 and 1899, which caused death and destruction in the Caroline Islands. Pohnpei island has not been affected the serious damage by earthquake since 1971.

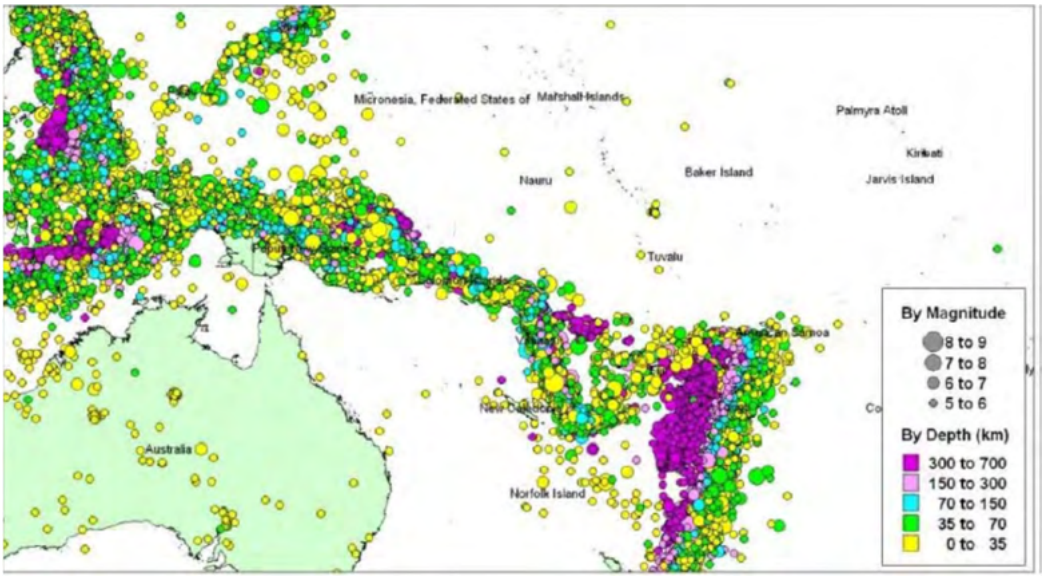


Figure 2-3: Epicentres of earthquakes in the west Pacific Islands region (Rong *et. al.* 2012)

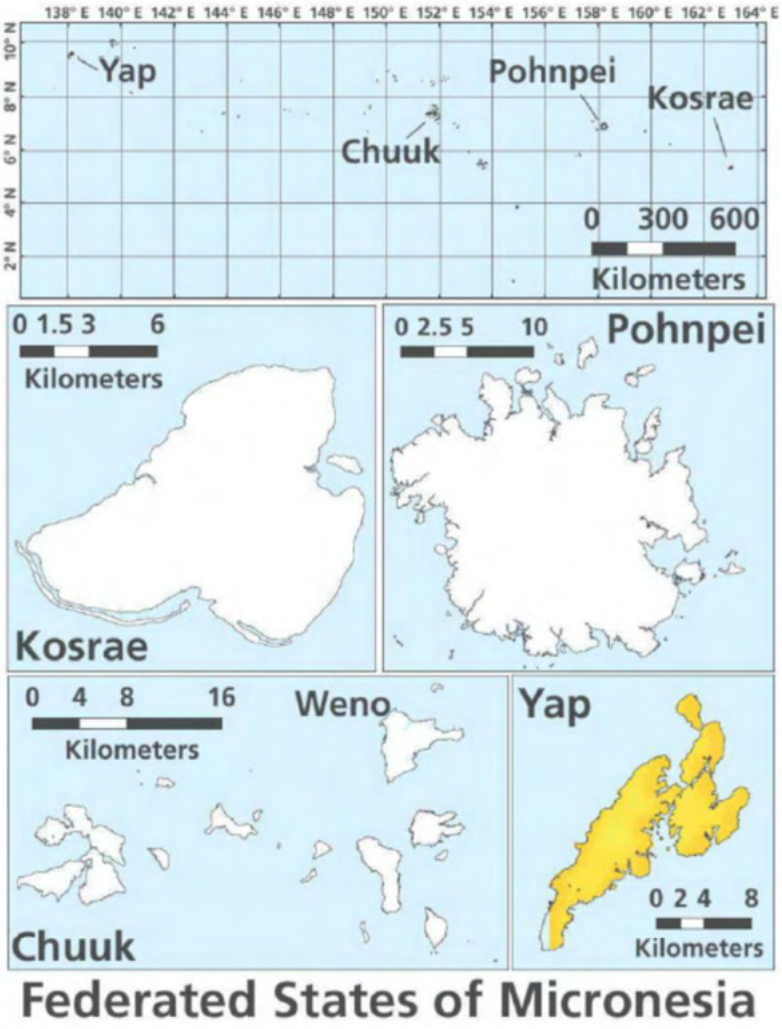
Yap has a 40% chance in the next 50 years of experiencing, at least once, light to moderate levels of ground movement (see Figure 2-4).

Moderate levels of ground movement are expected to cause minor damage to well-engineered buildings. Much lower levels of shaking are expected in the other main islands of FSM. In terms of expected annual Economic-Social Wealth (EWS) loss risk due to earthquakes, FSM sits in the second lowest zone.

2.1.6 Oceanographic characteristics

Tides are semi-diurnal (2 tides a day) throughout the FSM with a strong diurnal inequality and a maximum tidal variation of just over 1.5 m (meso-tidal) (Wolanski & Furukawa 2007). Small seasonal and daily tidal fluctuations have been recorded related to sea conditions associated with prevailing weather patterns.

Storm systems impact tidal height and can cause increased coastal erosion when coinciding with high water levels.



Perceived Shaking	Not Felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme
Potential Damage	none	none	none	Very light	light	Moderate	Moderate/ Heavy	Heavy	Very Heavy
Peak ACC. (%g)	<0.17	0.17-1.4	1.4-4.0	4.0-9	9-17	17-32	32-61	61-114	>114
Peak Vel. (cm/s)	<0.12	0.12-1.1	1.1-3.4	3.4-8	8-16	16-31	31-59	59-115	>115
Instrumental Intensity	I	II-III	IV	V	VI	VII	VIII	IX	X+

Figure 2-4: Peak horizontal ground acceleration calculated for FSM (Note: 1g is equal to the acceleration of gravity) (Rong *et. al.* 2012).

2.1.7 Unexploded Ordinance (UXO)

FSM has a significant World War II history. Although the risk of encountering a Unexploded Ordinance (UXO) is considered low (significant programs have been undertaken to identify and removed UXO through the FSM), due diligence and careful consideration will be needed during Project works to ensure that the presence of UXO WW II munitions are identified within the projects AOI and safety removed.

2.2 Biological Resources

2.2.1 Biodiversity

The FSM consists of two ecoregions (see Figure 2-5) (Wortel *et. al.* 2003). The Yap tropical dry forest ecoregion is characterized by a monsoon-like climate with rainy seasons followed by periods of drought. The dominant vegetation types are mixed broadleaf forest, swamp, mangrove, savanna, and agroforests (Falanruw et. al.,1987). Vegetation maps from 1976 aerial photos indicate that wild forests cover about 40% of the land area of Yap (including mixed broadleaf forest, swamp, and mangrove) (Falanruw *et. al* 1987). Agroforests (tree gardens) cover another 26% of the land area, and about 22% of the vegetation is savanna.

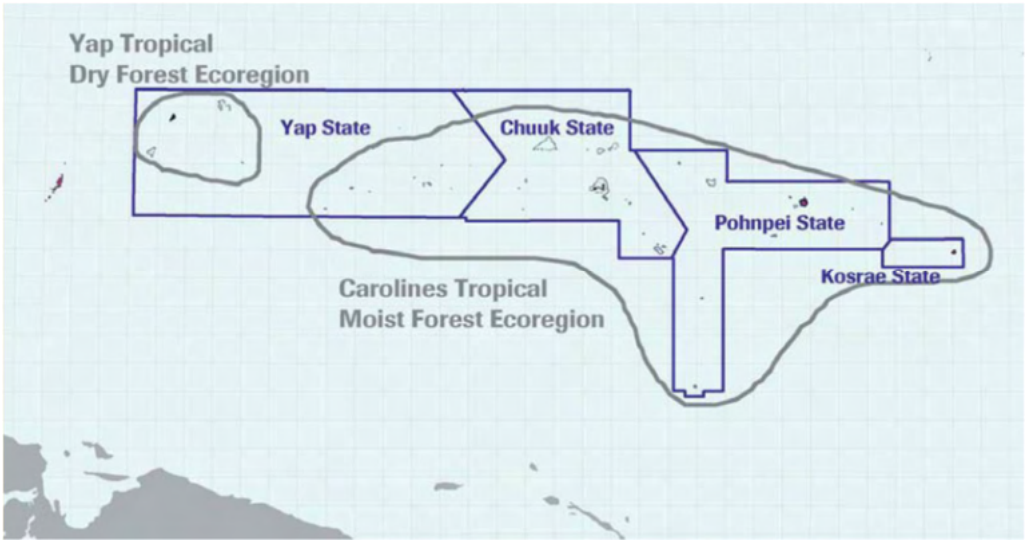


Figure 2-5: Map of FSM Ecoregions (TNC 2003)

The other three States share the Caroline's tropical moist forest ecoregion characterized by heavy rainfall. Mixed broadleaf forests comprise the dominant vegetation type on the high volcanic islands. Historically, broadleaf forests almost completely covered these high islands, but people have since cleared or disturbed much of the lowland vegetation.

The islands of FSM are characterised by 12 terrestrial biomes including: atoll forest, littoral beach strand, mangrove forest, swamp forest, freshwater marsh, riparian forest, freshwater rivers and streams, grassland, secondary (agro) forest, primary forest, rain forest, and crest (dwarf or montane cloud) forest. The country's marine biomes include: mangrove forest, estuaries, sea grass beds, lagoons, coral reefs and open ocean.

The biodiversity contained within these biomes is characterized by a high rate of endemism and large numbers of species.

2.2.2 Terrestrial Flora

Vegetation Types

Table 2-2 presents a summary of general vegetation types found across the high islands of FSM. Habitat sensitive to development disturbance as a proportion of total area ranges from:

- Mangrove - 7% (Chuuk) to 15.6% (Pohnpei)

- Swamp forest – 0% (Chuuk) to 0.8% (Kosrae)
- Upland forest – 16.2% (Chuuk) to 35.4% (Pohnpei)
- Marsh – 0% (Kosrae) to 5.6% (Chuuk)

Table 2-2: General vegetation types of FSM high islands (in Ha) (from FSM 2001)

	Kosrae	Pohnpei	Chuuk*	Yap
	1983	1983	1976	1976
Mangrove	1,562	5,525	306	1,171
Swamp Forest	345	214		155
Upland Forest	5090	12,548	677	2,556
Palm Forest		1,383		
Agroforest ***	2,585	11,865	2,378	2,538
Secondary vegetation	1,272	1,843	252	553
Grasslands		1,476	174	2,175
Marsh		149	234	165
Other nonforest **	263	490	149	403
Total Area	11,186	35,493	4,170	9,716

Plant Species

Over 1,239 species of ferns and flowering plants have been described in the FSM. Approximately 782 species are native, including about 145 species of ferns, 267 species of monocots and 370 species of dicots (Falanruw, 2002). Table 2-3 presents approximate numbers of native and introduced plant species by State.

Table 2-3: Approximate numbers of native and introduced species of plants in States of the FSM (from Fosberg *et. al.,* 1979, 1982, 1987).

Island	Ferns		Monocots		Dicots		Totals	
	Native	Introd.	Native	Introd.	Native	Introd.	Native	Introd.
Yap	45	2	144	64	187	176	376	242
Chuuk	45	3	95	61	158	108	298	172
Pohnpei	106	4	138	90	194	197	438	291
Kosrae	74	0	121	51	121	51	250	72

Over 457 species of plants, including many food plants have been introduced to the FSM with the percentage of introduced plants varying between states (Zirkus, 2001). Some of these introduced species have become invasive pests that have spread out of control. The spread of invasive species is a continual threat due to increased movement of people and machinery between the islands. Table 2-4 presents a list of the key invasive weed species in FSM (FSM, 2002).

A total of 364 vascular plant species that are considered endemic to Micronesia; most of them are restricted to the Caroline Islands (FSM and Palau) (Costion & Lorence, 2012).

2.2.3 Terrestrial Fauna

FSM terrestrial ecosystems support unique avian, mammalian, reptilian and other species, including:

- 119 species of birds (including 31 resident seabirds, 33 migratory shorebirds, 19 migratory land or wetland birds and five vagrant species). Several species of lizards have been introduced but thus far there has been no confirmed introductions of the brown tree snake (*Boiga irregularis*) which has decimated bird populations in Guam. Table 2-5 presents numbers of by category for each State (Engbring et. al., 1990).
- 25 mammals (including six endemic species or subspecies of bats);
- Over 27 species of reptiles (skinks, geckos, snakes) and amphibians (most of them native with at least four endemic) (Falanruw, 2002); and
- 40 species of freshwater fish have been recorded in FSM (Pippard, 2012).

Introduced mammals include three species of rats, a mouse, deer, pigs, dogs, cats, and from time to time goats, rabbits and cattle, all of which can have damaging impacts on native biodiversity. There is one introduced amphibian cane toad *Bufo marinus* (FSM 2002).

Table 2-4: Top invasive weed species within the FSM

Common Name	Scientific Name	Pohnpei	Chuuk	Kosrae	Yap
Ivy Gourd	*Coccina grandis*	NWS			
Siam weed	*Chromolaena odorata*	WS	WS	WS	WS
Pagoda flower	*Clerodendrum paniculatum*	WS	NWS		
Fire cracker	*Clerodendrum quadriloculare*	WS	WS	WS	WS
Honolulu rose	*Clerodendrum chinense*	NWS	NWS		
Crepe ginger	*Costus speciosus*	WS			
Merremia	*Merremia peltata*	NWS	WS	WS	WS
Giant Sensitive plant	*Mimosa diplotricha*	WS			WS
False kava	*Piper auritum*	NWS			
African tulip-tree	*Spathodea campanulata*	WS	NWS	NWS	NWS
Wedelia	*Wedelia trilobata*	WS	WS	WS	WS

Notes: WS – widespread, NWS – not widespread

Several species of lizards have been introduced but thus far, there have been no confirmed introductions of the brown tree snake (*Boiga irregularis)* which has decimated bird and reptile populations on nearby Guam.

2.2.4 Freshwater Flora & Fauna

There is a paucity of data available on the abundance and distribution of freshwater flora and fauna in FSM. The FSM ecoregion is noted for its four endemic gobies - *Sicyopterus eudentatus*, *Sicyopterus lividus*, and *Stiphodon caeruleus* located on Pohnpei and Kosrae, and *Sicyopus nigriradiatus*is only found on Pohnpei[2]. Of these, *Stiphodon caeruleus* is the most abundant. *Sicyopterus eudentatus* is listed as 'Endangered' according the IUCN Red List (IUCN, 2020).

Freshwater fish endemism is high within the FSM, however number of species is generally low, especially above the first major waterfall where most euryhaline species are unable to inhabit (Parenti & Maciolek, 1993). This is thought to be largely due to the limited food base consisting of few algae and aquatic insect species, hence the diversity of food types plays a significant role in the construction of an aquatic community. In Pohnpei, *Sicydiine gobies*, freshwater eels (Anguillid species), and shrimps are typically the dominant life forms above the first waterfall in stream systems investigated[3]. Anguillid eels, Gobiid fishes and shrimps are native to Kosraean streams (unpublished interviews) but there are no published reports regarding the riverine/stream biota.

Table 2-5: Categories of birds recorded from the four states of the FSM (after Engbring *et al.* 1990)

State	Native land and wetland residents	Resident seabirds	Non-resident seabirds	Shorebirds, migrants and vagrants	Introduced birds	Totals
Kosrae	10	5	9	16	2	42
Pohnpei	20	11	8	20	3	62
Chuuk	17	11	10	33	2	73
Yap	13	6	12	50	3	84

2.2.5 Marine Flora & Fauna

FSM coastline is about 3,300 nautical miles with an estimated 14,517 km^2 of reefs and wide range of different habitat types. Areas of mangrove and seagrass beds, consisting of a number of species and considered important sensitive habitat, are found throughout FSM. The national reefs are home to more than 1,000 species of fish, more than 350 species of hard coral and 1,200 species of mollusc (FSM, 2002).

Cetaceans

The EEZ of FSM has resident and transient or migratory populations of cetaceans (whales and dolphins). A total of 9 species have been observed in FSM (see

Table 2-6) (Miller 2009). Of these species, blue whale (*Balaenoptera musculus)* is considered 'Endangered' (i.e., likely to become extinct) and sperm whale (*Physeter macrocephalus)* is considered 'Vulnerable' (i.e., is likely to become endangered unless the circumstances threatening its survival and reproduction improve) based on the IUCN Red List.

[2] https://www.feow.org/ecoregions/details/829

[3] http://www.comfsm.fm/~brianl/research.html

For the remaining cetaceans, they are either of 'least concern' or there is insufficient information to make an assessment on status.

Table 2-6: Cetacean Species likely passing through the FSM waters (from Miller, 2009).

Species	Common Name	Category	IUCN Category
Physeter macrocephalus	Sperm whale	C2	Vu
Lagenodlphis hosei	Fraser's dolphin	C1	Lc
Tursiops sp	Bottlenose dolphin	C2	Lc
Ziphius cavirostris	Cuviers beaked whale	U	Lc
Stenella attenuate	Pantropical spotted dolphin	U	Lc
Peponcephala electra	Melon-headed whale	C1	Dd
Stenella coeruleoalba	Striped dolphin	C1	Dd
Stenella longirostris	Spinner dolphin	C1	Dd
Globicephala electra	Short-finned pilot whale	C1	Dd
Mesoplodon gingkodens	Gingko-toothed beaked	C1	Dd
Orcinus orca	Orca	U	Dd
Balaenoptera edeni	Bryde's-like whale	C1	Dd

Notes: C = confirmed. U = Unconfirmed. 1 refers to a relatively recent field (or specimen record) confirmation of the given species within the EEZ of a nation. 2 refers to a potential Class 1 record that is either dated, or may be marginally outside of a given EEZ. En = Endangered. Vu = Vulnerable. Lc = of least concern. Dd = Data deficient.

Marine turtles

The green turtle (*Chelonia mydas)* and hawksbill turtle (*Eretmochelys imbricate)* are the most commonly observed in the wider FSM waters, with the olive ridley turtle *Lepidochelys olivacea* and the leatherback turtle (*Dermochelys coriacea)* being less common (Edwards 2002).

An assessment of the conservation status of these species based on the IUCN Red List (version 3.1) indicates:

- Hawksbill turtle is 'Critically Endangered' (i.e., facing a very high risk of extinction).
- Green turtle is considered 'Endangered'; and,
- Olive ridley, leatherback and loggerhead turtles are considered 'Vulnerable'.

Seagrass

Tsuda *et al.* (1977) reported seven sea grass species in Yap, later confirmed by Tsuda & Kamura (1990), including *Cymodocea serrulata*, *C. rotundata*, *Enhalus acoroides*, *Thallasia emprichii*, *Halophila minor*, *H. ovalis* and *Syringodium isoetifolium*. In Pohnpei, Tsuda *et al.* (1977) reported two species of seagrass and McDermid & Edward (1999) reported a third species of sea grass *Cymodosia rotundata* at Nah Pali, Pohnpei. The abundance and distribution of seagrass in Pohnpei was last updated in 2005

(www.seagrasswatch.org). In Kosrae and Chuuk a total of 3 and 4 species respectively were identified in investigations undertaken in 2004 (www.seagrasswatch.org).

Mangroves

The three most common mangrove species *Bruguiera gymnorrhiza*, *Sonneratia alba* and *Rhizophora apiculata* are present on *Yap*, *Kosrae*, *Pohnpei* (Allen *et al* 2001) and *Chuuk* (Stemmermann & Proby 1978). A total of seven (Kosrae and Pohnpei) and eleven (Yap) other mangrove species are present but are generally much less common (Allen et. al., 2001). Table 2-7 presents the distribution of the most common species by FSM State.

Table 2-7: Key mangrove species in FSM (from Stemmermann & Proby, 1978).

Species	Pohnpei	Kosrae	Yap	Chuuk
Bruguiera gymnorrhiza	✓	✓	✓	✓
Lumnitzera littorea	✓	✓	✓	✓
Sonneratia alba	✓	✓	✓	✓
Rhizophora mucronata	✓	✓	✓	✓
Rhizophora apiculata	✓		✓	✓
Avicennia alba	✓	✓	✓	✓
Ceriops tagal			✓	

2.2.6 Conservation Areas

Each State has a network of currently and proposed terrestrial and marine protected areas. In addition, 130 Areas of Biodiversity Significance (ABS) have also been identified in FSM (**Error! Not a valid bookmark self-reference.**) (TNC, 2019). The location of these areas in each State is described in detail in the following sections.

In summary, the combined sites encompass 291,753 hectares (ha) or 19% of the FSM's entire terrestrial and inshore area (including reefs and lagoon areas). Because the land area of FSM is very small, 50% of the ABS (64 sites) and a majority of the total area (61% or 178,191 ha) are coastal marine sites connecting terrestrial and coastal targets.

Marine-only sites, largely lagoons and coral reefs, comprise the second largest area at 28% (82,620 ha) of the total ABS area. Terrestrial sites, mainly upland native forests, make up just 8% (22,636 ha) of total ABS area, but total 23 sites. This reflects the relatively limited extent of natural terrestrial systems on small Pacific islands compared with the much larger marine systems surrounding them. Coastal freshwater areas, primarily coastal freshwater marshes, total just 3% (38,133 ha) of the total ABS area.

2.3 Socio-Economic Environment

2.3.1 Economy

Overview FSM GDP

The National Government, for the fourth consecutive year, showed a significant fiscal surplus of $35.8 million FSM's gross domestic product (GDP) was US$1.13b, or US$3,500 per capita, in 2015. In that year there as a trade balance deficit of US$314 million, with exports at US$20.6 million (-17.8% annualized) and imports at $162 million (+15.8% since 2010) (OEC 2017). National government revenue was at its highest level ever at $166.1 million in FY2017 when both domestic revenue and external grants reached record levels.

Public Law 18-107 in FY2015 amended the tax collection allocation to the States from 50 percent to 70 percent of net taxes collected for import taxes, income tax, and gross revenue tax.

The impact of this tax policy change sees a $4.8 million decline in tax revenue for the National Government from FY2016 onwards. This revenue has not been passed directly to the States but by law is invested in the FSM Trust Fund on their behalf. It is estimated that $40 million will be invested in the Trust Fund on behalf of the States by 2023.

Table 2-8: Number and size of areas of biodiversity significance (ABS) by type and State (adapted from TNC 2019)

Species	# of ABS sites	Area (Ha)
TERRESTRIAL SITES		
Yap	3	651.9
Chuuk	9	1,328.1
Pohnpei	9	12,833.3
Kosrae	2	4,835.0
Total Terrestrial	**23**	**22,648.3**
MARINE ONLY SITES		
Yap	6	49,471.1
Chuuk	10	20,683.3
Pohnpei	5	12,480.5
Kosrae	1	54.5
Total Marine	**22**	**82,689.4**
COASTAL MARINE SITES		
Yap	21	24,007.4
Chuuk	20	77,089.9
Pohnpei	18	75,695.3
Kosrae	5	1,466.1
Total Coastal Marine	**64**	**17,8358**
COASTAL FRESHWATER SITES		
Yap	2	31.8
Chuuk	11	936.7
Pohnpei	3	5,283.1
Kosrae	4	1,904.9
Total Coastal Freshwater	**20**	**8,156.4**
OVERALL TOTAL	**130**	**29,1752.8**

FSM Strategic Development Plan- 2004-2023

The FSM's Strategic Development Plan (SDP) 2004 – 2023 provides a road map for social and economic development in FSM for the period 2004 – 2023. The SDP four main objectives include maintaining economic assistance at levels that support macroeconomic stability, improved enabling environment for economic growth - to be achieved through the FSM commitment to economic reform and the provision of an enabling environment to support open, outward - oriented and private sector led development and the use of the annual Compact grant to support the provision of basic services in education and health (FSM 2003).

Compact of Free Association and Challenges from 2023

In 1986, the FSM entered into a Compact of Free Association (Compact) with the United States of America (US), which provides for US economic assistance (including eligibility for certain US federal programs) and other benefits in exchange for US defence and certain other operating rights in the FSM. The US and FSM negotiated a second (amended) Compact agreement in 2002–2003 that runs for a 20-year period to 2023, during which the US is providing roughly $2.1 billion to FSM (FSM Statistics Division, 2018). The amended Compact's financial terms were renegotiated with the aim of encouraging sustainable development. Under this agreement the United States will provide almost $100 million in direct assistance every year until 2023, which includes the systematic reallocation of a portion of the direct aid to a jointly managed Trust Fund (GSO, 2017). The Compact Trust Fund's total net position value increased 21.0 percent to $565.0 million in FY2017 from $466.9 million in FY2016. The increase was primarily due to interest, dividend, and realized and unrealized gains from investment of $69.3 million (OEC 2018) and contribution from the US government of $29.5 million (FSM, 2018).

About 60% of the Compact Funds supports the Government's administrative costs with the rest infrastructure projects and economic development. The public sector drives the cash economy and supports the service oriented private sector. FSM's gross domestic product (GDP) was US$1.13 billion, or US$3,500 per capita, in 2015 (OEC, 2017). FSM faces a range of economic challenges as it approaches 2023, when financial assistance under the amended compact expires. The immediate challenge is to facilitate and sustain strong private sector growth through the use of its own land and marine resources. It also needs to create an enabling environment conducive to private sector development that can complement Compact Trust Fund resources and sustain FSM financially beyond 2023.

Earnings from Export

There has been increased revenue from exports with the last five reported years indicating the exports of Micronesia have changed by $88m from $41m in 2013 to $129m in 2018. The main exports of Micronesia are non-filleted frozen fish, fish fillets, aluminium plating and plating and the main destinations are Thailand, China, Japan, Philippines and Mexico. The fishing industry is highly important with foreign commercial fishing fleets paying over $16.985m annually for the right to operate in FSM territorial waters. These licensing fees account for 28% of the national government revenue and in addition, export of marine products, mainly to Japan, account for nearly 85% of export revenues.

Fishing license fees broke the $70 million level for the first time with a payment in the September quarter of $7 million for outstanding fees for 2015 and 2016 (FSM, 2018) and the medium-term outlook for fishing fees is a steady $65 million per year (GSN, 2018). The services sector, also a main contributor to GDP, stood at 65%. Manufacturing, as a value

adding activity, was responsible for only 0.45% of the country's economy (Global Edge, 2017). Yet, while the value of tuna harvested within the country's EEZ every year is about US$200 million, the vast majority is fished by foreign vessels and the FSM earns only US$20 million annually from the sale of licensing fees.

Tourism Potential

The tourism industry is another area of potential for FSM, particularly scuba diving, surfing and eco-tourism. Visitors numbered 24,125 in 2016, which represented a decrease of 20% on the previous year (Knoema, 2015). Tourism development is, however, constrained by limited airline links and a lack of infrastructure. Some pre-historical cultural attractions of Nan Madol and Lelu ruins are special attractions for tourism in Pohnpei and Kosrae respectively. There is a need to preserve these sites for income generation through tourism (PITA, 2019).

Tourism will not develop without the involvement of local villages and community members who are the major landowners in the FSM. The tourism industry is another area of potential for FSM, particularly scuba diving, surfing and eco-tourism. Some 21,000 tourists visit the islands each year. Tourism development is, however, constrained by limited airline links and a lack of infrastructure. Some pre-historical cultural attractions of Nan Madol and Lelu ruins are special attractions for tourism in Pohnpei and Kosrae respectively. There is a need to preserve these sites for income generation through tourism (PITA, 2019). The complex landownership system makes access to land difficult and risky. Both formal and informal institutions fall short in coping with the modern land market. These compounding issues have led to underutilized and unproductive lands, hampering the growth of the tourism industry (ADB, 2015).

On-going support to the States of FSM

The National Government, through Congress, continues to support the States through revenue sharing initiatives, increasing from $9.4m in FY2012 to $47.7m in FY2017. FY2017 includes infrastructure allocations to the States of $15.4m and public projects of $11.0m which are a mix of infrastructure, economic and social projects (Ibid, 2018). Economic activity for the four states consists largely of subsistence farming and fishing, and government which employ two-thirds of the adult working. The potential for tourism is limited by isolation, lack of adequate facilities and limited internal air and water transportation.

Governance Structure

The Pohnpei, Kosrae, Chuuk and Yap governments have exclusive power to deal with lands and leases and over the regulation of foreign investment, distribution of federal tax revenue and access to the US Compact of Free Association (Compact) grants. The FSM government is complex with three branches of government and four constitutional states with specific authority and differing legislations. The states have greater autonomy in managing their political and economic affairs. Natural resources, budgetary policies, and economic development are also managed by each state. However, national policies give recognition to individual states policies and priorities.

Each state government holds equal power in national affairs through electoral representation in the FSM National Congress. Most national political power was delegated to the four states by the FSM constitution including regulation of foreign investment and restrictions on leases. This meant that investors had to navigate between five different sets of regulations and licenses. U.S. citizens were able to live and work in the FSM indefinitely

without visas under the Compact but cannot own property on most FSM State islands (Ibid, 2018).

Most States have an existing effective traditional system of governance which complements the newer systems of government and are also supported by non-government agencies (Raynor and Kostika, 2003). In most FSM states, traditional management of land, waters and all natural resources, is through the traditional leadership system[4]. Although patterns and rules of land ownership are changing within the FSM, complex traditional systems of land tenure still predominate. For instance, in the state of Yap land ownership has traditionally involved multiple rights of use and one piece of land might belong to one person but be subject to the consent of another, be lived on by a third, and harvested by a fourth party. This complex system of land control has resulted in considerable diversity in management while preventing widespread changes to large pieces of land (Falanruw, 1985).

Customary Law and Tradition

Customary law and tradition have a lot of influence on access to and use of land, as declared in the FSM National Code, in matters where recognized customary law is deemed relevant by the courts, the customary law "*shall the full force and effect of law so far as [it does not conflict with the TT laws of the or the laws of the U.S. in effect in the Trust Territory*]." Indeed, even where parties before a court have not asserted that any principle of custom or tradition applies, courts have an affirmative obligation of their own to consider custom and tradition. The Constitution of the FSM includes a "*Judicial Guidance Clause,"* requiring that decisions of the Court be "*consistent*" with the customs and traditions of the indigenous people of the FSM. FSM citizens treat land as their most significant asset. The government states that "leasing of private lands in particular can be time consuming, due to fractional ownership and uncertain boundaries and titles. Many parcels of land are held by families or clans that may have different factions, all of whom assert interest in the land (ADB, 2015).

Land Tenure Arrangements

Land is part of family trusts that pass down land use rights, surface and subsurface, from generation to generation within the extended matrilineal family system. Clans hold many parcels, leading to fractional ownership and uncertain boundaries and titles. By Constitution, only citizens can own land. Domestic corporations that have non-citizen shareholders may not own land (FSM, 2015).

While individual states have separate and distinct land tenure arrangements, there are some broad commonalities that persist throughout state land tenure systems. The FSM Constitution forbids land ownership to foreigners, as well as to domestic corporations that have non-FSM citizens among their shareholders (Edward, 2002).

Group and communal ownership of land is prevalent throughout the FSM. There are differences, however, concerning rights of land transfer within the FSM. In Chuuk, Kosrae and Yap, land can be transferred by law to all FSM citizens. In Pohnpei, however, it can only be transferred to persons from that island (Pohnpei State, 1997). Traditional and cultural institutions have a strong presence in Micronesian life. The keystone of Micronesian society is the extended family, which is collectively responsible for maintaining the family welfare—particularly as it relates to customary family land. Traditionally, land ownership in the FSM was limited to inheritance within a family or clan. As a result, many land parcels in the FSM

[4]Traditional leadership and impact on land ownership at State level will be explained in detail under discussions on land under each state.

are subject to the communal use and alienation rights of extended families, clans and communities (EMAPT, 1996). Private landholders—influenced to varying degrees by customary land tenure systems, occupy most lands. The government describes landownership in the FSM as "one of smallholdings. Most property is held as family trusts, and land use rights are passed down from generation to generation within the extended family system. Subsurface property rights are synonymous with surface rights. There are no state owned subsurface mineral or water rights in any of the States (ADB, 2015). Landownership is limited by the Constitution to citizens.

The government describes landownership in the FSM as one of smallholdings (ADB, 2015 & FSM DOTC&I, 2015). Most property is held as family trusts and land use rights are passed down from generation to generation within the extended family system. With the exception of Yap and a few atolls in Pohnpei State where patrilineal affiliations govern inheritance of land rights, matri-lineages traditionally controlled estates in Micronesia (Ryan & Les, 2018). Clans tend to hold many parcels, leading to fractional ownership and uncertain boundaries and titles. In FSM subsurface property rights are synonymous with surface rights such that there are no state-owned subsurface mineral or water rights in any of the states. FSM citizens treat land as their most significant asset and leasing of private lands can be time-consuming due to fractional ownership and uncertain boundaries and titles.

Landownership is limited by the Constitution to citizens. Even domestic corporations that have noncitizen shareholders may not own land. However, noncitizen individuals and corporations may lease either public or private lands. Although it is illegal to sell lands in Pohnpei there are many recorded cases of 'gifts' of land with widely known but unrecorded concurrent payments.

In FSM the majority of land is privately owned (68%) with only 32% considered to be public land (Table 2-9). The amount of public land varies considerably between states, with only 2% of Yap state public land and the rest privately owned.

Table 2-9: FSM land ownership (Doran 2004)

	FSM		Chuuk		Kosrae		Pohnpei		Yap	
Dry land area (sq miles)	165		16.7		42.3		67.4		38.6	
Public land	52.7	32%	0.2	1%	27.2	64%	24.4	36%	0.9	2%
Private land	111.9	68%	16.4	98%	15	35%	42.8	64%	37.7	98%
Commercial land	0.5	0%	0.1	1%	0.1	0%	0.2	0%	0.1	0%

Livelihoods and income

The majority of the population live in the coastal areas of the high islands; the mountainous interior is largely uninhabited; less than half of the population live in urban areas. Most people live a rural lifestyle largely dependent on their gardens and fishing for daily food requirements, although imported food is an increasing part of the diet. People are attracted to urban center's for incomes directly or indirectly derived from offshore transfers in the form of grants from the United States (US) and other donors.

FSM is at an early stage of the process of urbanization with about 22% of its population living in the urban areas (urban areas include Colonia in Yap, Weno in Chuuk, Kolonia in Pohnpei and Lelu in Kosrae), a slight increase from the level estimated in 2000 (FSM DOS, 2010). According to the 2010 FSM Census, 22,924 out of the total population of 102,843 live in the various defined urban areas across the four states compared to 79,919

in rural areas or 77% of the total population (Knoema, 2015). Visitors numbered 24,125 in 2016, which represented a decrease of 20% on the previous year.

Like many households in the Pacific, agricultural and livestock raising activities are almost universal among FSM households (95% and 82% respectively; 95% and 86% in Yap). In addition, fishing activities accounted for 71% of all households (88% in Yap). These activities were carried out for own household or family use and consumption purposes. About 10 percent of households reported to be engaged in these activities for sale or marketing for cash. These activities were common throughout all four states, particularly the outer island households reported heavy involvement in these activities for family use and consumption.

In FSM, according to a household income and expenditure surveys in 2013/14, heads of households are primarily male (80%), with 53% of heads aged 40 – 59 years old (Table 2-10). The annual average income in FSM was estimated to be USD 16,950. However, 20% of the households earned less than US$ 2,600 and approximately 37% of household heads earned less than USD 5,000; with the majority of household heads earning between USD 5,000 –29,000. Households headed by males earn on average 9% more than female headed households (total net income excluding imputed rents) and 11% more based on cash income.

Table 2-10: Distribution of households by household head characteristics (FSM 2014)

Sex	No. HHs	Age	No. HHs	% HH	Annual total income group (USD)	% Male	% Female
Male	13,365	< 30	712	4%	<5,000	37.4%	36.7%
Female	3,312	30 – 39	2,972	18%	5,000 – 9,999	23.2%	28.2%
		40 – 49	3,993	24%			
		50 – 59	4,756	29%	10,000 – 29,000	29.2%	28.4%
		60 – 69	2,682	16%			
		70+	1,562	9%	>30,000	10.2%	6.7%
Total	*16,677*	*Total*	16,677	100%	*Total*	*100%*	*100%*

Headed households who are involved in paid work earn on average 36% more than the retired and obviously much higher than the one who work for free (might be home production for consumption or volunteers). Households in FSM are dependent on cash income as over 63% of their total income is cash with additional income (or its equivalent) gains from a range of other sources (i.e. home production, gifts, imputed rents and in-kind) (

Table 2-11). The less cash dependent households are the one whose heads work for free (not for cash) as they are involved in subsistence activities for own consumption.

Table 2-11: Household income by state 2013/14 (FSM 2014)

	Total annual household income (USD 000)	Average annual income (excluding imputed rent) (USD)			Income source				
		Total	Male	Female	Cash	Home production	Gifts	Imputed rents	Income in-kind
FSM	282,683	16,950	13,311	12,208	63.1	10.3	3.4	22.8	0.4
Yap State	41,807	17,768	16,103	15,085	67.1	16.7	5.3	10.8	0.1
Chuuk State	77,726	11,398	8,858	6,197	58.6	13.2	1.8	26.2	0.2
Pohnpei State	143,042	22,293	17,033	15,517	62.6	7.9	3.8	25.1	0.6
Kosrae State	20,109	18,461	15,190	14,896	75.6	3.0	3.0	18.0	0.4

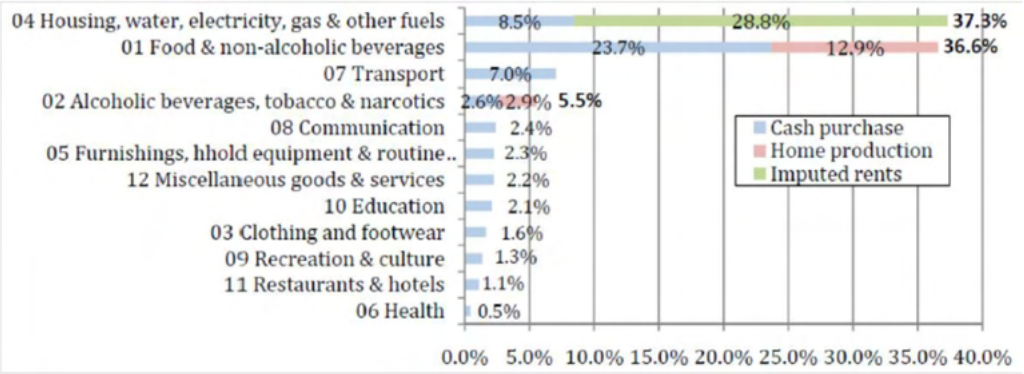
Notes: Cash: wage and salary income, business income, and sales of home production (agriculture, handicraft, livestock and/or fisheries). Home production: value of home production that the household produces themselves and then consumes. Gifts: all goods given receive are treated as income. Imputed rents: represent the value of a house for owner if they were to receive rent. Income in-kind: any income received by the household which was not in the form of cash

While approximate 55% of households report cash income from a current wage and salary job (55.5%) the most common source of income for households in FSM was the home production (mainly agriculture items) with 76% of the households involved in some form of subsistence activity. A large proportion of households also receive remittances i.e. cash from outside of FSM (41.6%).

Most household expenditure/disbursements are associated with consumption expenditure (94.1%) which represents items that the household consume itself. This analysis includes cash/in-kind purchases as well as home production consumed and gifts given away outside the household. Non-consumption expenditure accounts for only 4.9%, followed by only a small amount on investment/savings (1.0%).

The majority of consumption expenditure is associated with “housing” (37.3%), especially imputed rents (**Error! Not a valid bookmark self-reference.**, Table 2-12). Food and non-alcoholic beverages is the next most significant group (36.6%). Transport and Alcohol and tobacco (including sakau and betel nuts) account for 7.0% and 5.5% of the total household consumption expenditure respectively, with eight other divisions registering contributions lower than 3%. Only a small amount is spent on education and health due to government assistance in this area.

Figure 2-6: Household expenditure 2013/14



Notes: Cash purchases represent any purchases made by the household for goods or services for which a payment was made by the household. The payment can be made in the form of a cash payment or payment in-kind. Home production: covers the value of items which were home produced by the household and then consumed by that household. Imputed rents: represent the value of the house for owner and people who live in their main house for free (rent free)

Table 2-12: Household expenditure by State 2013/14

	Total annual expenditure (USD)		Average annual expenditure per capita (USD)	Average annual expenditure per household (USD)
FSM	237,132	100.0%	2,293	14,218
Yap State	32,471	13.7%	2,707	13,801
Chuuk State	70,637	29.8%	1,450	10,358
Pohnpei State	116,517	49.1%	3,154	18,159
Kosrae State	17,507	7.4%	3,046	16,072

Employment

The working age population at the 2919 census, defined as people aged 15 years and older, of 66,146 people represents an increase of 2,310 people (3.6%) since the 2000 census (FSM 2010, Census). The actual labor force comprised 37,919 people (22,076 males, 15,843 females) representing a national labor force participation rate of 57.3% (66% for males, 48% females). Of this group, 31,789 people consider themselves employed while 6,130 are unemployed equating to an unemployment rate of 16.2% for FSM (15% males, 17% females).

Only 40% of households were employed in paid work, resulting in an average annual income between USD 18 – 20,000. For household where the head had no paid work, was retired, had home duties or other (60%) the average income was less than USD 13,624 (Table 2-13).

Table 2-13: Occupational status of households 2013/14

Occupation status	Average income (USD)	% cash income	No. HHs
Work for pay employee	18,365	88.2%	5,755
Work for pay – other	20,078	89.8%	871
Work – no pay	8,496	62.8%	4,705
Retired	13,624	86.6%	2,121
Home duties	7,613	72.6%	2,646
No work – other	10,623	76.7%	581
Total	*13,092*	*81.7%*	*16,677*

For those that are employed and working for salaries and wages, over half are involved in education (24.6%), public administration and defence (18.6%), wholesale/retail trade and motor vehicle repair (9.7%) and health and social work (9.1%) (**Error! Not a valid bookmark self-reference.**). Very few earn a wage or salary in the fishing (1.8%) or agriculture (0.6%) sectors, as income from these sectors is generated from subsistence activities.

Transport

Priority infrastructure development projects in the ten sectors at National and State level plus project management costs, institutional projects and infrastructure maintenance represent a total investment of $1,082 million over the 10-year Plan period. For the first time a project specifically targeted at cross-sector climate change adaptation is included. This project in Yap will be followed in the future by similar projects identified through the Joint National/State Action Plan processes that are now coming on-line across the FSM (FSM 2018).

FSM has 388 km of roads, 184 km sealed and 204 km unsealed (FSM DOTC&I, 2015). The majority of these roads are on the four main State islands. Few of the outer islands have any roads and islanders rely on small walking tracks to get between villages. None of the States have widely available public transportation options except for taxis, and school bus service on each of the main State islands. Road and pedestrian facilities are largely the responsibility of state departments for infrastructure/public works.

The islands of Yap, Pohnpei, and Chuuk all contain major international ports which welcome cruise and trading ships from around the world. Port development and management is the responsibility of independent authorities in Kosrae, Pohnpei and Yap that retain revenue generated from operations and have responsibility for operating costs and making investments. In Chuuk the port is the responsibility of the Department of Transportation and Public Works.

Table 2-14: Total wage and salary income by industry 2013/14

Industry	USD 000	Percent
Education	25,965	24.6%
Public administration & defence	19,571	18.6%
Wholesale & retail trade, repair of motor vehicles	10,193	9.7%
Human health & social work	9,590	9.1%
Construction	4,896	4.6%
Transportation & storage	4,597	4.4%
Accommodation and food service activities	3,779	3.6%
Financial & insurance activities	3,704	3.5%
Electricity, gas, steam & air conditioning supply	3,165	3.0%
Professional, scientific & technical activities	3,020	2.9%
Activities of extraterritorial organizations	2,949	2.8%
Information & communication	2,386	2.3%
Activities of households as employer	2,352	2.2%
Manufacturing	2,072	2.0%
Fishing	1,921	1.8%
Other services activities	1,863	1.8%
Administrative & support service activities	1,801	1.7%
Agriculture	612	0.6%
Water supply, sewerage, waste management	312	0.3%
Quarrying	255	0.2%
Arts, entertainment & recreation	231	0.2%
Forestry	87	0.1%
Real estate activities	76	0.1%
Total	105,394	

There are four major airports in FSM, with an international airport located in each state. In addition there are nine smaller airports located on outer islands, two in Yap state, three in Chuuk state and four in Pohnpei state. Airport development and management is the responsibility of independent authorities in Kosrae and Pohnpei that retain revenue generated from operations and have responsibility for operating costs and making investments. In Chuuk and Yap the airport is the responsibility of the Department of Transportation and Public Works.

According to the 2010 census, approximately 44% of Yapese household have a car, 6% a bus or truck and 2% a motorbike. In Yap, 13% of households own a boat with a motor, while 16% have a canoe or boat without a motor. Very few households in the Outer Islands (5) own a car, reflecting the lack of roads on the islands, however, they own the majority of canoes or boats without motors in Yap (76%).

2.3.2 Demographics

The last Census were data is available for FSM was in 2010, a census was undertaken in 2020, but data is yet to be published. FSM's 2010 census record (DOS, 2012) had a total population of 102,843 comprising 52,193 males and 50,650 females (

Table 2-16). Current estimated population for FSM in 2020 is 105,503. World Bank estimate for 2019 population was 104,936 (World Bank 2016). The National Projected population based on 2010 Census and HIES survey is provided in Table 2-15.

Table 2-15: National Projected population based on 2010 Census and HIES survey (for 2010/2021)

	2020 Year			2021 Year		
National & States	Males	Females	Total	Males	Females	Total
National FSM	53,110	51,540	104,650	53,202	53630	104,832
Pohnpei	18164	18,138	36,832	18726	18170	36896
Chuuk	25,271	24,237	49,509	25315	24280	49,585
Kosrae	3411	3321	6732	3417	3327	6744
Yap	5734	5843	11577	5744	5853	11597

Long-range population projections suggest a continuation of little or no population growth for the foreseeable future. Projections to 2030 suggest no population growth from 2010 and less than 10% total growth to 2050. The level of urbanization in FSM remains relatively low at 22.9% of the total population (2020) (FSM, 2018).

The average household size in FSM declined from 6.7 persons in 2000 to 6.1 persons in 2010 (

Table 2-16). Similarly, average family size declined from 7.0 in 2000 to 4.4 in 2010 indicating a preference for smaller families by couples. This also reflects the decline in fertility as well, as young people delaying first marriage.

Table 2-16: Demographic information for FSM (source 2010 census).

Feature	FSM	Yap State	Kosrae State	Pohnpei State	Chuuk State
Land area (sq Km)	702	102	110		127.2
Land area (sq m)	271	45.6	42		49.2
Population	102,843	11,377	6,616	36,196	48,654
Male	52,193	5,635	3,352	18,371	24,835
Female	50,650	5,742	3,264	17,825	23,819
Average annual growth Rate	-0.40%	0.12%	-1.50%	0.48%	-0.97%
Population Density (person/sq mile)	379	247	156	274	993
Population -Percent urban	22.3	7.4	32.6	16.8	28.5
Population -Percent rural	77.7	92.6	67.4	83.2	71.5
Place of birth - FSM	96.9	94.4	93.9	95.3	99.0
Place of birth - Yap	10.5	92.7	0.1	0.6	0.0
Place of birth - Chuuk	47.6	0.9	0.4	2.2	98.8
Place of birth – Pohnpei	32.7	0.8	2.4	91.8	0.2
Place of birth - Kosrae	6.1	0.1	90.9	0.6	0.0
Median age (years)	21.5	25.1	21.6	21.8	20.7
Median age - male (years)	21.5	23.8	21.4	21.4	20.5
Median age – female (years)	21.9	26.4	21.9	22.2	20.9
Average family size	4.4	3.7	4.2	4.2	4.8
Average household size	6.1	4.9	5.7	5.6	6.9
No. of Households	16,767	2,311	1.143	6.289	7,024

2.3.3 Education

FSM runs an American style education system with free public education from age 6 through age 15 or completion of the 8th grade. High School attendance is not assured. All States administer high school entrance tests to 8th graders. Instruction is strictly a responsibility of the States with the National Government providing support and assistance. Funding for education is primarily provided through State Compact funds with some local revenue. The FSM is eligible for selected US Federal Education Programs that contribute a significant amount to the overall education budget. The FSM's only Institute of Higher Education (IHE) is the College of Micronesia-FSM (COM-FSM) located in Pohnpei (FSM, 2015) with satellite facilities in the each state.

The national education agency is the FSM Department of Education (NDOE). Each state has its own education agency operating public schools. The curriculum in this eight-year program includes subjects such as science, mathematics, language arts, social studies and physical education. Public elementary and secondary schools are free for all Micronesian students. There are five secondary schools (one per island) as well as several private secondary schools. In FSM, the CPM provides accredited post-secondary education from six campuses spread across all States.

Vocational Education and Training (VET) schools offer pathways to provide for the qualified workforce needed across all sectors of the FSM economy. Equal access to affordable, high quality VET schools is a target of FSM's Sustainable Development Goals (SDGs), with an emphasis on substantially increasing the number of youths and adults with the relevant skills for employment, decent jobs and entrepreneurship by 2030 (FSM, 2020). FSM has allocated $205.8M over a decade (2016-2025) toward the construction of new schools and school facilities throughout the islands, the single largest investment in the nation behind roads and pedestrian facilities (FSM, 2020). This will be a collaborative effort between the respective Departments of Public Works and the Departments of Education[5]. In terms of bilateral aid to FSM the education sector receives the most assistance, with more than 35% of all Overseas Development Assistance (ODA) going to educational opportunities, activities and infrastructure (FSM, 2020).

2.3.4 Public health

Health is a key SDG priority for FSM, highlighted by the fact that this sector has one of the highest government expenditures (21%) as a percentage of national GDP (FSM, 2020). The World Health Organization (WHO) working with partners supports the Government in pursuing its national strategic priorities which include universal health coverage antimicrobial resistance by building resilient and sustainable health systems, build core capacities for proactive preparedness in health emergencies and natural disasters and, build capacity for Non Communicable Disease (NCD) prevention and control (WHO, 2018).

The Department of Health Services in each state provides medical and public health services through a hospital, community health centers and dispensaries (WHO, 2018). Compared to other countries in the Western Pacific Region, the FSM has relatively high coverage of health essential services (WHO, 2018). Each state system is autonomous. Health services are highly subsidized by the state governments, except in private clinics.

The National Department of Health and Social Affairs (DHSA) oversees health programs, including health planning, donor coordination, and technical and training assistance. It is also responsible for public health programs funded by the US Department of Health and Human Services.

In total, there are six private health clinics in the country and one private hospital. Access to hospital services remains an issue, particularly for outer-islands residents due to transportation difficulties between islands. Furthermore, non-communicable diseases (NCDs) such as diabetes, cardiovascular diseases and cancers are major health problems.

NCDs remain a vast and pervasive issue for the FSM, accounting for more than 70% of deaths (FSM, 2020).

[5] There are Boards of Education in each State and the COM has a Board to manage its affairs. Sector coordination is undertaken through the FSM Association of Chief State School Officers comprised of the Secretary of Education, State Directors of Education and the COM President.

The overconsumption of imported packaged food, lack of physical activity and use of tobacco products are contributing to the high prevalence of NCDs and obesity in the country. Intentional (violence) injury and suicide are other issues, whose contributing factors are likely to be the burden of cultural and economic dislocation, particularly among young adult males. Alcohol use often leads to violent incidents. Tuberculosis (TB) also has a high prevalence, as does leprosy, the latter being among the highest in the Pacific.

COVID 19 Response

The implications of COVID-19 will impact the 4 states many ways, particularly noting public health, education, violence against women and children, mental health, psychosocial distress self-sufficiency and the economy. In FSM, response to the COVID-19 pandemic, people's safety and security was the priority. The President declared a public health emergency and the government established a COVID-19 taskforce and a response framework with a budget of $2.1M, and an economic stimulus package of approximately $15M to provide subsidies to businesses and to support workers in the tourism, retail and fisheries sectors. The health pandemic only added to the range of challenges faced by FSM including climate change, social and economic inequalities.

The COVID-19 pandemic has highlighted the need to shore up social protection systems and wider policies and initiatives to deliver public goods and services, particularly to the poorest and most vulnerable in the Federation (FSM Government, 2020).

2.3.5 Gender & Poverty

Ensuring that women are part of decision making at all levels, and protecting young girls, has been a sustained focus over the past decade in FSM. The development, endorsement and implementation of the National Gender Policy in 2018 has led to significant progress in government and civil society to address family protection issues.

The FSM National Gender Policy (FSM, 2017) aims to ensure that all women, men, girls and boys in FSM states are respected and can reach their potential. The policy focuses on six goals: elimination of gender-based violence; better women's representation in decision-making; improved education outcomes; addressing barriers faced by women in the workforce; better healthcare and choices over fertility; and mainstreaming gender across government targets lifting the status of women to enable them to equally participate in the political, economic and social affairs of the country.

The National Gender Policy has five main goals and these include the better representation of women in decision making, elimination of violence against women, equitable education outcomes, addressing barriers women face in the workforce and access to better health care. The FSM National Youth Policy (2017-2023) also addresses young people's issues and this also specifically includes young women. The Policy seeks to ensure opportunities to all youth to be active, responsible and self-reliant members of the community through the development of their full potential.

Poverty

Poverty and hardship exist in FSM and low-income households mostly spend their resources on food especially in Yap and Chuuk. As welfare levels rise, food share falls in all States. With more than 90% of families having access to land for farming, combined with strong cultural norms of sharing, hunger is rare in the nation. Malnutrition is likely the greater issue.

The last FSM national basic needs poverty assessment was based on the Household Income and Expenditure Survey (HIES), the most recent of which was completed in 2013/14.

Although considerable progress has been made, the incidence of hardship in the FSM is still high.

The 2013/14 HIES indicates 31.4 % of the FSM population live below the national basic needs poverty line with a slight increase from 2005 to 2013 (UNICEF, 2017). Poverty levels are not uniform in the states. Children are also more likely to be vulnerable to poverty: nine per cent of children aged 0–14 years were living less than 10 per cent above the basic needs poverty line compared with 4.8 per cent of the total population (Ibid, 2017).

Poverty levels are not uniform in the states. The poverty incidence is higher or more severe in Pohnpei and Chuuk than in Yap and Kosrae. This remains a challenge for FSM with a clear need to initiate projects and programs to both lift the capacity of government agencies, civil society organizations and the business community to implement projects successfully (FSM. 2020).

Data suggest that poverty particularly affects children and female-headed households and that poverty rates are significantly lower in Yap than in the other three states (UNDP, 2014). While female-headed households constituted 20% of the household population in FSM, they constituted 39% of the total number of households in the lower three expenditure deciles (ADB, 2017).

Gender Considerations

Although there are no specific discriminatory provisions in FSM law, there is no proactive approach ensuring that women are able to exercise their *de facto* legal rights. A comprehensive review carried out shortly after FSM ratified Committee on the Elimination of Discrimination against Women (CEDAW) found that with respect to 113 internationally recognized indicators of legal compliance, FSM was fully compliant on 27% partially compliant on 16 % and out of compliance on 57% of these indicators.

The concluding observation of the UN on the CEDAW discussions with FSM in 2017 identified many gaps in laws relating to gender based violence in all the 4 States (FSM, 2017). In 2018, the FSM National Gender Policy had been endorsed and this will help progress gender work both at the national and state levels. The Gender Policy builds on the National Strategic Development Plan 2017-2023 which had identified the importance of inclusion of women as partners in development in FSM.

Gender relations in FSM are shaped by cultural norms and practices that vary greatly across the four states. Women rarely become traditional leaders and tend to defer to men in community affairs. In 2017 there was only one woman each in the Pohnpei and Chuuk legislature and the FSM Congress has introduced a bill (CB 20-116) that would purportedly guarantee representation of women in the FSM Congress.

Micronesian societies, with the exception of Yap and a few atolls in Pohnpei, emphasize matrilineal descent where identities, titles, rights and acquisition to property are traced through female hereditary lines. Women's rights to land ownership and their access to resources have, however, changed under the various colonial authorities that have governed FSM, with most decision making related to land ownership and land use being retained by male members of the family (SPC, 2012).

FSM has one of the highest rates of maternal mortality in the Pacific region, with all four states reporting high teenage pregnancy rates. In the FSM, maternal deaths are declining but are widely under-reported, and skilled birth attendants are in short supply in both states. Authorities recognize maternal mortality is still a problem in FSM (FSM, 2017).

In the FSM gender parity in education this had been achieved at all levels, however, there is the issue of low economic participation of women. Better access to education does not translated into increased participation by women in the formal sector. This is likely due to deeply entrenched beliefs in the traditional role of women, where their role is at home (Ibid, 2018).

In 2017 (Gender Policy baseline year), no women had been elected to the National government and there were only two female senators - one each in Pohnpei and Chuuk legislatures. Presence of women in higher positions in management and government is also rare. Gender norms that curtail women's opportunities to speak out and participate in decision-making are still strong (WBG, 2017).

Culture and Traditions

Culture and traditions are revered in FSM and are constitutionally protected in the national and state constitutions. Article V, Section 2 provides: the traditions of the people of the Federated States of Micronesia may be protected by statute. If challenged as violative of Article IV, protection of Micronesian tradition shall be considered a compelling social purpose warranting such governmental action. This provision is mirrored in Article II, Section 2 of the Kosrae Constitution; Article V, Section 2 of the Pohnpei Constitution; Article IV, Section 1 of the Chuuk Constitution, and Article III, Section 2 of the Yap Constitution.

Each FSM state exhibits its own distinct culture and tradition, but there are also common cultural and economic bonds that are centuries old. For example, cultural similarities are evidenced in the importance of the traditional extended family and clan systems found on each island. Although united as a country, the people are actually a heterogeneous mixture, with different customs and traditions bound together by recent history and common aspirations (SPREP, 2018). Cultural diversity is typified by the existence of eight major indigenous languages, and the people continue to maintain strong traditions, folklore and legends (FSM, 2019).

Traditional gender norms, the patriarchal society and marriage practices such as early and forced marriage perpetuate Gender Based Violence (GBV). Customary practices such as mediation and reconciliation disadvantage survivors of GBV prioritising community harmony over the harm caused to them and their needs and rights (FSM, 2020).

Gender- Based Violence (GBV)

The legal rights of women are protected under the FSM National Constitution and the constitutions of the four states, all of which prohibit discrimination on the grounds of sex. There is no national legislation criminalising sexual assault, however, each state has identical legislation criminalising both sexual assault with penetration and sexual intercourse with girls under the age of 13.

State women's councils have been active in a range of women's rights areas including the elimination of violence against women and children. State women's councils have rotationally hosted National Women's Conferences, which result in an outcomes document of resolutions to government on a range of actions to progress the situation for women.

Gender based violence is relatively low in FSM. In 2016 it was estimated that 33% of women have experienced physical and/or sexual violence from their intimate partner (ADB, 2016) and stakeholders reported that Domestic Violence Law of 2017 is not being implemented. Victim protection facilities are non-existent (in some states there are reported designated safe houses however they are not equipped for habitation) and protection processes are unclear. Also commonly reported during consultations was age consent issues as age of consent regulations are not enforced. The consent age has been recently lifted to 16; however, Human Trafficking (HT) law defines a child as any person below the age of eighteen (ESIA, 2019).

In many parts of FSM, GBV towards women is normalised and socially and culturally accepted. While there is no data specific on Sexual Exploitation and Abuse (SEA) and workplace Sexual Harassment (SH) 65.2% of women agreed with at least one circumstance when a man has the right to leave his wife (FSM, 2020).

As part of efforts to strengthen national prevalence data across the Pacific region, Family Health and Safety Surveys have recently been conducted in most Pacific Island Countries and Territories (PICTs) including FSM. These national surveys provide insight and confirm the experience of women in FSM who have been working to address GBV, highlighting that rates of intimate partner violence and non-intimate partner violence against women are high. The national survey also confirms attitudes held by men and women that support and excuse GBV towards women. There remains a gap in national prevalence data on other forms of GBV including workplace SH, SH towards women in public places, SEA, forced prostitution and human trafficking for the purpose of SEA (FSM, 2020).

Surveys indicate one in five women in Pohnpei and one in four women in Yap have experienced violence at the hands of a loved one and these are below the National average. The prevalence rate of 'ever partnered'[6] women in Chuuk is above the national average at one in two and in Kosrae is higher again at close to three women in five (FSM, 2018). The FSM government increased its capacity to generate sex-disaggregated data and to use gender statistics to guide national policy and decision-making, evaluation and learning and human rights reporting. This resulted from support from SPC's Progressing Gender Equality in the Pacific (PGEP) project (PWO, 2020).

The FSM Maritime Project (ESIA, 2019), consisting of maintenance and upgrades to existing infrastructure at primary ports across the four States, concluded that it is unlikely that there will be significant environmental and social impacts. However, influx of foreign workforce during the implementation phase and the increase in visiting fishing fleets during post-implementation, have a potential to cause harm or harassment to host communities including incidents of human trafficking.

There has been very little data collected on the levels of violence against women across FSM, since 2014 (UNFPA, 2014) and increasing reports of domestic violence cases and gender-based violence is widely considered to be one of the primary human rights issues facing the FSM. Incest and child abuse both exist in FSM but are believed to be under-reported due to cultural sensitivities. The government has acknowledged the need for reliable data on the nature and incidence of domestic violence against women.

Human Trafficking (HT)

[6] Women who have ever been married, ever lived with a man or are currently with a regular male sexual partner.

The FSM is a source country for women subjected to trafficking with women from FSM trafficked to Guam and mainland USA.

FSM has a national policy on human trafficking supported by anti-trafficking legislation at the national level and in all states. Two states have approved state-level action plans to implement the FSM National Action Plan and the government created an anti-trafficking coordinator position to oversee government anti-trafficking work (PWO, 2020).

However, the FSM Government does not fully meet US Government minimum standards for the elimination of trafficking but is making significant efforts to do so demonstrating overall increasing efforts resulting in Tier 2 status (USSD, 2029). As reported human traffickers are known to exploit domestic and foreign victims in FSM and from FSM abroad. Although the government established an anti-human trafficking division within the Department of Justice minimum standards in several key areas have not been met such as comprehensive Standard Operating Procedures (SOPs) for proactive victim identification and referral to protection services.

Women's groups in all four states have lobbied extensively over the years for legislation that protects women from domestic violence and marital rape. In their concluding observations to the FSM government, the CEDAW Committee raised concerns about the discriminatory provisions particularly in relation to sexual offenses against women in the penal codes and conditions of employment in the labour laws in FSM.

2.3.6 Sites of Archaeological & Historical Value

A total of 26 of the buildings, sites, districts, and objects in FSM have been listed on the US National Register of Historic Places.

2.3.7 Infrastructure

Potable water

Piped water systems in FSM consist of two basic types. Systems, which use streams consist of a small intake across the stream, a raw water main to the treatment plant (for those systems which incorporate treatment) and a transmission and distribution network (SPREP, 2019). Water treatment is by rapid filtration followed by chlorination. Only 5 systems out of about 70 identified have treatment facilities, and most systems supply untreated water. Table 2-17: Major water systems in the FSM (from SPREP, 2019) identifies key water systems in FSM.

Groundwater systems usually consist of a production borehole fitted with a submersible pump and a transmission and distribution network. A chlorine injection procedure is sometime incorporated into the system at the wellhead. A total of about 90 boreholes are present in the main islands. Table 2-18 identifies the key wells and production capacities. Underground formations are not conducive to the development of high yielding wells. However, the hydrogeology is considered suitable for multiple, low to medium yielding wells and the quality of ground water is mostly excellent.

Table 2-17: Major water systems in FSM (from SPREP 2019).

Water System Name	Location	Population on Served	Source of Water	Type of treatment
Kolonia	Pohnpei	1,900	Nanpil River and Wells	Sedimentation, Filtration and Chlorination
Palikir	Pohnpei	1,600	Wells	None
Weno	Chuuk	10,000	Pou River and 32 wells	None
Colonia	Yap	3,150	Gitam Reservoir and wells	Coagulation, Sedimentation, Filtration and Chlorination
Gagil – Tomil	Yap	1,700	Wells	Chlorination
Southern	Yap	900	Wells	Chlorination
Tofo/Lelu	Kosrae	2,927	Tofol and Innem River	None
Malem	Kosrae	1,257	Malem River	None
Utwe	Kosrae	1,152	Pulusrik River	None
Tafuyat	Kosrae	407	Tafuyat River	None
Yekula	Kosrae	430	Yekula River	None
Mutunte	Kosrae	1,360	Mutunte River	None
Walung	Kosrae	100	Walung River	None

Table 2-18: Production Capability of Operational Wells.

Location	No. of wells in Operation	Production Capability (gpd)
Kosrae	4	331,000
Chuuk	32	1,600,000
Pohnpei	11	700,000
Yap	13	900,000

Sewerage Systems

There are five sewerage systems in FSM, which serve Kolonia town in Pohnpei, Weno Island in Chuuk, Colonia town in Yap, Lelu town in Kosrae and the Tofol administrative area in Kosrae. Table 2-19 presents an overview of waste management infrastructure.

Table 2-19: Overview of waste management infrastructure in FSM

States	Public sewer system					Residential sewer system (population served)	
	Treatment process	Design capacity (MGD)	LPS/ GPS/ ES	Length of sewer/ size (Miles)	Population on served	Septic tank / cesspool	Pit latrine and others
Pohnpei State						8,500 (20%)	20,500 (57%)
PUC wastewater system	Extended aeration activated sludge	*0.8 – av.* 1.6 - max	5 – lps 2 - es	11.6	7,000		
PFC	Extended	.0066	1	0.5	12 tonnes		
	Aeration				Tuna, 1 hotel & staff		
Palikir	Septic tank w/ leaching field				700 employee		
Chuuk State							
Weno Island	Primary treatment	*0.75 – av.* 1.5 – max.	21 (old) 15 (new)	11.3 6.0 (new)	5,000 (8.6%)	8,300 (14.4%)	45,000 (77%)
Yap State						1,000 (9%)	6,400 (56%)
Yap Central	Imhoff	0.35	11		4,000 (36%)		
Kosrae State						4,500 (57.7%)	1,500 (19.3%)
Tofol	Oxidation on pond	0.015			1,800 (23%)		
Lelu	Small bore sewer and marine outfall						

Solid Waste Management

There are limited solid waste collection facilities in each of the principal islands of each state and dumpsites are located in the main centres of Pohnpei, Yap and Chuuk and in each municipality of Kosrae (Johnston, 2011). This report identified none of these facilities approaches what could be considered an acceptable landfill. In each state the government has plans to develop a new landfill site but has been constrained by land availability and funding availability. The situation is most critical in Chuuk where the current dumpsite is neither secure nor environmentally acceptable (DOTC&I, 2004).

2.3.8 Noise & Vibration

There is limited noise and vibration monitoring data available for the FSM states. Noise data was collected for the Pohnpei Port Development Project and is outlined in Table 2-20: Noise data for the Pohnpei Port Development Project (from ADB 2013).

Table 2-20: Noise data for the Pohnpei Port Development Project (from ADB 2013)

Sampling Location	Noise Level (dBA)	
	Day	Night
Kolonia Town area (urban)	48.2	34.7
Min. Temperature	54.7	45.8

Figure 2-7 presents typical noise levels and sources. Both locations are typical of 'quiet' to 'moderately loud' noise environments.

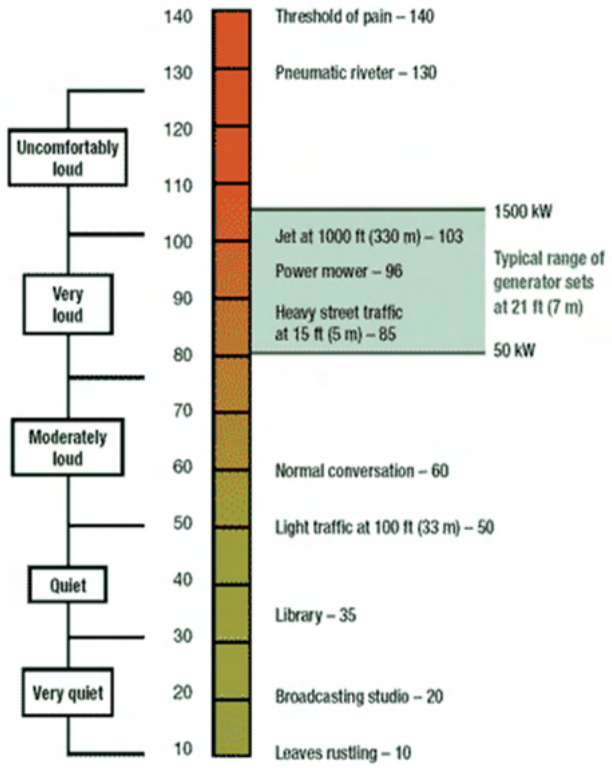


Figure 2-7: Typical noise levels and sources (Source: http://800nonoise.com/tutorials/generator-set-noise-solutions/)

The British Standard BS 5228-2:2009 outlines human response guidelines for vibration effects (Table 2-21). Any vibration generated from Project activities would need to be compliant with these (or similar) guidelines.

Table 2-21: Human response guidelines for vibration effects (from British Standard BS 5228-2:2009)

Vibration level (mm/s)	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3	Vibration might be just perceptible in residential environments.
1.0	It is likely that vibration of this level in residential environments will cause complaint.
10	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

2.3.9 Air Quality

There is a paucity of air quality monitoring data for FSM states. Table 2-22 presents World Health Organisation air quality guideline (WHO, AQG) concentrations for a range of key parameters which will be required to be met in relation to the current Project.

Table 2-22: Relevant WHO air quality guideline concentrations for key parameters

Parameter	Averaging period	Air quality criterion
PM_{10}	24 hour	50 µg/m^3
	Annual	20 µg/m^3
$PM_{2.5}$	24 hour	25 µg/m^3
	Annual	10 µg/m^3
SO_2	10 min	500 µg/m^3
	24-hour	20 µg/m^3
NO_2	1-hour	200 µg/m^3
	24-hour	400 µg/m^3
	Annual	40 µg/m^3

3. Kosrae

3.1 Physical Environment

3.1.1 Climate

Table 3-1 presents key climate data for Kosrae (from https://en.climate-data.org/). The key point to note is the abundant rainfall Kosrae receives annually (542 cm).

Table 3-1: Key climate statistics for Kosrae including temperature (°C) and rainfall (mm)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Avg. Temperature	27.5	27.5	27.4	27.2	27.4	27.4	27.2	27.5	27.4	27.5	27.5	27.5
Min. Temperature	24.8	24.8	24.7	24.5	24.6	24.5	24.2	24.3	24.2	24.3	24.4	24.7
Max. Temperature	30.2	30.2	30.1	30	30.2	30.3	30.3	30.7	30.7	30.8	30.6	30.3
Rainfall (mm)	399	485	500	583	491	453	446	415	383	344	414	510

3.1.2 Topography, Geology, Soils & Hydrology

Kosrae has a total area of approximately 112 km^2. The steep mountainous interior, which has four peaks ranging in height from 465-620 m above MSL, is covered with lush tropical rainforest. Around much of the island there are continuous mangrove swamp forests and seaward coastal strands. The island is surrounded by a broad shallow carbonate platform much of which is covered by freshwater swamps, mangrove forests and low coral land and beach strand (US Army Engineers, 1989).

Kosrae is a volcanic high island with relatively flat and narrow coastal plains extending from the foothills to the shore. Soils are typically brownish red in color, mostly fine granular clay depending on the bedrock and can be deep in places. The parent rock is mostly Olivine or Benhaline basalt, and in places is porous and slaggy. Carbonates compose the majority of reef environments which include fringing reefs, lagoon floor, barrier reef, and deep passes. Figure 3-1 presents the distribution of highly erodible soils based on soil type and slope. The yellow and olive brown areas are considered to be the most highly erodible (Takesy, 2014).

Figure 3-2 presents the location of key watersheds and rivers in Kosrae. The most significant rivers on Kosrae are the Finkol, Innem, and Okat. A number of other smaller perennial and intermittent streams and springs also occur around the base of the volcanic part of the island.

3.1.3 Groundwater

Groundwater is currently not an important water source on Kosrae as relatively little water seeps through the soil and into cracks and pores in the volcanic rocks . In some parts of the coastal fringe, wells tap a shallow layer or lens of freshwater underlain by saltwater. However, these wells only rarely provide drinking water because their water quality is poor.

There are a number natural springs that are highly respected as sources of water of excellent quality and has substantial groundwater resources (FSM/UN 1995, Jenson & Heitz, 2004).

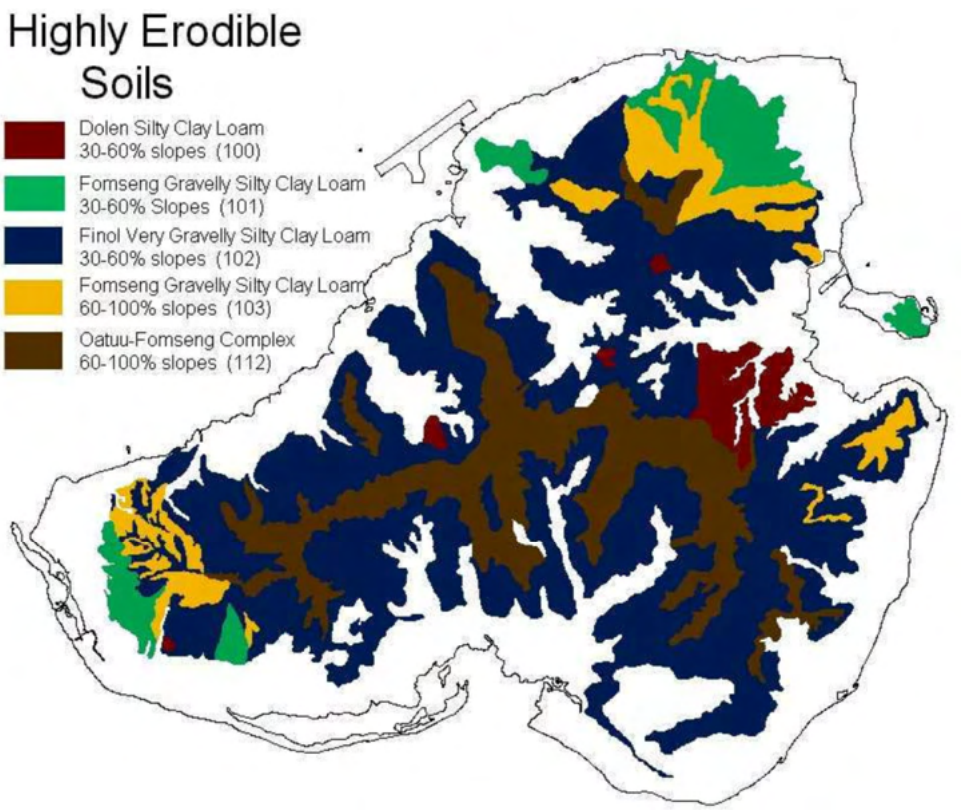


Figure 3-1: Distribution of highly erodible soils (from Takesy 2014)

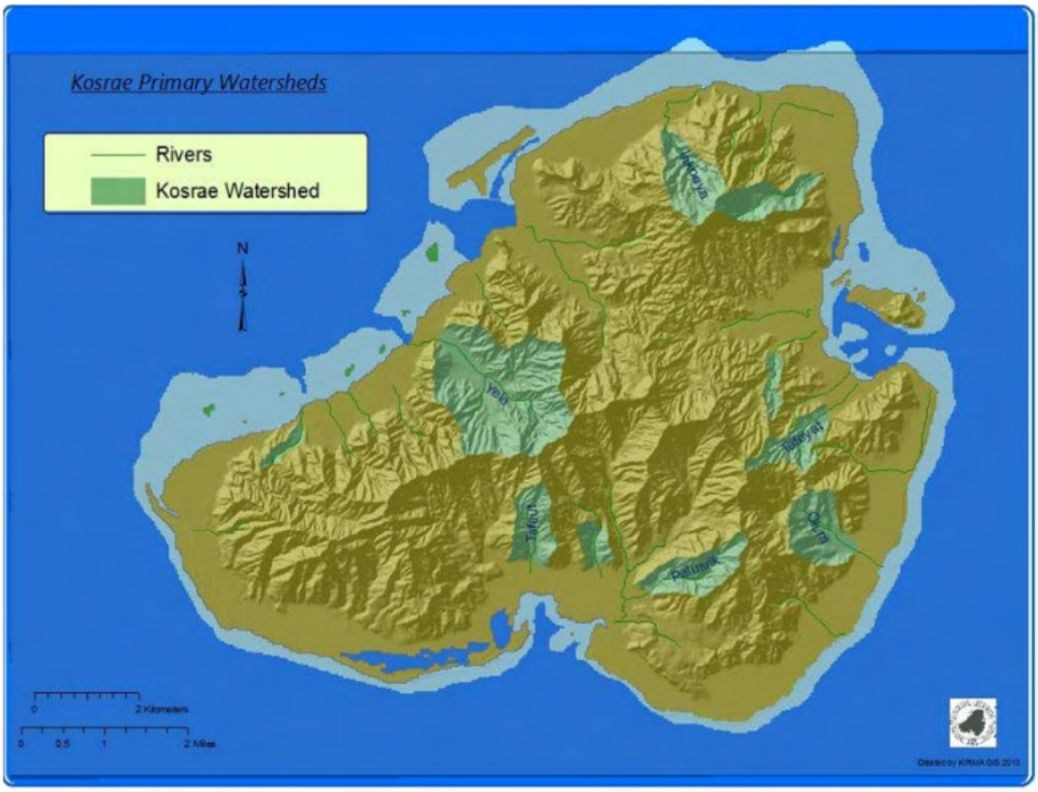


Figure 3-2: Digital Elevation Model with Important Watersheds of Kosrae (from FSM 2010)

3.1.4 Coastal Hazards

An investigation of the impacts of coastal change and inundation in Kosrae has been undertaken previously (Ramsay & Douglas, 2000). A number of areas were identified where coastal change-related impacts are likely to be most significant either due to ongoing movement of the shoreline and/or the proximity of key infrastructure to the shoreline (see Figure 3-3) including:

- **Lelu -** Large changes have occurred in the shoreline position at Finfokoa over the last half century and continued changes in shoreline position are expected. Continued retreat of the coastline along the central section at Pukushruk will likely increase the exposure of the road to damage over time. Similarly the proximity of the road to the shoreline at Putukte suggests it will be susceptible to damage during periods of large waves and high tides.
- **Malem –** The length of road exposed at Pal and Mosral will continue to increase (to the south) with damage from erosion and wave over washing. At Mosral if the concrete outlet continues to deteriorate reducing its effectiveness as a "groyne" the coastline to the north of the Mosral River could retreat more rapidly. A pattern of ongoing slow shoreline retreat is likely along much of the Malem coast particularly at Yeseng, Kuplu and from Yewak to Tenwak. At Yewak/Pilyuul, where the Pilyuul River would have originally discharged before being deflected north, there is a risk that ongoing retreat will increasingly expose the road to damage.
- **Utwe -** The Impuspusa coastline is relatively stable but experiences episodic storm damage which, over time, may increase the potential for damage to the road where it is located close to the shore.
- **Tafunsak –** The position of the shoreline at Finfoko and Wiya is relatively stable but the proximity of the road to the shore means it is susceptible to storm-related damage. At the western end of the seawall at Tafunsak downdrift erosion is undermining the road.

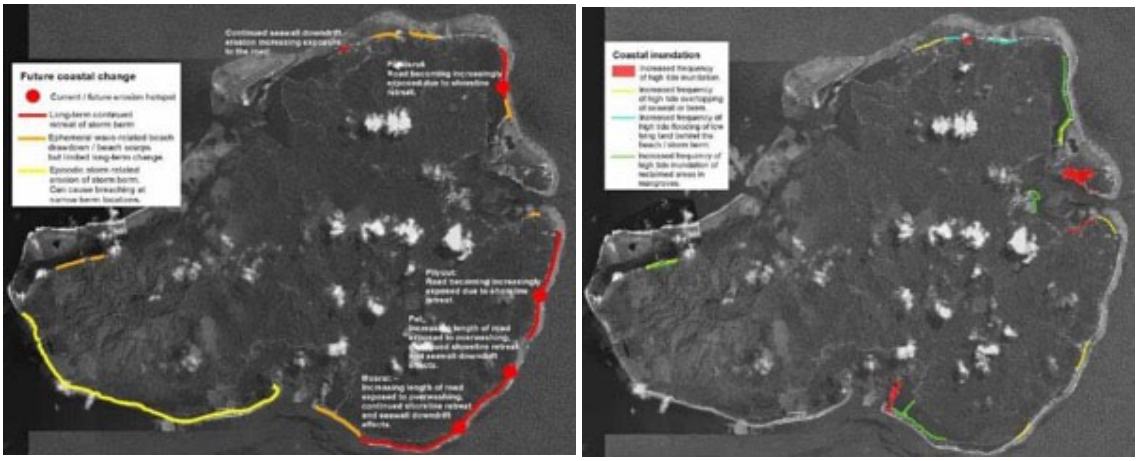


Figure 3-3: Key locations and types of coastal change likely to be experienced (left) and where coastal inundation issues are expected to increase (right) on Kosrae

3.2 Biological Environment

3.2.1 Terrestrial Ecology - Flora

The vegetation of Kosrae (Falanruw, 2002) is dominated by the following (see Table 3-2: Types of plant communities in Kosrae):

- Cloud forest, which is considered unique given the number of endemic species present.
- Native upland forest characterised by *Campnosperma* species.
- Palm trees, a component of forests which occur in dense stands especially in areas where the primary forest has been disturbed.
- Freshwater marsh and riverine systems with grasses, sedges and herbs growing in standing water most of the year and generally located in areas slightly above sea level and are often just inland of mangroves.
- Swamp forests occur where soils are inundated with fresh or slightly saline water. They are most commonly found just inland of mangroves, above tidal influence but lower in elevation than the surrounding terrain.
- Mangrove forests.

There are over 322 plant species in Kosrae of which 250 species are native, many of which are endemic to one or more islands in the FSM.

Table 3-2: Types of plant communities in Kosrae

Community Type	Area (ha)
Mangrove Forest	1,562
Swamp Forest	345
Upland Forest	5,090
Agroforest *	2,538
Secondary vegetation	1,272
Other non-forest	263
Total Area	**11,186**

Notes: * includes coconut plantations.

Figure 3-4 presents a map showing the distribution of key terrestrial habitat classes (from Weeks 2019).

Three IUCN listed threatened (one 'Endangered' and two 'Vulnerable') and one near threatened (NT) flora species are present in Kosrae (Table 3-3). Of these species, one species (NT) is not endemic to Kosrae, but instead a cultivar from the islands of Pohnpei and Chuuk (Ivory nut palm *Metroxylon amicarum*). Two of the threatened species are lowland forest tree species (thorrot *Intsia bijuga* and lach *Pterocarpus indicus*) with *Pericopsis mooniana* from coastal forest and *Cycas micronesica* from closed forest. The other threatened species is the hornwort *Dendroceros japonicas*. The endemic tree species *Terminalia carolinensis* (ka), also found in Pohnpei, is protected in Kosrae.

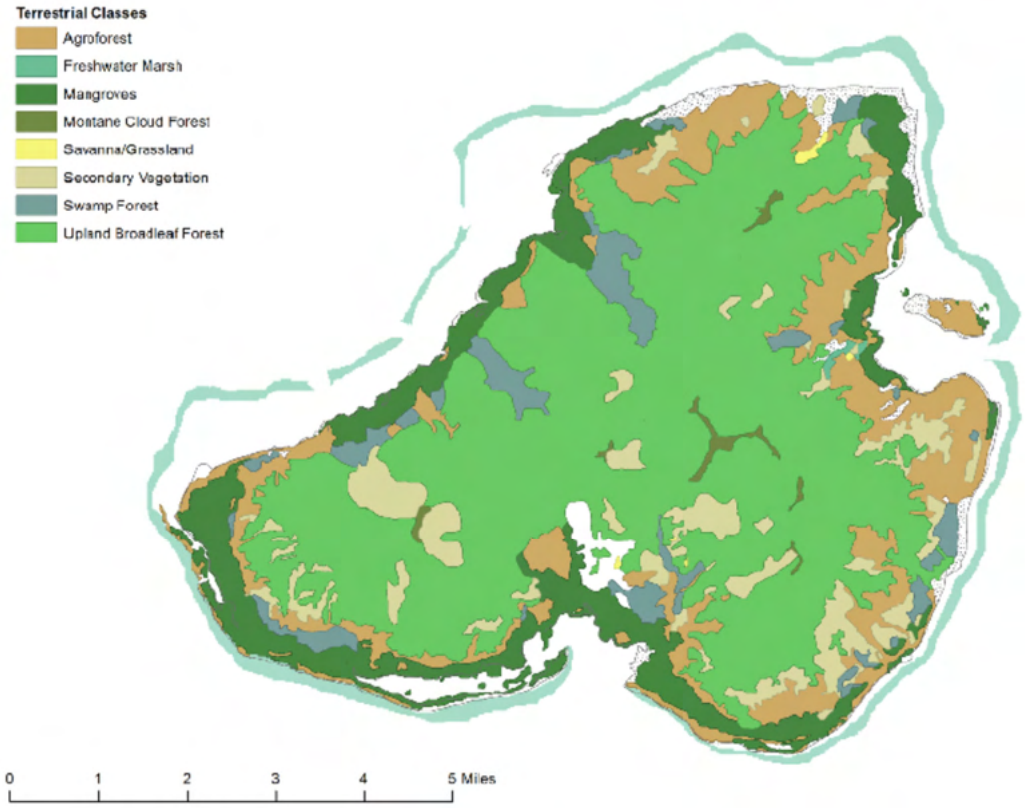


Figure 3-4: Location of key terrestrial habitat classes in Kosrae

Rare, regionally significant or protected flora species

In addition to IUCN listed species, Kosrae supports 18 endemic plant species (Costion & Lorence, 2012) (see Table 3-4) with a further 20 found only in the Eastern Carolines (Kosrae, Pohnpei and Chuuk) and one species only found in Kosrae, Pohnpei and Palau. In addition, 19 endemic species are found across the Caroline Islands (FSM and Palau) including Kosrae.

3.2.2 Terrestrial Ecology - Fauna

Rare, regionally significant or protected species

Kosrae has six endemic bird species (Table 3-5):

- Two species are now extinct as they were last recorded in the 1800s: Kosrae Starling *Aplonis corvine* and Kosrae Crake, *Zapornia monasa*; and
- The other four endemic species are considered to be relatively common in their restricted range and are considered of 'Least Concern': Caroline Reed-warbler *Acrocephalus syrinx*, Caroline Swiftlet *Aerodramus inquietus*, Kosrae Fruit-dove *Ptilinopus hernsheimi* and Kosrae White-eye *Zosterops* cinereus.

Table 3-3: Threatened or near threated flora species of Kosrae (Falanruw 2002 & IUCN 2018)

Common name	Scientific name	IUCN Category	Comments	Habitat
	Dendroceros japonicus	Endangered	Recorded from Taiwan, central Japan (Honshu, Kyushu, Shikoku, Tokunoshima Island, Yakushima Island, Nansei-shoto (Ryukyu islands) and Ogasawara (Bonin) Islands and Kosrae (FSM)	Grows on tree-trunks or (more seldom) on rocks in temperate and subtropical evergreen forest
"thorrot"	*Intsia bijuga*	Vulnerable	Produces one of the most valuable timbers of South East Asia	Lowland rainforest tree
"lach"	*Pterocarpus indicus*	Vulnerable	Widespread tree	Found in lowland primary and some secondary forest, mainly along tidal creeks and rocky shores.
Ivory nut palm	*Metroxylon amicarum*	Near Threatened	This tree species is endemic to the islands of Pohnpei and Chuuk but is cultivated more widely. Also occurs on Guam, but the lack of local name indicates that it is probably not a native species.	A few trees have been planted in moist areas in Kosrae. Occurs from sea level up to 550 m asl.

Table 3-4: Endemic plant species specific to Kosrae (Costion & Lorence 2012).

Species	Distribution	Form	Notes
Endemics limited to Kosrae			
Selaginella kusaiensis	Kosrae	Herb	often occurring along rocky stream banks or moist rocky outcroppings
Elaphoglossum kusaiense	Kosrae	Herb	
Peperomia kusaiensis	Kosrae	Epiphyte	epiphytic in the cloud forests of Kosrae
Agrostophyllum kusaiense	Kosrae	Epiphyte	Orchid
Bulbophyllum fukuyamae	Kosrae	Epiphyte	Orchid
Bulbophyllum kusaiense	Kosrae	Epiphyte	Orchid
Phreatia kusaiensis	Kosrae	Epiphyte	Orchid
Rhynchophreatia pacifica	Kosrae	Epiphyte	Orchid
Robiquetia kusaiensis	Kosrae	Epiphyte	Orchid
Pandanus amissus	Kosrae	Tree	
Pandanus kusaicolus	Kosrae	Tree	
Polyscias subcapitata	Kosrae	Tree	
Cyrtandra kusaimontana	Kosrae	-	
Medinella diversifolia	Kosrae	WL	
Psychotria hosokawae	Kosrae	Tree/shrub	
Psychotria rhombocarpa	Kosrae	Tree/shrub	
Planchonella micronesica	Kosrae	-	
Elatostema fenkolense	Kosrae	Herb	

In addition, there are two additional restricted-range bird species including the 'Critically Endangered' migratory species Beck's petrel *Pseudobulweria becki* and the Micronesian Imperial-pigeon *Ducula oceanica* which is considered 'Near Threatened'. Kosrae may also be visited by 19 IUCN listed migratory bird species including two species considered 'Endangered', six 'Vulnerable' and 11 'Near Threatened' species.

Other rare, regionally significant or protected fauna species include:

- Two endemic species of bats of the genus Pteropus occur in Kosrae state; the Kosrae flying fox *Pteropus ualanus* – 'Vulnerable') and Kosrae fruit bat (*Pteropus mariannus ualans* –'Endangered') both of which are endemic (Table 3-6).
- Three threatened reptiles are known to occur in Kosrae: two migratory marine turtle species that nest on beaches and the Micronesia saw tailed gecko (*Perochirus*

ateles) which is endemic to the Marianas Islands and FSM and listed as 'Vulnerable' (Table 3-7).

- Two 'Endangered' freshwater fish species that may occur in Kosrae including the Japanese eel *Anguilla japonica* previously recorded as a vagrant in FSM and *Sicyopterus eudentatus* a large, herbivorous riverine goby which is endemic to Kosrae and Pohnpei (
-
- Table 3-8).

Table 3-5: Restricted-range and threatened birds of Kosrae (Birdlife International 2018, IUCN 2018)

Common name	Scientific name	IUCN Category	Comments	Habitat
Non-migratory species				
Kosrae Starling	*Aplonis corvina*	Extinct	*Aplonis corvina* was **endemic** to Kosrae. It is only known from two specimens collected in 1828 and was extinct by 1880.	Its inhabited mountain forests.
Kosrae Crake	*Zapornia monasa*	Extinct	Zapornia monasa was **endemic** to Kosrae. Two specimens were collected in 1827-1828, and the species was regarded as uncommon then. It declined to extinction over the next half-century.	It inhabited coastal swamps and marshes, taro patches and "continually wet, shadowy places in the forest.
Beck's Petrel	*Pseudobulweria becki*	Critically Endangered	Only known from Papua New Guinea and Solomon Islands. Has been seen in the Vanuatu archipelago. May occur in FSM as the extent of its breeding range and at-sea distribution is still unknown	Marine species that is likely to nest in burrows on the slopes of high mountains on larger islands, but may also breed on small islets
Micronesian Imperial-pigeon	*Ducula oceanica*	Near Threatened	This species occurs in the Micronesian islands of Palau, Yap, Chuuk, Pohnpei and Kosrae, including many small offshore islands. It is probably extinct on Kiribati and many or all of the Marshall Islands. There were estimated to be 572 birds on Yap, 51 on Chuuk, 822 on Pohnpei, 7,474 on Kosrae in 1983-1984. Numbers on Pohnpei are known to have declined by about 70% between 1983 and 1994. The population on Kosrae is inferred to have declined less severely due to the lower rate of forest loss and smaller human population on that island.	Forest species, found predominantly in the mountains of Pohnpei and Kosrae, but widespread where not hunted, including secondary forest, beach forest and mangroves.
Caroline Reed-warbler	*Acrocephalus syrinx*	Least Concern	**Endemic** to FSM	Found in subtropical/tropical dry grasslands but has also been recorded in subtropical/tropical moist montane forest and rural gardens
Caroline Swiftlet	*Aerodramus inquietus*	Least Concern	**Endemic** to FSM and is described as common to abundant. The population on Kosrae has not been	Found in caves and subterraean habitats (non-aquatic) but can also occur in subtropical and tropical moist lowland forest
			quantified but the species's population in the rest of its range is estimated to be 83,500 individuals.	
Kosrae Fruit-dove	*Ptilinopus hernsheimi*	Least Concern	**Endemic** to Kosrae and RMI	Prefers subtropical/tropical mangrove vegetation above high tide level but also found in subtropical/tropical moist lowland forest, subtropical/tropical moist forest and rural gardens
Kosrae White-eye	*Zosterops cinereus*	Least Concern	**Endemic** to Kosrae	Found across a range of habitats including subtropical/tropical moist lowland and degraded former forests, subtropical/tropical seasonally wet/flooded grasslands, dry savanna, subtropical/tropical moist shrubland, plantations and arable land

Table 3-6: Threatened mammals of Kosrae (IUCN 2018)

Common name	Scientific name	Category	Comments	Habitat
Kosrae fruit bat	*Pteropus mariannus walans*	Endangered	Endemic to Kosrae Island	Found in areas of native tropical forest, coastal strand, and mangroves. roosting within healthy forest – both atoll and upland forests
Kosrae flying Fox	*Pteropus walanus*	Vulnerable	Endemic to Kosrae Island	Natural history of this species is not well known. Suggested that it is similar to *Pteropus marianmus* in that it forms congregations in native forest and mangrove habitats.

Table 3-7: Restricted-range and threatened reptiles of Kosrae (IUCN 2018)

Common name	Scientific name	Category	Comments	Habitat
Hawksbill turtle	*Eretmochelys imbricata*	Critically Endangered	Migratory species. Has a circumglobal distribution throughout tropical and, to a lesser extent, subtropical waters of the Atlantic Ocean, Indian Ocean, and Pacific Ocean	Marine species that nests on insular and mainland sandy beaches in more than 70 countries worldwide
Green turtle	*Chelonia mydas*	Endangered	Migratory species. Has a circumglobal distribution, occurring throughout tropical and, to a lesser extent, subtropical waters Listed as Endangered on US Endangered Species Act 1973	Marine species that nests on beaches in more than 80 countries worldwide
Micronesia saw-tailed gecko	*Perochirus ateles*	Vulnerable	Species is distributed throughout the Marianas Islands (including Guam, where it is now presumed to be extinct); FSM where it is present on about a third of the islands (including Yap, Truk, Chuuk, Pohnpei, Kosrae, Kapingamarangi Atoll); and the Marshall Islands.	This species has been collected from palm leaf axils, in shrubs and bushes, and under loose flaking bark on standing trees. It is apparently highly arboreal and appears to be somewhat adaptable, occurring on islands where the only vegetation consists of coconut and breadfruit trees, as well as in natural forest.

Table 3-8: Threatened fishes of Kosrae (IUCN 2018)

Common name	Scientific name	Category	Comments	Habitat
Japanese eel	*Anguilla japonica*	Endangered	Migratory species. Occurs as a native species in Japan, China, Taiwan and Korea. The range of this species extends from the southern Pacific coast of Japan and further south to Hainan Island covering large areas of mainland China, Taiwan and the Republic of Korea. It has been recorded as a vagrant in FSM.	The species is catadromous, spending its lifetime in freshwater, estuaries and coastal environments, including rivers, streams and wetlands, but migrates thousands of kilometres to spawn
	Sicyopterus eudentatus	Endangered	Endemic to the FSM where it is known from Pohnpei and Kosrae Islands. This species is amongst the least common, if not the rarest, of the gobies in Pohnpei and Kosrae rivers. It used to be found in the Nanpil-Kiepw river. However, in 2001, no specimens were found in the Nanpil-Kiepw river and only one specimen was found in the Senipehn River at 92 m.	This is a large, herbivorous riverine goby. The species is found in rivers on rocky substrates and feeds on algae.

3.2.3 Coastal Marine Ecology

Kosrae is surrounded by a broad shallow carbonate platform much of which is covered by freshwater swamps, mangrove forest and low coral land and beach strand. The carbonate platform is of recent reef origin and extends between 1 – 5 km out from the islands volcanic shoreline boundary. Three lagoons or embayments bisect the reef platform, the largest of which is Lelu Harbor off the east coast. The floor of the harbour is deep, mostly in excess of 20-30m and is blanketed by fine silts and muds. Figure 3-5 presents a map showing the distribution of key marine habitat classes in Kosrae (from Weeks, 2019).

Mangrove Forests

Mangroves are a significant coastal habitat and play an important role in coastal biological diversity, erosion control and are a natural barrier of protection for the islands such as Kosrae (Falanruw, 2002). They also play an important role in trapping sediment moderating the effects of excessive storm runoff on the surrounding reef system.

Mangrove and lowland swamp forest occupy relatively large areas between the basaltic uplands and seaward beach strands. There is 1,562 ha of mangrove forest in Kosrae which represents 14% of the total land area (Cole et. al., 1999). Eleven mangrove tree species, including one hybrid, are present on the island of which *Sonneratia alba*, *Bruguiera gymnorrhiza* and *Rhizophora apiculata* are the most common (Allen et. al., 2001.)

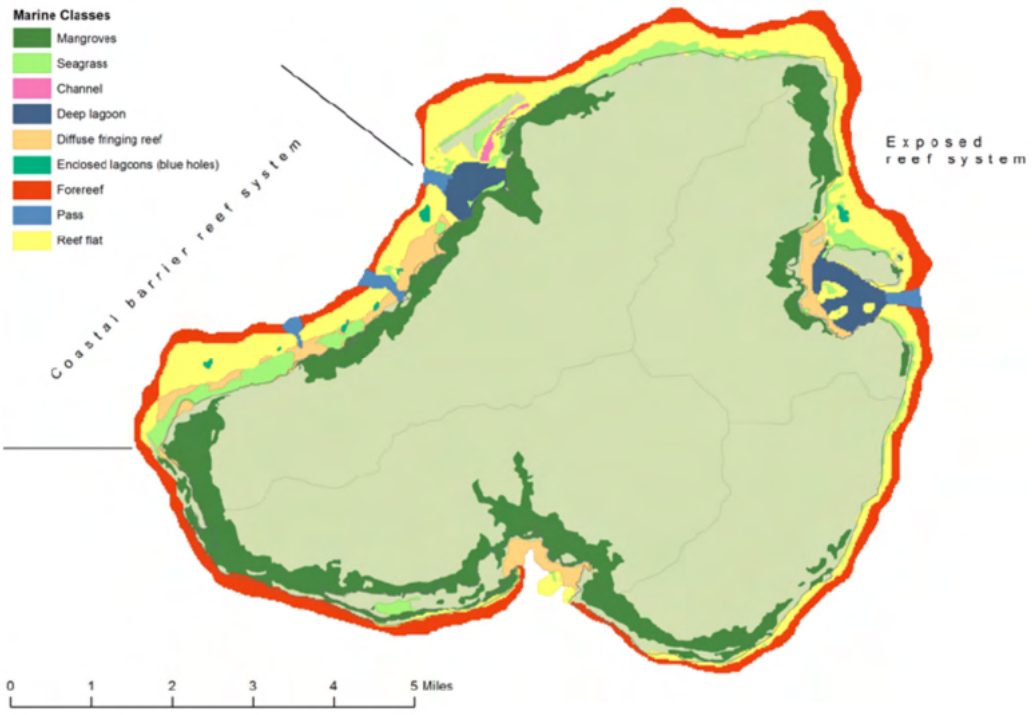


Figure 3-5: Location of key terrestrial habitat classes in Kosrae (from Weeks 2019)

Mangrove forest is most extensive along the south and north west coasts, and in Lelu Harbour, while lowland swamp forest occurs mainly along the southeast coast. Much of the forest occurs behind a protective coastal strand. The most widespread anthropogenic disturbance is harvesting of trees for fuelwood and poles which is done selectively and generally creates small, dispersed gaps. Other forms of anthropogenic disturbance, such as modifications of coastal landforms, alterations of freshwater inflows, road construction and conversion to residential or agricultural uses are still relatively minor but have led to some irreversible losses (Allen et. al., 2001).

The swamp forests have been modified in some areas over time by development for agroforestry, cutting of timber and clearance for house construction.

Seagrass

Sea grass beds are present on fringing reef flats primarily along the north and west coasts. Like mangroves, seagrass acts as a trap for terrigenous sediments and provide important habitat for a range of invertebrate and fish species. Four species have been identified; *Cymodea rotundata*, *Enhalus acoroides*, *Thalassia hamprichii* and *Holdule uninervis (see* www.seagrasswatch.org).

In the late 1960's and early 1970's, causeway construction on the reef flat between Kosrae and Lelu islands is considered to have adversely affected Lelu Harbour. The causeway blocked water circulation and fish runs into inner Lelu Harbour leading to a decline in seagrass and fish catches. The environmental effects of construction activity are possibly still impacting nearshore areas with shore erosion, reduced water flow and restoration still occurring at Lelu Harbour.

Reef Systems

The inner reef systems which extend beyond the mangrove fringe and terrigenous sediments are dominated by calcareous sand and rubble deposits which support seagrass

beds (Edwards, 2002). The middle to seaward portion is frequently covered by coral rubble, shingle tracts etc. On windward reefs (north and east facing), the outer edge of the reef platform is covered by a solid reef pavement grading to sloping spur-and-groove formation in the surf zone where robust corals and coralline algae are abundant. Steep reef slopes and terraces with abundant coral growth and high diversity extend beyond the spur and groove formation. On leeward facing reefs this formation is less developed or absent altogether and a coral-rich reef slope descends abruptly beyond the outer edge of the reef flat.

Soft Bottom Benthic Communities

Rudimentary embayments bisect the reef platform at several places including Lelu Harbour which measures 3km long by 2km wide. The floor is in excess of 20-30m deep and covered in fine muds and silts. These softer sediments are likely to be dominated by a range of infaunal and epifaunal invertebrates.

The deeper reef slopes of the Harbour are dominated by talus slopes of coral rubble with live coral more conspicuous on the steep mid-level and upper portions of the walls.

Threatened & Protected Species

Several species of giant clam are under threat in FSM due to the high levels of exploitation. One species, *Tridacna gigas* has been extirpated in FSM. Other species, such as *Hipoppus hipoppus* are also being depleted and like the *T. gigas*, they are being cultured for restocking of reef flats.

As described in Section 3.3, the green turtle *Chelonia mydas* and the hawksbill turtle *Eretmochelys imbricata*, are 'threatened' and 'critically endangered' respectively. However, these species are known to be harvested throughout FSM.

3.2.4 Conservation Areas

Kosrae has 8 Protected Managed Areas (PMA) and 12 Areas of Biological Significance (ABS) (Figure 3-7) including two terrestrial, one marine, five coastal marine and two coastal freshwater ecosystems, totalling 8,261 ha (Conservation Areas

Each State has a network of currently and proposed terrestrial and marine protected areas. In addition, 130 Areas of Biodiversity Significance (ABS) have also been identified in FSM (**Error! Not a valid bookmark self-reference.**) (TNC, 2019). The location of these areas in each State is described in detail in the following sections.

In summary, the combined sites encompass 291,753 hectares (ha) or 19% of the FSM's entire terrestrial and inshore area (including reefs and lagoon areas). Because the land area of FSM is very small, 50% of the ABS (64 sites) and a majority of the total area (61% or 178,191 ha) are coastal marine sites connecting terrestrial and coastal targets.

Marine-only sites, largely lagoons and coral reefs, comprise the second largest area at 28% (82,620 ha) of the total ABS area. Terrestrial sites, mainly upland native forests, make up just 8% (22,636 ha) of total ABS area, but total 23 sites. This reflects the relatively limited extent of natural terrestrial systems on small Pacific islands compared with the much larger marine systems surrounding them. Coastal freshwater areas, primarily coastal freshwater marshes, total just 3% (38,133 ha) of the total ABS area.

3.3 Socio-Economic Environment

3.3.1 Economy

Overview FSM GDP

The National Government, for the fourth consecutive year, showed a significant fiscal surplus of $35.8 million FSM's gross domestic product (GDP) was US$1.13b, or US$3,500 per capita, in 2015. In that year there as a trade balance deficit of US$314 million, with exports at US$20.6 million (-17.8% annualized) and imports at $162 million (+15.8% since 2010) (OEC 2017). National government revenue was at its highest level ever at $166.1 million in FY2017 when both domestic revenue and external grants reached record levels. Public Law 18-107 in FY2015 amended the tax collection allocation to the States from 50 percent to 70 percent of net taxes collected for import taxes, income tax, and gross revenue tax.

The impact of this tax policy change sees a $4.8 million decline in tax revenue for the National Government from FY2016 onwards. This revenue has not been passed directly to the States but by law is invested in the FSM Trust Fund on their behalf. It is estimated that $40 million will be invested in the Trust Fund on behalf of the States by 2023.

Table 2-8). Three officially protected terrestrial areas include:

- Yela Ka Forest is a conservation area of ka trees (*Terminalia carolinensis*) in the Yela Valley. A conservation easement, the first achieved outside the Americas, protects 78 acres of the 1,400 acre valley (Figure 13).
- Olum Watershed Protected Area is an ABS site (310.3 ha) with native upland forest that includes cultural and historical sites. The area is managed by Kosrae Island Resource Management Authority (KIRMA) in partnership with landowners.
- Mahkontowe Conservation Area was enacted into Kosrae State Law 11-156 on June 7, 2018. This area refers to a 15 km^2 area which hosts a variety of significant cultural, archaeological, and natural aspects (Figure 11).

Table 3-9 identifies informally and formally protected areas.

Figure 3-6: Existing and proposed protected areas (from TNC 2019)

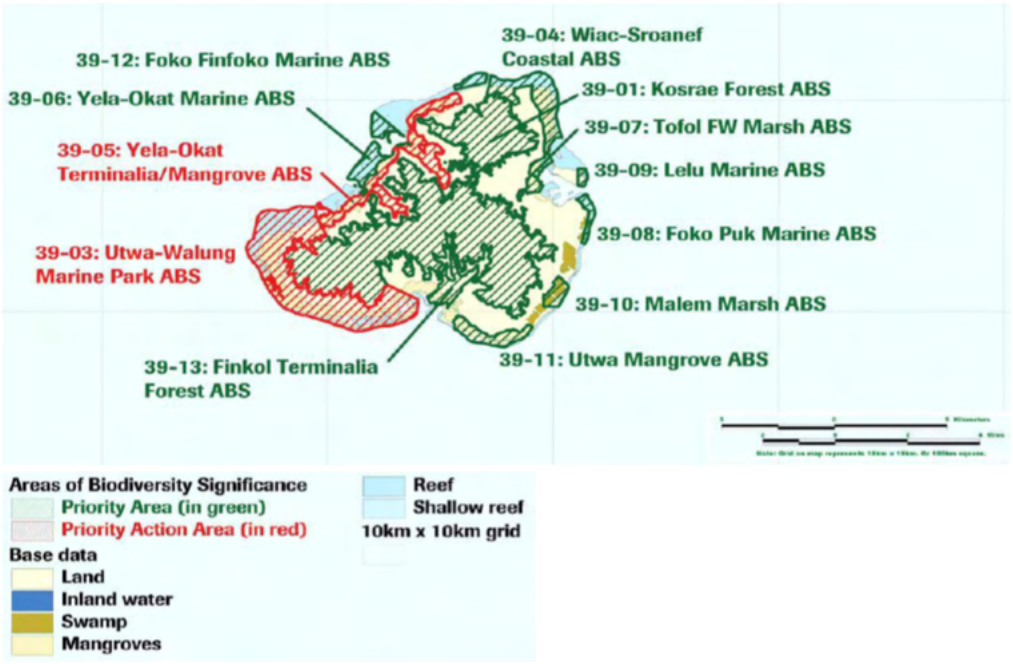


Figure 3-7: Areas of Biological Significance in Kosrae (from TNC 2019)

Table 3-9: Protected areas of Kosrae

0	Protected area name	Terrestrial or Marine	Area (ha)	Gazetted
1	Tafunsak	Marine	58.8	yes
2	Utwe Biosphere Reserve (includes the Utwe- Walung Marine PA)	Marine	130.88	yes
3	Awane	Marine	131.2	yes
4	Tukasungai (Trochus niloticus) Sanctuary	Marine	277.8	yes
5	Olum Watershed PA	Terrestrial	310.3	yes
6	Pikensukar MPA	Marine	20	no
7	Kuuplu Mangrove Forest Reserve	Terrestrial	44.8	no
8	Tofol Watershed Area	Terrestrial	305.9	no
9	Tukunsruh MPA (Mangrove Forest)	Marine	150A	no
10	Yela Ka Forest	Terrestrial	520.3	yes
11	Mahkontowe Conservation Area	Terrestrial	1,500	yes

3.3.2 Rivers & Watersheds

Figure 3-2 presents the distribution of key watersheds and rivers in Kosrae (FSM 2010).

3.3.3 Invasive Species

Figure 3-8 presents the known locations of Kosrae's priority action invasive species which include the starburst bush *Clerodendrum quadriloculare*, bitter vine *Mikania micrantha* and castor bean plant (Tangan tangan) *Ricinus communis* (FSM 2010). Other, more dispersive species have not been mapped.

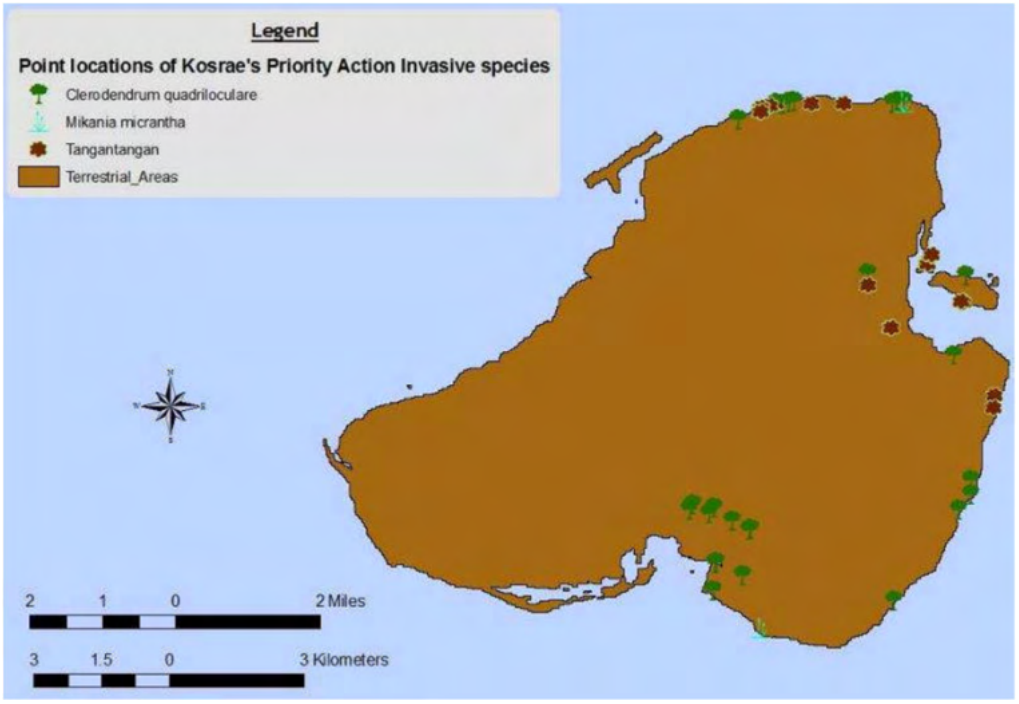


Figure 3-8: Incidence of targeted invasive species in Kosrae (U.S. FS and the FSM (2010)

3.4 Socio-Economic Environment

3.4.1 Economy

The major economic sectors of Kosrae are marine resources, tourism, and agriculture. Subsistence farming and fishing remains very important to most families. The public sector greatly depends upon the economic assistance of the United States through the Compact of Free Association.

The public sector plays a central role in the economy, the national and state-level governments employ over half of the country's workers and government services and public enterprises account for 38% of GDP. In 2013 the Kosrae Strategic Development Plan: 2014 – 2023 (KSDP) was finalized, recognizing the needs and aspirations of the Kosrae community and stakeholders in Kosrae. The KSDP takes a 10 year view of Kosrae and its place in Federated States of Micronesia. Kosrae's GDP growth has declined by 0.7% per annum since the beginning of the Amended Compact. A major issue is the size of the public sector in the economy, accounting for 40 percent of GDP activity. These factors suggest the Kosrae economy is in a highly volatile state as it approaches 2023 and has no significant financial reserves to fall back on.

Kosrae's GDP in 2015 was estimated at USD$14.6 million (or USD$1,963 per person). Major economic sectors in the State of Kosrae are marine resources, tourism, agriculture and small scale businesses. The combined output from these sectors contributed to an estimated USD$1.6 million, or 10% of the state products. The State Government owns and operates all infrastructure facilities, health facilities, and most education services, small enterprises, and an extensive commercial activity in the fishery.

The subsistence economy is based on small-scale horticulture and fishing. These two activities are not mutually exclusive as most farmers are also fishermen. Some have livestock for food production. This traditional subsistence economy is still vital for the

Kosraean's. Remittances from family overseas also supplement the household income especially those with subsistence production and or no employment.

3.4.2 Land Tenure and Access

In Kosrae, land rights may be legally sold to FSM citizen. The FSM Constitution forbids the ownership of land by foreigners but they are permitted to lease land. Multiple ownership of land still exists throughout the FSM, requiring the consensus of families, clans and traditional leaders for leases and development. This can present a constraint to development depending on the ability to achieve consensus.

The Kosrae Constitution took effect on January 11, 1984. The Kosrae Constitution contains a provision where stated rights may be superseded where "*when a tradition protected by statute provides the contrary*." The Constitution also stipulates that court decisions "*shall be consistent with this Constitution, State traditions and customs, and the social and geographical configuration of the State."* The emphasis on protection of natural land resources is a unique feature of the Constitution. This emphasis has made it possible for Kosrae to enact an island-wide land use program supported by law.

Article XI, § 5 deals with the issue of eminent domain and compensation for land appropriated by the government and authorizes the State Government to "*acquire interests in private land for public purpose without the consent of the interested parties*." Such an acquisition may occur upon "*upon payment of fair compensation and the State Government's showing that the land and the interest are highly suited to their intended use, that it has made a good faith effort to gain the consent of the interested parties, and that it has made every reasonable effort to avoid substantial hardship to the interested parties in consideration of their personal circumstances.*

Article XI, § 6 designates rivers and streams as public property, and authorizes the State Government to regulate their use in the public interest.

Article XI, § 7 limits ownership of land to a specified class of individuals and states that only a person who is a citizen of the Federated States of Micronesia and Kosraean by descent including by adoption or a corporation which is wholly owned by such persons, may acquire title to land in the State. Acquisition of title by persons whose status as Kosraean by descent is based solely on adoption shall be within limits set by law. Acquisition or utilization of interests in real property may be restricted or regulated by law.

Article XI, § 8 states that "*[n]o certificate of title shall be issued to the State Government for land consisting of the road and adjacent areas except where the State has actual title*." A certificate of title previously issued to the State for such land is voidable upon application by the landowner holding title provided that any prior use agreement between the State Government and the private landowner shall be reinstated according to its terms until modified."

3.4.3 Demographics

Kosrae has a total population of 6,616 consisting of 3,352 is males (50.6%) and 3,264 (49.4%) female (FSM 2010 census) (Table 3-10). With an average annual growth rate of -0.40%, the greatest rate of change of all the FSM states, this is a reflection declining economy resulting in population movement interstate (Pohnpei) or to other countries.

Table 3-10: Demographic information for FSM (source 2010 census)

Feature	FSM	Yap State	Kosrae State	Pohnpei State	Chuuk State
Land area (sq Km)	702	102	110		127.2
Land area (sq m)	271	45.6	42		49.2
Population	102,843	11,377	6,616	36,196	48,654
Male	52,193	5,635	3,352	18,371	24,835
Female	50,650	5,742	3,264	17,825	23,819
Average annual growth Rate	-0.40%	0.12%	-1.50%	0.48%	-0.97%
Population Density (person/sq mile)	379	247	156	274	993
Population -Percent urban	22.3	7.4	32.6	16.8	28.5
Population -Percent rural	77.7	92.6	67.4	83.2	71.5
Place of birth - FSM	96.9	94.4	93.9	95.3	99.0
Place of birth - Yap	10.5	92.7	0.1	0.6	0.0
Place of birth - Chuuk	47.6	0.9	0.4	2.2	98.8
Place of birth – Pohnpei	32.7	0.8	2.4	91.8	0.2
Place of birth - Kosrae	6.1	0.1	90.9	0.6	0.0
Median age (years)	21.5	25.1	21.6	21.8	20.7
Median age - male (years)	21.5	23.8	21.4	21.4	20.5
Median age – female (years)	21.9	26.4	21.9	22.2	20.9
Average family size	4.4	3.7	4.2	4.2	4.8
Average household size	6.1	4.9	5.7	5.6	6.9
No. of Households	16,767	2,311	1.143	6.289	7,024

In addition, a number of other key points regarding the demographics of Kosrae:

- With a population of 6,616, Kosrae is the smallest state by population in FSM and has the lowest population density of all the FSM states (156 persons/square mile/400 persons/km^2).
- The distribution of Kosrae's population varies considerably between rural (4,456 people) and urban (2,160) areas with the population in both rural and urban areas declining growing at an average annual rate of -1.34% and -1.82% respectively.
- The greatest population in Kosrae is located in Lelu municipality (22.7%) followed by Tafunsak (32.0%), Malem (20.4%) and Utwe (13.9%)52. Figure 3-9 shows the location of urban areas on Kosrae and municipal boundaries.
- The average household size (5.7) is slightly smaller than the national average, as is the average family size (4.2).
- The official language is Kosraean with English used in government discourse with 90.1% of the population speaking English and 90.7% speaks Kosraean.
- The median age in Kosrae was 21.5 years.
- There are 1,143 households in Kosrae. Of these: 1,1079 households (94%) source power from a public utility; 990 (87%) have access to drinking water via public or community water supply or household tank; 1119 (98%) are connected to a sewer or have a septic tank; 872 (76%) have access to a car, bus/truck or motorbike; 490 (43%) have access to a mobile phone; and 246 (22%) have access to a computer, with 156 (14%) having access to the internet.

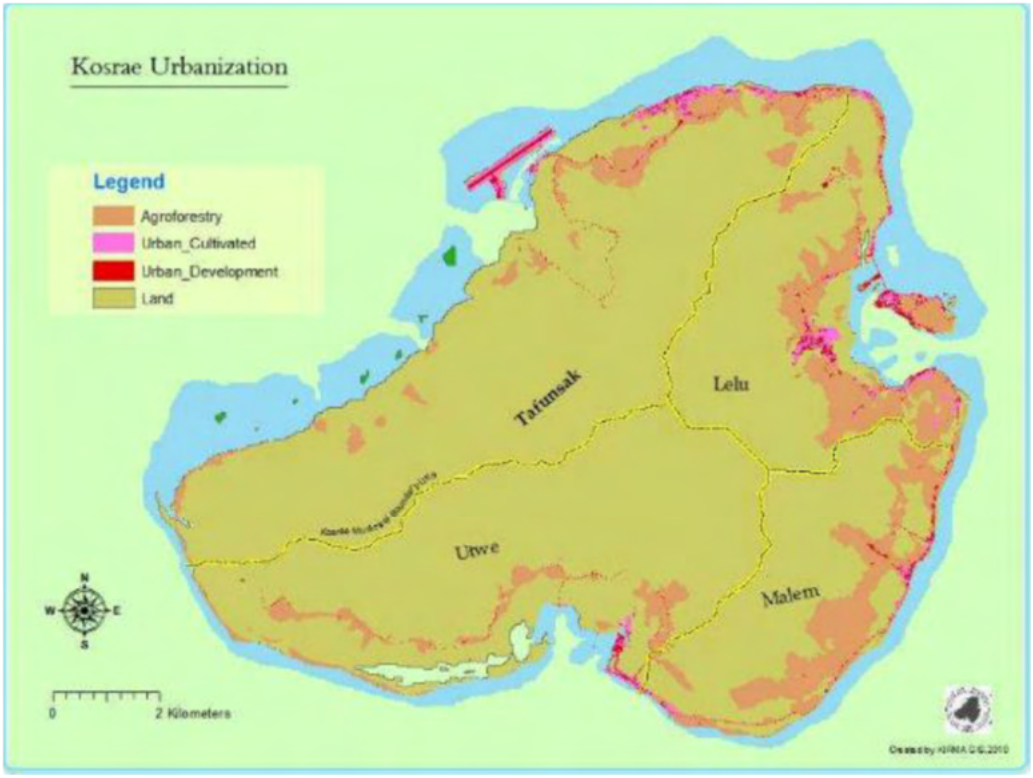


Figure 3-9: Urban areas in Kosrae

3.4.4 Education

Education in the FSM is compulsory for children aged 6 to 13 (elementary school). The national education agency is the FSM Department of Education. Each state has its own education agency operating public schools. The curriculum in this eight-year program includes subjects such as science, mathematics, language arts, social studies and physical education. Public elementary and secondary schools are free for all Micronesian students. There are five secondary schools (one per island) as well as several private secondary schools. In FSM, the College of Micronesia provides accredited post-secondary education from six campuses spread across all States.

According to the 2010 census, in Kosrae, 101% of 6-13-year olds go to elementary school (indicating students repeating years), 93% of 14-17 year olds attended high school and 25% of 18-24 year olds attend college. The 2010 FSM census also showed that 85% percent of Kosraean's aged 25 years and over had completed elementary education; 55% had completed high school, and 39% had attended college or other higher-level education institute with approximately 16% graduating. A further 2% were recorded as never having attended school.

3.4.5 Fisheries – Related Industries

Commercial & Artisanal Fisheries

There are no large-scale inshore commercial fishing operations in Kosrae. Small scale commercial game fishing charters catering for tourists is allowed. Much of the local small-scale fishers capture fish principally for household consumption and secondarily as an additional income stream.

Dive Industry

In 1997 a series of mooring buoys were installed around the Kosrae coast in anticipation of increased diving and fishing pressure on the surrounding reefs (see Figure 3-10). These sites are used by local dive operators as part of a small dive tourism industry, with a subset used for regular monitoring of the health of coral reef by KIRMA.

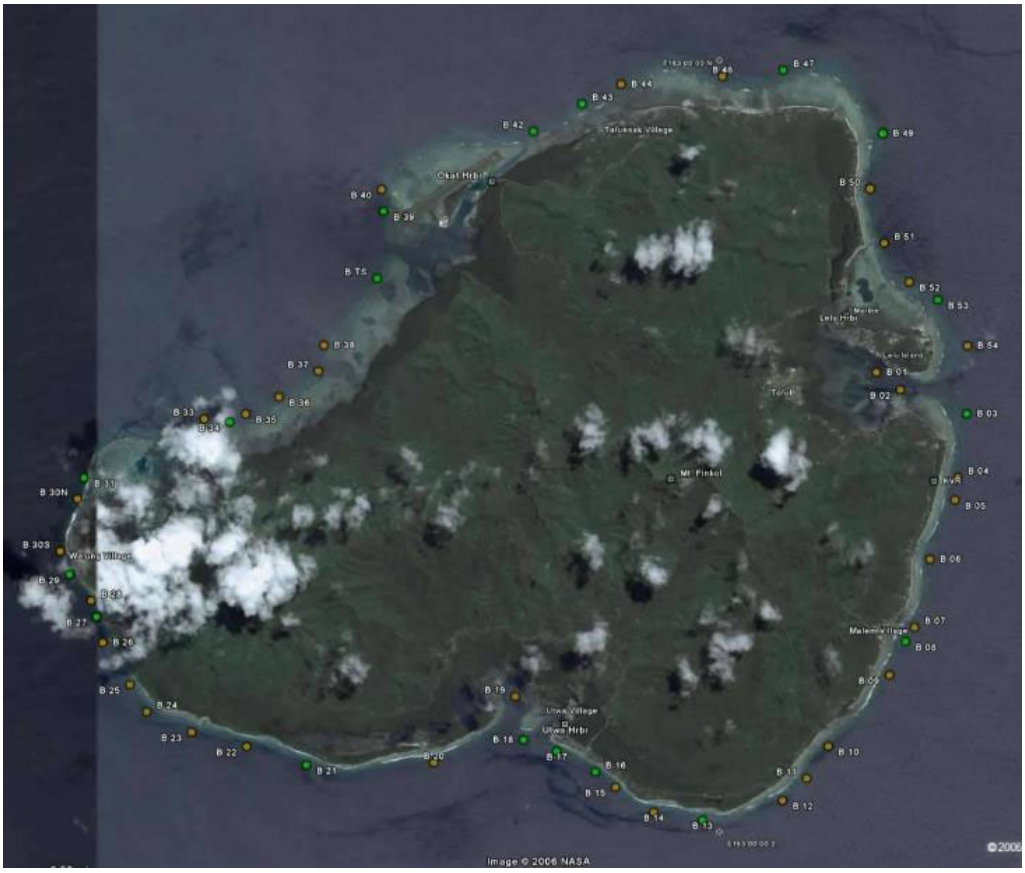


Figure 3-10: Locations of moorings in Kosrae indicating key dive sites

3.4.6 Sites of Archaeological & Historical Value

Figure 3-11 presents the locations of historical sites in Kosrae. Several heritage sites have been identified in Kosrae that are identified in the US National Register of Historic Places (Table 3-11).

Figure 3-11: Locations of historic sites in Kosrae

Table 3-11: Heritage sites listed on the US National Register of Historic Places

Name on the Register	Date listed	Location	Municipality	Description
Leluh Ruins	August 16, 1986	Address Restricted	Lelu	Leluh is a major prehistoric and historic archaeological site, encompassing the remains of a city on Lelu Island, a satellite of the larger island of Kosrae. The remains are those of a civilization that peaked around the 14th and 15th centuries, with elements still visible at the time of European contact in the early 19th century. The rulers of Leluh gradually conquered and thus unified the island of Kosrae. From the capital at Leluh, they ruled the island with a monarchy that archaeologists believe was similar to the kingdoms of Tonga or Hawaii.
Safonfok	February 17, 2002	Address Restricted	Walung	Safonfok is a prehistoric archaeological site near Walung. At the time of its discovery in 1999, it was one of the largest prehistoric industrial complexes found in the islands of the Pacific. The site, whose full extent has not been fully determined, was excavated in 1999-2000, revealing a major complex where an estimated hundreds of workers manufactured coral fishhooks and other tools.
Likinlulem	April 14, 2004	Walung 5°17'32"N162°54'40"E 5.292361°N 162.911111°E	Walung	Likinlulem is a major archaeological site in Kosrae. The site encompasses more than 2.8 ha on either side of Likinlulem Stream on the island's southwestern coast, in an area that is now overgrown mangrove swamp. It includes at least nine large enclosures with extensive internal features, a channelized stream, canoe landing, and a large open platform that is subject to inundation at high tide. Occupancy of the site has been dated to 1200-1800 CE, with one area possibly dating as far back as 1000 CE. The site is an important element of the island's oral history as it was here that its paramount chiefs are said to have held court prior to the ascendancy of Leluh c. 1400.

3.4.7 Infrastructure

Piped water systems from rivers serve 7 areas in Kosrae, a total population of 6,633 (see Table 2-17). The Lelu sewerage system provides small bore sewers which receive effluent from household septic tanks. Collected sewage is delivered to a pumping station. The Tofol sewerage system collects sewage from Government buildings and provides oxidation ponds treatment which has a capacity of 15,000 gallons (56,000 litres) a day.

Quarries

Kosrae has 20 permitted privately-owned quarry sites (see Figure 3-12). Only Quarry #16 at Tenwak (locally-known as Puk Quarry) has a rock crushing machine and a sorter (see Figure 3-13). The current quarry output is approximately 40m^3 / day with 80% being 1" crushed gravel. DOTC&I have stated aggregates (for asphalt) used in past road paving

projects in Kosrae have been imported but that the local quarries should be able to provide quality fill materials as base course. This needs to be confirmed however.

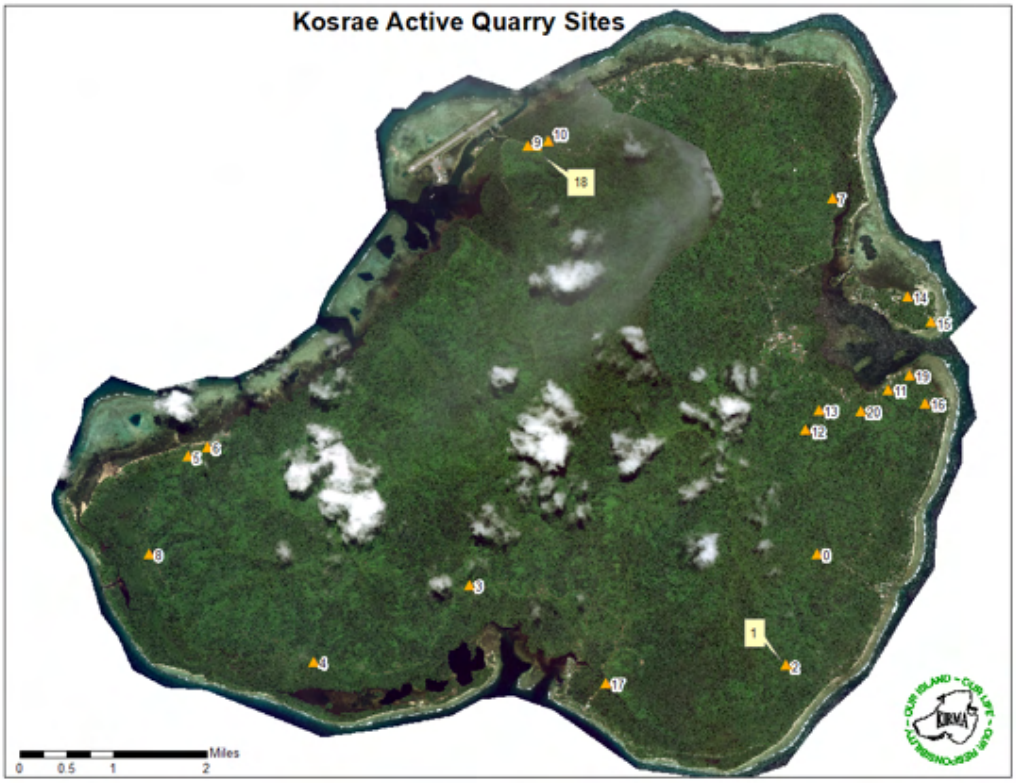


Figure 3-12: Quarry site locations in Kosrae

Figure 3-13: Images showing infrastructure at Puk quarry

Solid Waste Management

The solid waste facilities in Kosrae consist of five dumpsites and an aluminium can compaction and storage facility (FSM DOTC&I, 2004). The dumpsites include:

- Lelu Municipality dumpsite which is the largest of the five and occupies a hillside opposite the Kosrae Utilities Authority (KUA) power plant. This is the only site to have a public collection service. A dump truck is employed for roadside collection of trash along the circumferential road, two times per week.
- The Tafunsak Municipality dumpsite, a small area located east of the airport and commercial port.
- The Malem Municipality dumpsite, a small area located south of the Lelu causeway along the circumferential road.
- Very small dumpsites located at Utwe and Walung village.

In all cases the dumpsites are located near residential and/or administrative areas and none are fenced or any evidence of an organised operation. No state government body is specifically charged with responsibility for solid waste management, but this role is taken on by default by the Department of Public Works.

Further investigation is required to determine whether the solid waste facility has the ability to dispose of any waste roading material generated from the PRIME and SCORE Projects.

Seawalls

A number of seawalls have been created in response to ongoing coastal erosion issues. The location of existing seawalls is shown in Figure 3-14.

Figure 3-14: Location of existing seawalls in Kosrae

3.5 Primary Data Collection

A range of assets located in the road corridor along the islands primary (PRIME) and secondary (SCORE) road network have been identified based on fieldwork undertaken. A map showing the location of these assets (which includes as private fences/walls and gardens, fruit trees, buildings, bridges/culverts, etc.) and other key resources are provided in Figure 3-16. Appendix B presents further detail on this map. **Error! Reference source not found.** presents examples of these assets. This information has been used to identify E&S sensitivities for the ESMF.

Figure 3-15: Images showing (a-f) PRIME (g-h) SCORE key assets located in close proximity to the roads on Kosrae.

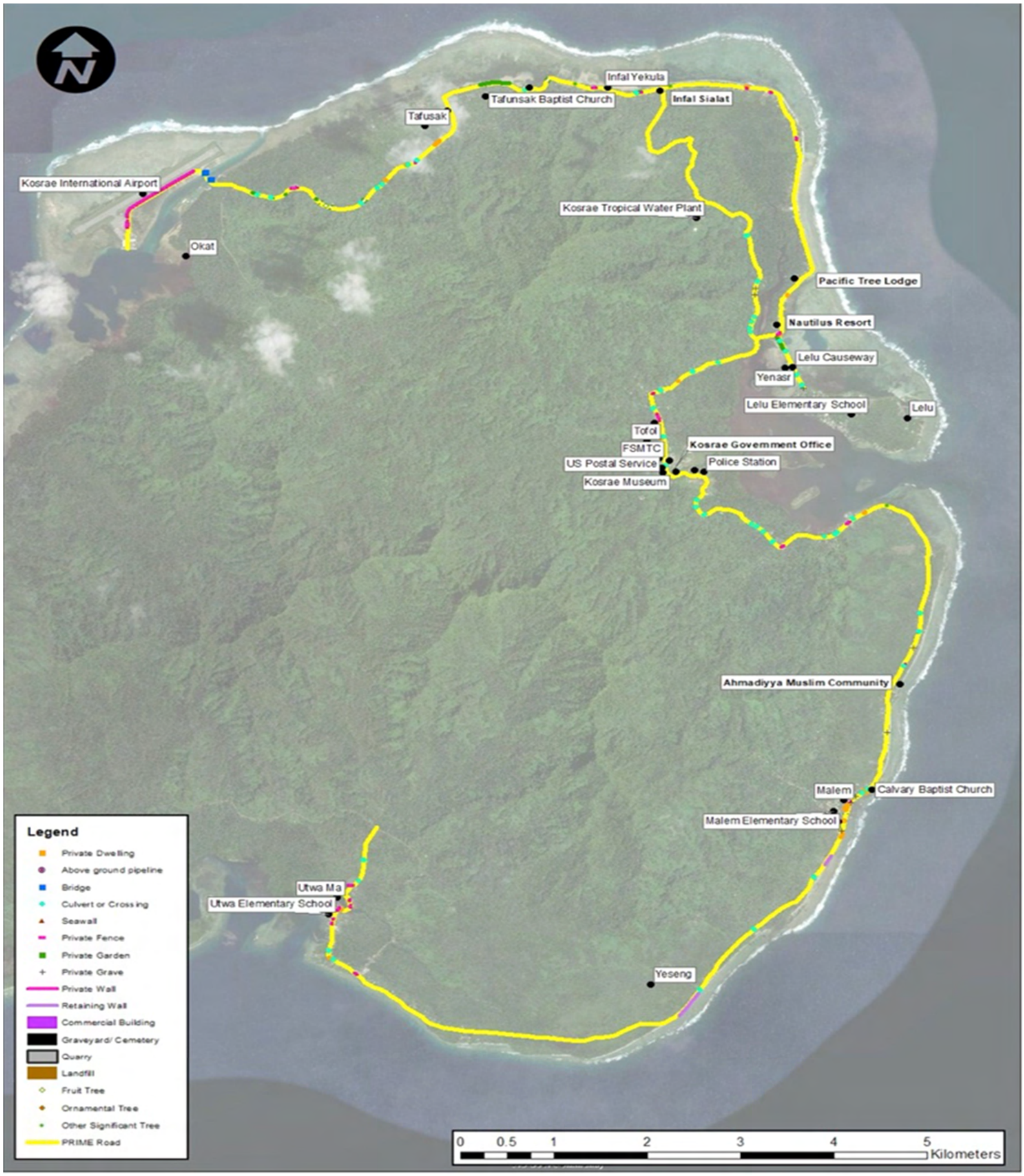


Figure 3-16: Assets within road corridor and location of sensitive social receptors – Kosrae

4. Pohnpei

4.1 Physical Environment

4.1.1 Climate

Table 3-1 presents key climate data for Pohnpei (from https://en.climate-data.org/). The key point to note is the abundant rainfall Pohnpei receives annually (480 cm).

Table 4-1: Key climate statistics for Pohnpei including temperature (°C) and rainfall (mm)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Avg. Temperature	27.2	27.3	27.3	27.3	27.4	27.3	27	27	27	27.1	27.2	27.3
Min. Temperature	24.2	24.3	24.3	24.1	24	23.7	23.1	22.9	22.9	23	23.3	24
Max. Temperature	30.2	30.3	30.4	30.6	30.8	30.9	31	31.2	31.2	31.2	31.1	30.6
Rainfall (mm)	329	262	341	443	478	427	453	442	413	426	403	390

4.1.2 Topography, Geology, & Soils Hydrology

Pohnpei consists of a main island surrounded by an inner coral reef, 23 small basaltic islets, a number of inshore deposit islet, and an outer encircling barrier reef with about 15 low coral islets. Pohnpei itself is a high volcanic island with a mountainous interior and peaks as high as 798 m above sea level, is about 21km in diameter and 112km in circumference. Including lagoon islands, the total land area of Pohnpei is approximately 340km^2.

The distribution of various soil types across Pohnpei has been described by U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) in 1982. The five key soil types present are as follows:

- Nansepsep/Sonahnpll/lnkosr - Very deep, well drained to poorly drained, level to gently sloping soils; on bottom lands and alluvial fans.
- Nanlak - Very deep, poorly drained, level and nearly level soils; in coastal tidal marshes.
- Umpump/Rakled - Moderately deep and very deep, moderately well drained and somewhat poorly drained, level to moderately steep soils; on old lava flows, terraces, and benches.
- Dolekel/Fomseng - Shallow and moderately deep, well drained, moderately steep to extremely steep soils; on uplands.
- Tolonler/Dolen - Very deep, well drained, strongly sloping to extremely steep soils; on uplands.

Figure 4-1 presents a map prepared by the Island Research and Education Initiative (iREi) showing the distribution of the key soil types.

4.1.3 Hydrology

Groundwater

Groundwater development on Pohnpei has been limited mainly to areas in the northern part of the island in and around the town of Kolonia and Palikir (Spengler et, al., 1992). Wells in the Kolonia area exploit local unconformities between flow units of the late-stage volcanics and the unconformity between these volcanics and the underlying shield-building

lavas. More productive wells located in the Palikir area exploit relatively unweathered shield-building lavas.

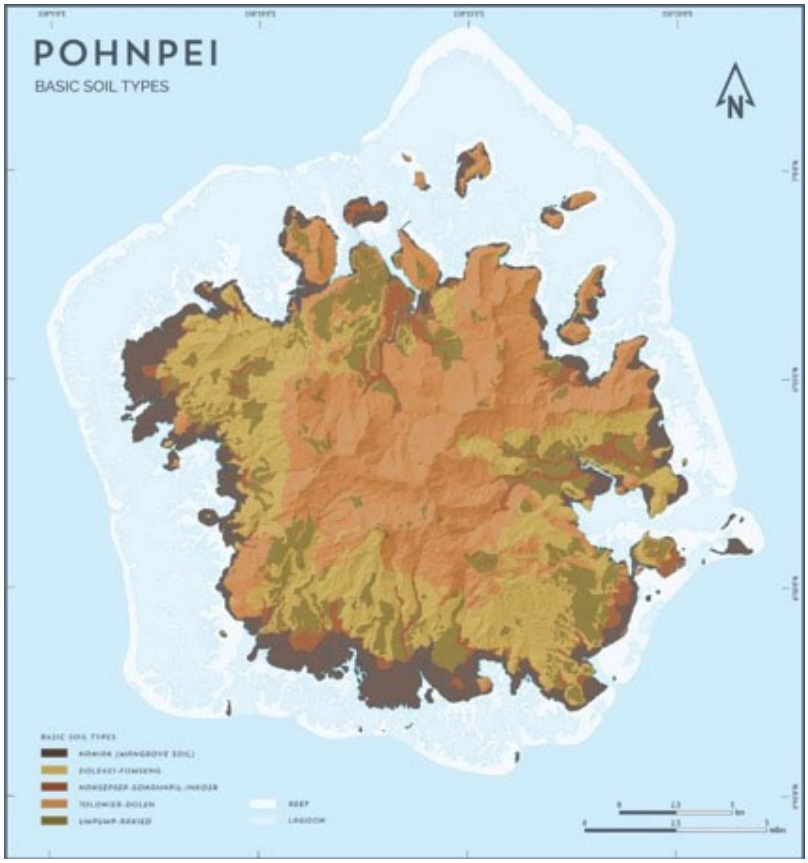


Figure 4-1: The distribution of the key soil types in Pohnpei

Groundwater development in the northern half of the island is hindered by low permeability basement rock and lack of an extensive, low permeability capping layer to impede the movement of basal groundwater into the lagoon. More favorable conditions for the development of basal groundwater are thought to exist in the southern half of the island due to the presence of relatively thick deposits of low-permeability ash near the coast, although groundwater has not yet been developed in this location.

Figure 4-2 presents a map prepared by (iREi) showing distribution of general water resources.

Surface Water

The general distribution of freshwater resources on Pohnpei is shown in Figure _ based on data provided by the U.S. Geological Survey in 1944 (USGS, 1944) and complied by iREi. The key point to note is that the majority of the island, primarily in the interior, has numerous streams and springs with a few locations where water is taken from shallow wells (or streams) for consumption. The majority of water for consumption located primarily on the coastal fringes is through collected rainfall. Figure 4-3 presents maps showing location of surface watercourses based on the U.S. Geological Survey (USGS) topographic maps (2001) and reinterpreted by iREi.

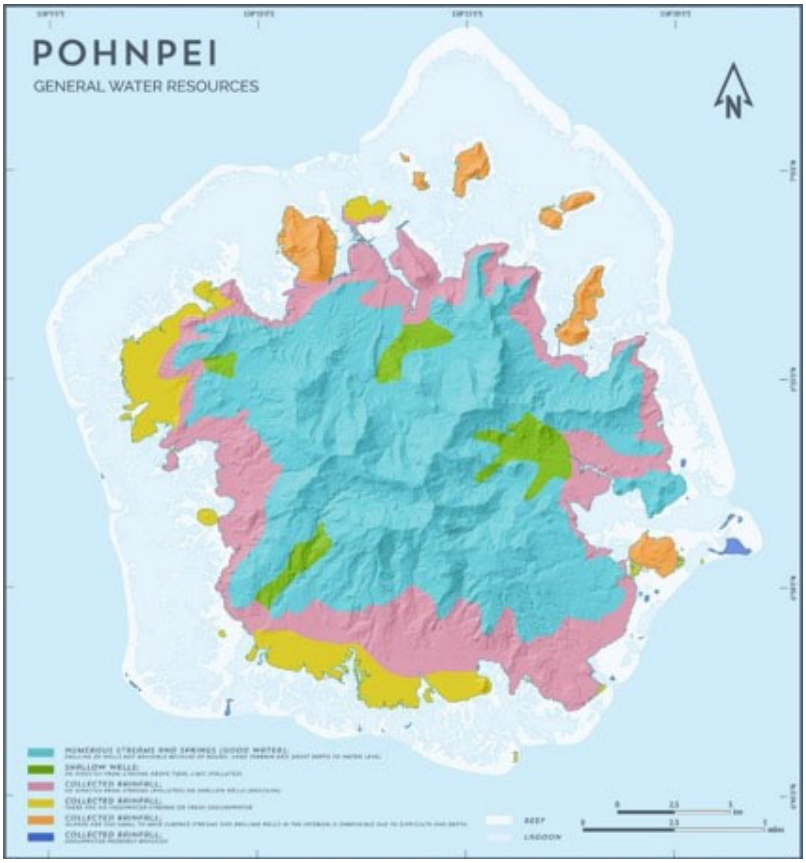


Figure 4-2: The distribution of the general water resources in Pohnpei

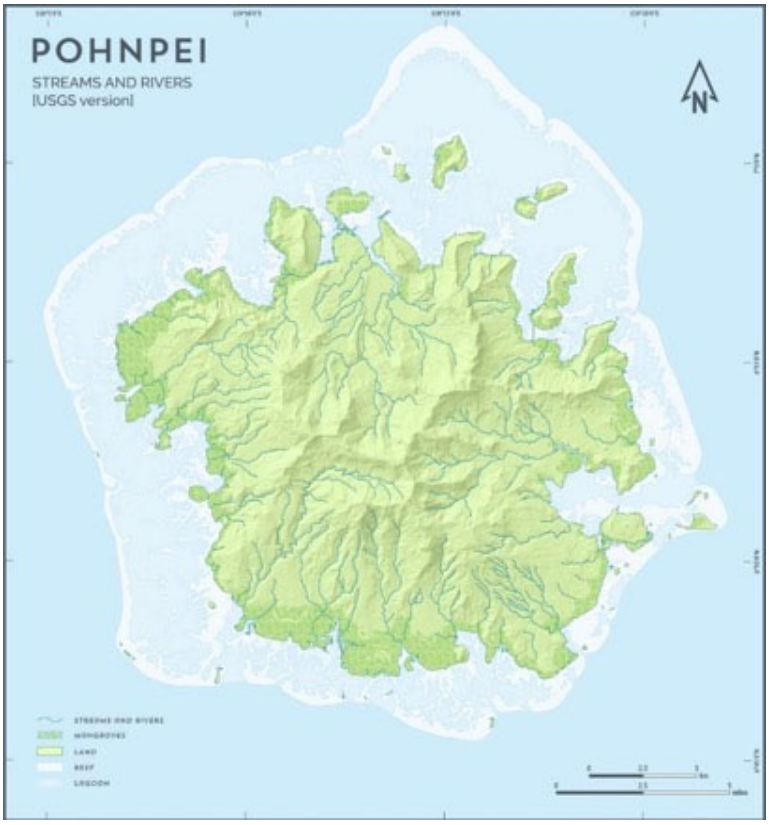


Figure 4-3: The distribution of water courses in Pohnpei

4.1.4 Hazards

Flooding

Figure 4-4 presents a map showing various levels of flooding hazard for Pohnpei prepared by iREi and is based data from the U.S. Department of Agriculture (USDA) - Natural Resources Conservation Service (NRCS) for local soil type, drainage, and other parameters. The key point to note is that the majority of the low-lying coastal margin is considered at risk of flooding.

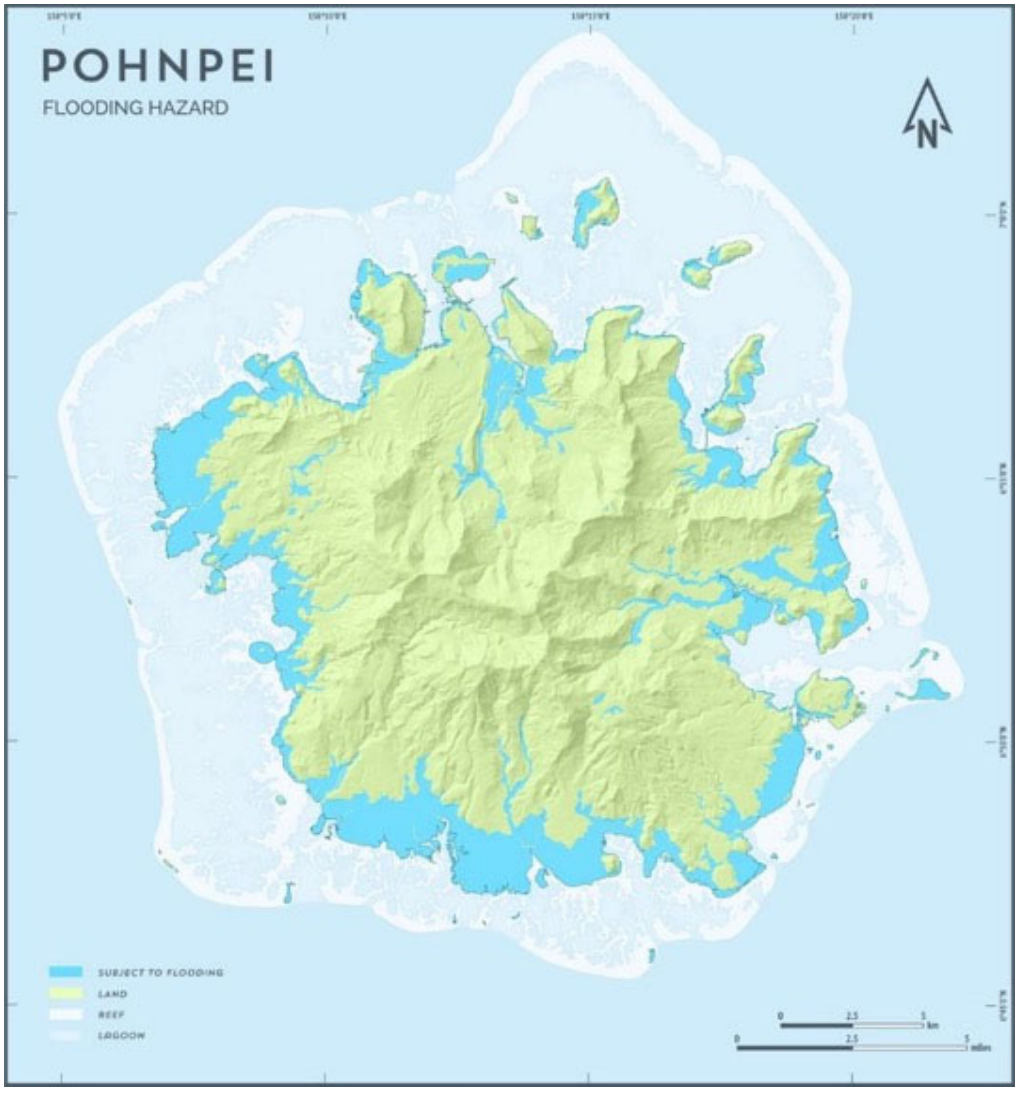


Figure 4-4: Areas of flood risk in Pohnpei

Erosion

Figure 4-5 presents a map showing various levels of erosion hazard for Pohnpei prepared by iREi and is based data from the U.S. Department of Agriculture (USDA) - Natural Resources Conservation Service (NRCS) for local soil type, slope and other parameters. The key point to note is that the majority of 'very high' to 'high' potential erosion hazard areas are located in the stepper areas poorer quality soils of the interior occasional extending towards the coastal margin.

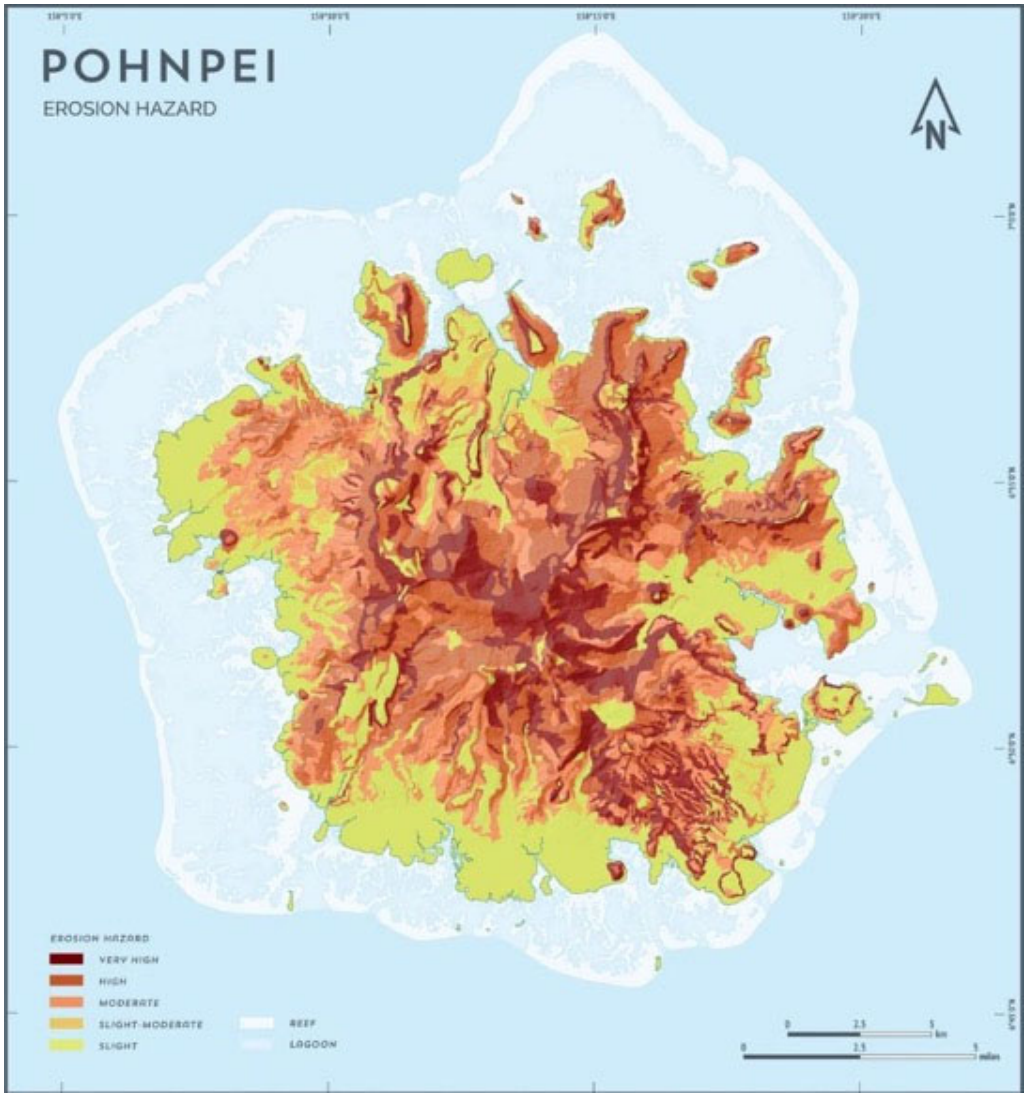


Figure 4-5: Erosion hazard areas in Pohnpei

4.2 Ecology

4.2.1 Terrestrial Ecology – Flora

Vegetation Types

Table 2-2 presents a summary of general vegetation types found in Pohnpei. Key habitat sensitive to development disturbance as a proportion of total area ranges includes mangrove (15.6%), swamp forest (0.6%), upland forest (35.4%) and marsh (0.4%) (from FSM 2001).

Plant Species

A total of 729 species of ferns and flowering plants have been described in Pohnpei. Approximately 438 species are native, including about 106 species of ferns, 138 monocot species and 194 dicot species (Falanruw, 2002) (Table 2-3).

A total of 291 species of plants have been introduced to Pohnpei (Zirkus, 2001). Some of these introduced species have become invasive pests (Table 2-4) and, of the top 11 invasive weed species in FSM, all are present in Pohnpei including the widespread Giant

Sensitive plant *Mimosa* diplotricha, African tulip-tree *Spathodea campanulata* and *Wedelia trilobata* (FSM, 2002).

Figure 4-6 presents a map showing the distribution of various vegetation types across Pohnpei. The data set was developed from 2005 QuickBird satellite imagery by Digital Globe through land cover classification carried out by U.S. Forest Service (2007).

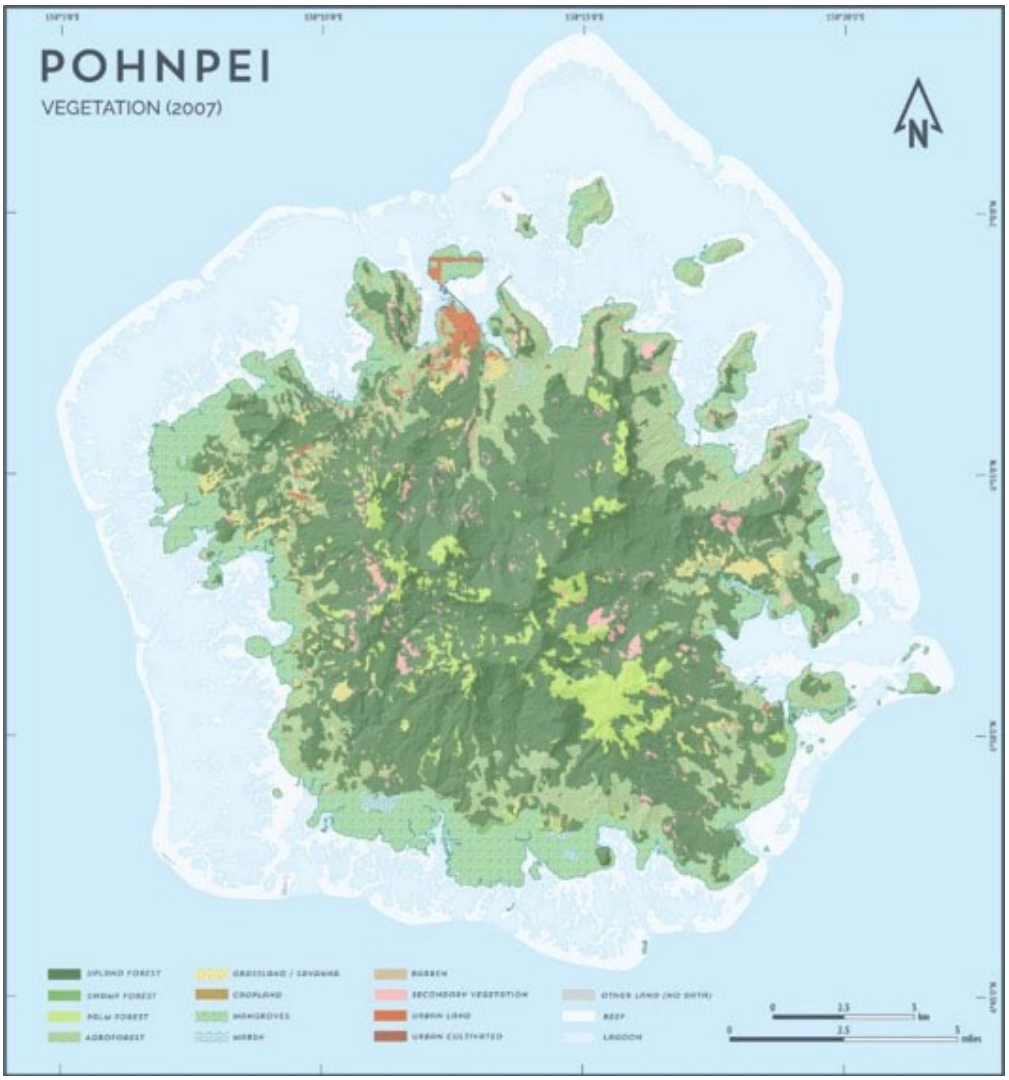


Figure 4-6: Distribution of vegetation types in Pohnpei

4.2.2 Terrestrial Ecology – Fauna

A range of avian, mammalian, reptilian species are present including 73 species of bird (including 20 native species, 19 resident and non-resident seabirds, 20 migratory shorebirds, and 3 introduced bird species) (Table 2-5). A number of mammals (including bats), reptiles (skinks, geckos, snakes), amphibians and freshwater fish are also likely to be present.

The Pohnpei Island skink (*Emoia ponapea*) is the only reptile endemic to Pohnpei, and it is widely distributed in low-land and upland forest (Buden, 2000).

4.2.3 Coastal Marine Ecology

Coastal Habitat

A number of significant marine ecological features are located around Pohnpei (from Weeks, 2015). Figure 4-7 identifies these key features.

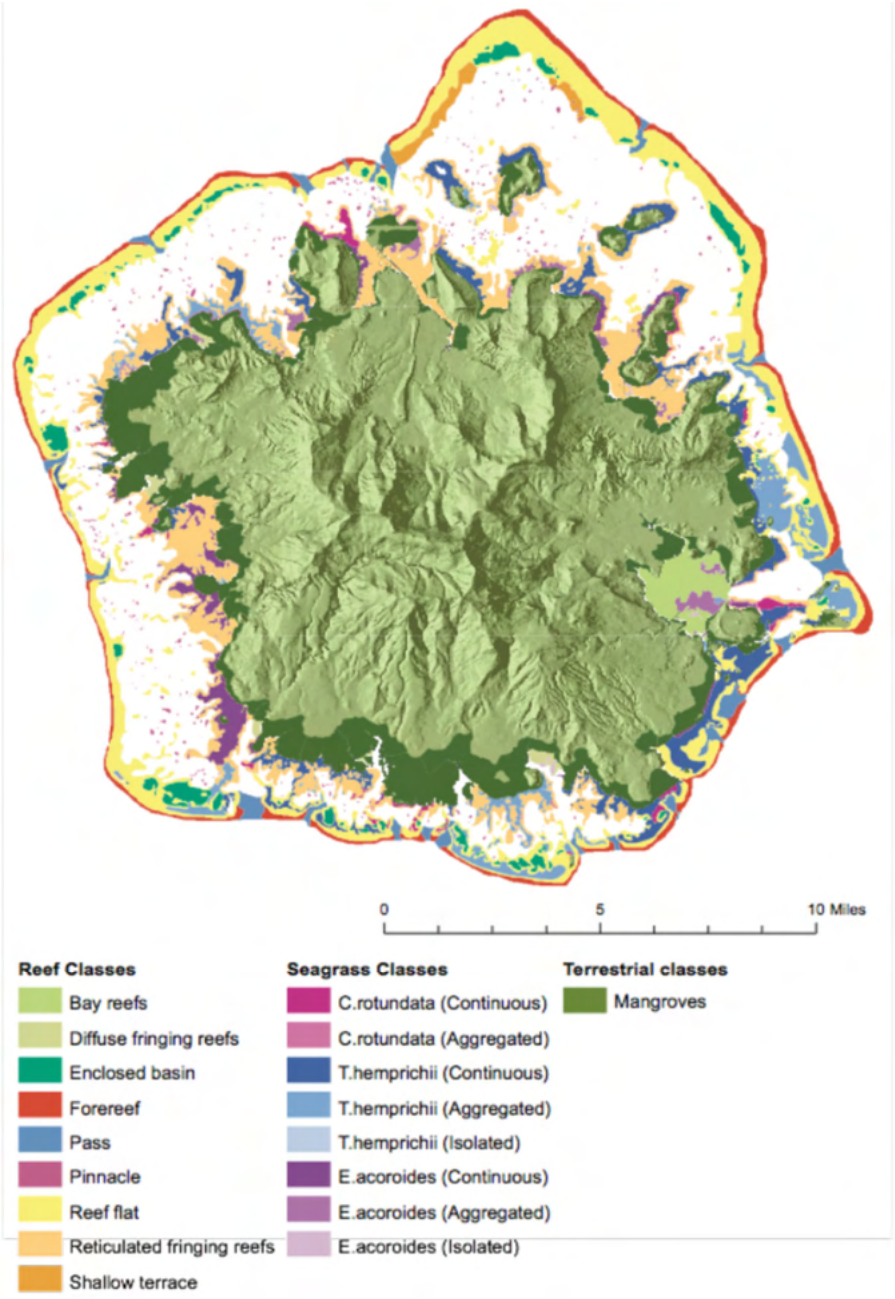


Figure 4-7: Key marine ecological features in Pohnpei

Mangroves

The three most common mangrove species *Bruguiera gymnorrhiza*, *Sonneratia alba* and *Rhizophora apiculata* are present on Pohnpei (Allen et. al., 2001). A total of seven other mangrove species are present but are generally much less common. Table 2-7 presents

the distribution of the most common species by FSM State. Figure 4-7 presents a map showing the distribution of mangroves around Pohnpei.

Seagrass

Approximately 4,403.6 ha of predominately intertidal and shallow (<3m) subtidal seagrass meadows are present the waters around Pohnpei Island (and Atoll) consisting of three key species (*Cymodocea rotundata*, *Thalassia hemprichii*, and *Enhalus acaroides*) of varying levels of coverage (continuous, aggregated, and isolated) (McKenzie & Rasheed, 2006). Figure 4-8 presents a map showing the distribution of seagrass areas around Pohnpei.

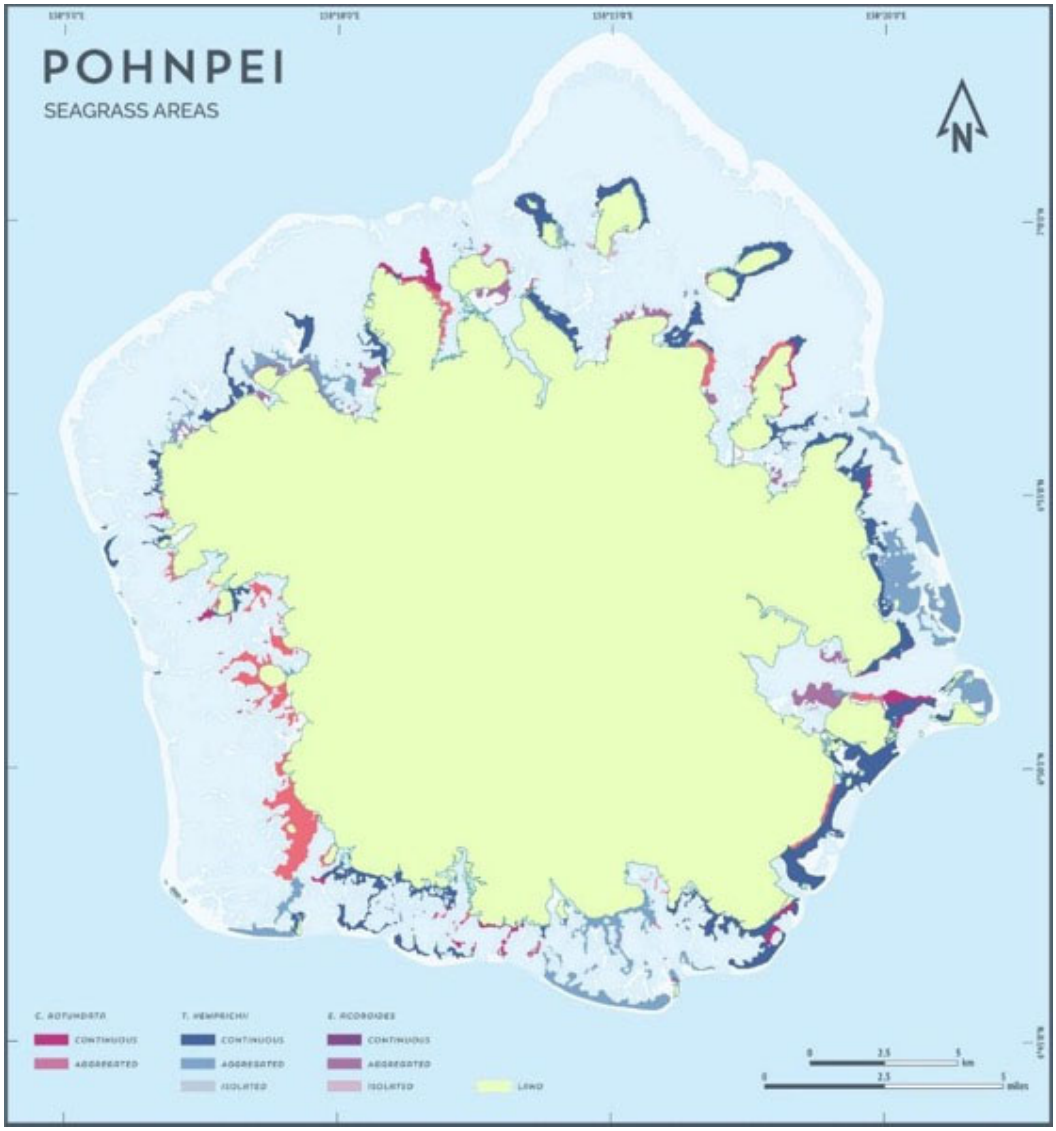


Figure 4-8: Distribution of seagrass beds in Pohnpei

Reef Zonation

The distribution of various reef zones around Pohnpei has been mapped using data collected by the Millennium Coral Reef Mapping Project (IMaRS-USF & IRD 2005). Reef zones describe the locations and ecological conditions of different parts of the reef with respect to the reef system as a whole. The key reef type in close proximity to the coast is described as "*reticulated fringing reef defined as a network of linear or polygonal reef*

framework with intervening depressions". Figure 4-9 presents a map showing the various reef zones.

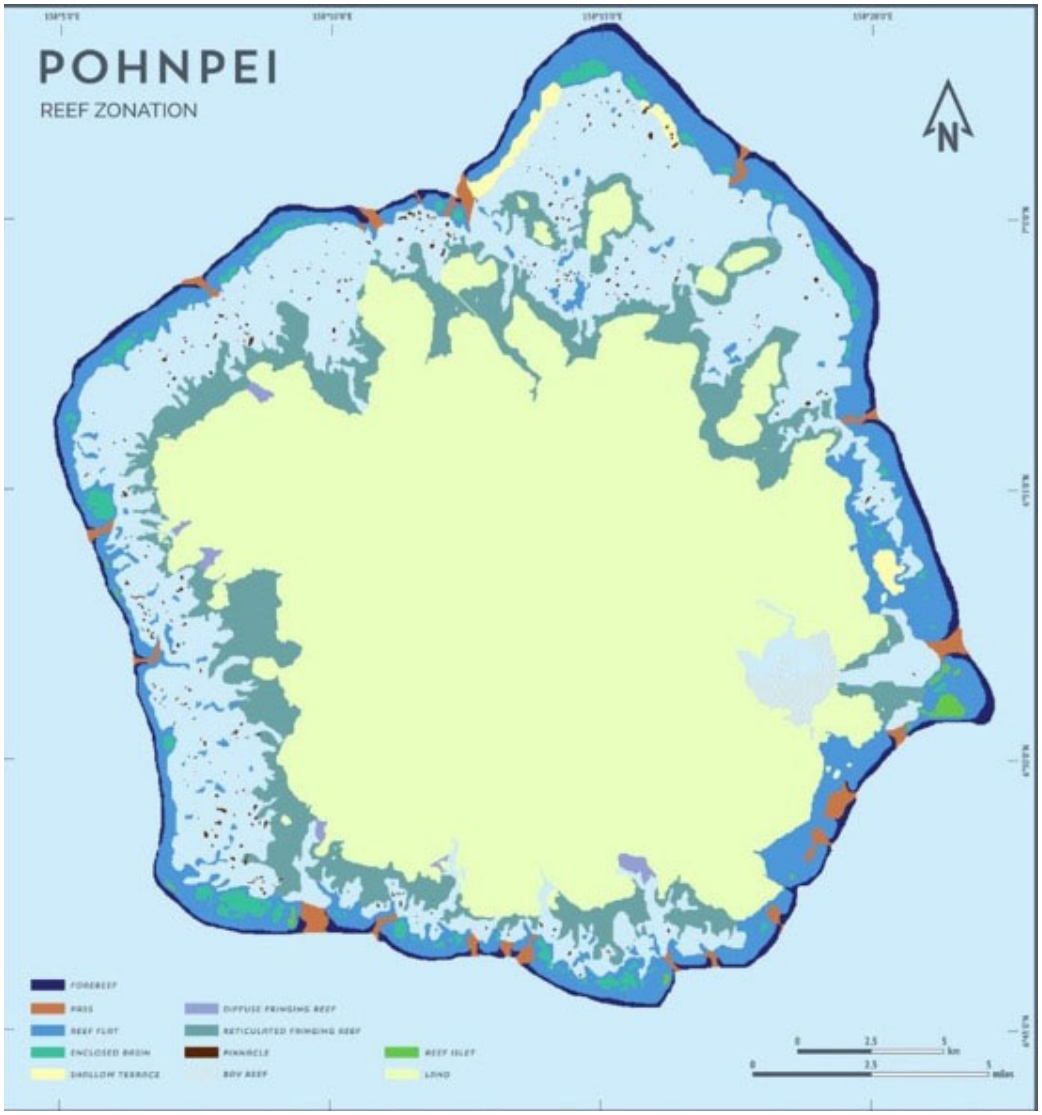


Figure 4-9: Distribution of reef zones in Pohnpei

Fauna

Two species of sea turtles (*Chelonia mydas* and *Eretmochelys imbricata*) are known to occur regularly in surrounding waters (Buden, 2000)

4.2.4 Conservation Areas

Figure 4-10 presents a map showing existing designated (12 areas) and proposed (12 areas) protected areas in Pohnpei.

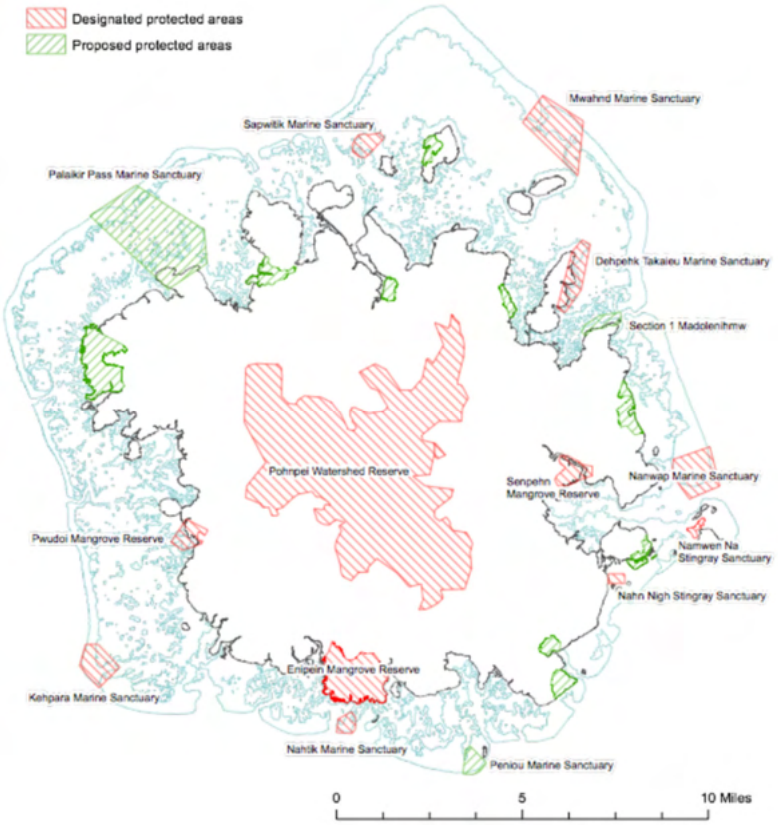


Figure 4-10: Pohnpei existing and proposed protected areas (from Weeks, 2015)

In addition, 35 Areas of Biodiversity Significance (ABS) have been identified for Pohnpei including terrestrial (9), marine (5), coastal marine (18) and coastal freshwater sites (3) (Conservation Areas

Each State has a network of currently and proposed terrestrial and marine protected areas. In addition, 130 Areas of Biodiversity Significance (ABS) have also been identified in FSM (**Error! Not a valid bookmark self-reference.**) (TNC, 2019). The location of these areas in each State is described in detail in the following sections.

In summary, the combined sites encompass 291,753 hectares (ha) or 19% of the FSM's entire terrestrial and inshore area (including reefs and lagoon areas). Because the land area of FSM is very small, 50% of the ABS (64 sites) and a majority of the total area (61% or 178,191 ha) are coastal marine sites connecting terrestrial and coastal targets.

Marine-only sites, largely lagoons and coral reefs, comprise the second largest area at 28% (82,620 ha) of the total ABS area. Terrestrial sites, mainly upland native forests, make up just 8% (22,636 ha) of total ABS area, but total 23 sites. This reflects the relatively limited extent of natural terrestrial systems on small Pacific islands compared with the much larger marine systems surrounding them. Coastal freshwater areas, primarily coastal freshwater marshes, total just 3% (38,133 ha) of the total ABS area.

4.3 Socio-Economic Environment

4.3.1 Economy

Overview FSM GDP

The National Government, for the fourth consecutive year, showed a significant fiscal surplus of $35.8 million FSM's gross domestic product (GDP) was US$1.13b, or US$3,500 per capita, in 2015. In that year there as a trade balance deficit of US$314 million, with exports at US$20.6 million (-17.8% annualized) and imports at $162 million (+15.8% since 2010) (OEC 2017). National government revenue was at its highest level ever at $166.1 million in FY2017 when both domestic revenue and external grants reached record levels. Public Law 18-107 in FY2015 amended the tax collection allocation to the States from 50 percent to 70 percent of net taxes collected for import taxes, income tax, and gross revenue tax.

The impact of this tax policy change sees a $4.8 million decline in tax revenue for the National Government from FY2016 onwards. This revenue has not been passed directly to the States but by law is invested in the FSM Trust Fund on their behalf. It is estimated that $40 million will be invested in the Trust Fund on behalf of the States by 2023.

Table 2-8). The location of Pohnpei ABSs are shown in Figure 4-11 and Figure 4-12.

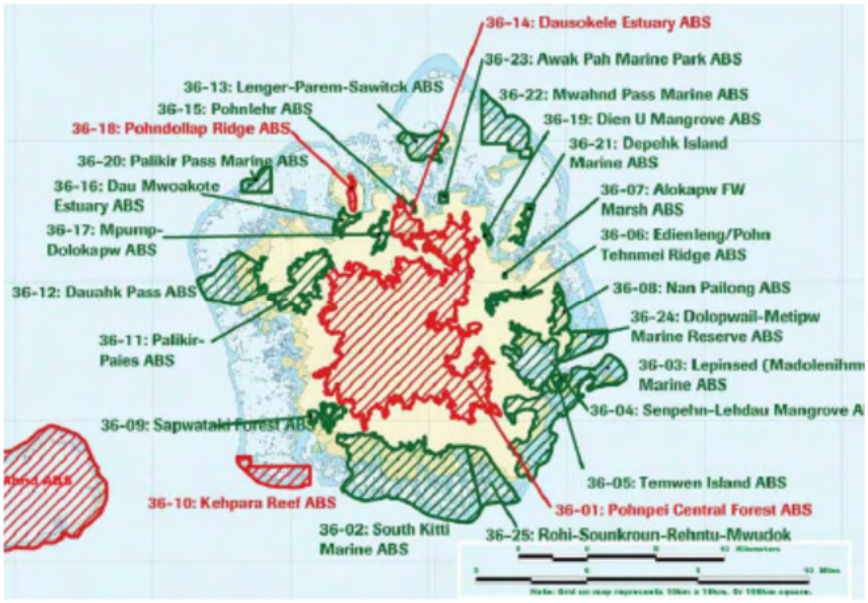


Figure 4-11: Pohnpei existing and proposed protected areas (from Weeks 2015)

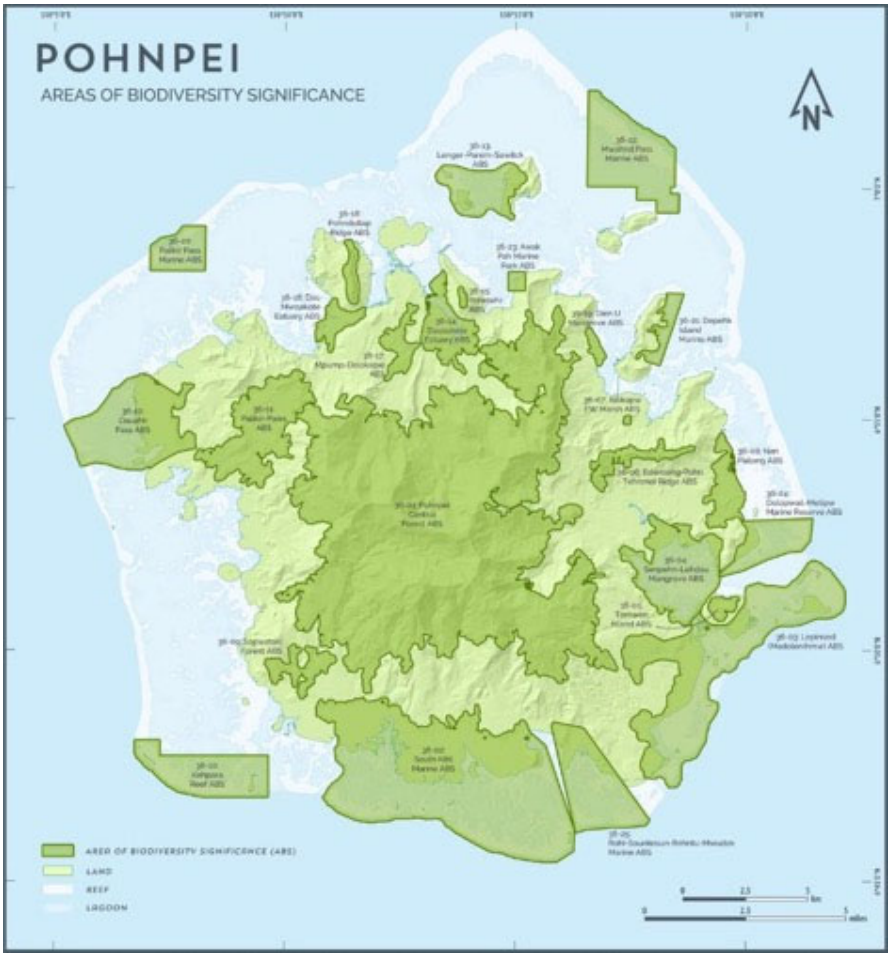


Figure 4-12: Areas of Biodiversity Significance in Pohnpei

4.4 Socio-Economic Environment

4.4.1 Economy

Economic activity consists largely of subsistence farming and fishing and government, which employs two-thirds of the adult working population and receives funding largely - 58% in 2013 – from Compact of Free Association assistance provided by the US. The potential for tourism is limited by isolation, lack of adequate facilities, and limited internal air and water transportation. Pohnpei (and Yap) have been the fastest growing with GDP growth averaging 2% per annum in the FY1987-FY2003 period (FSM Strategic Development Plan, 2003). In the early period FY1987-FY1995 of the Compact growth was strong in Pohnpei which experienced rates of growth of 5.4. The private sector expanded vigorously in both states attaining nearly 9.0% and public sector activity in Pohnpei expanded by 2.3%.

4.4.2 Land Tenure & Access

Ownership of land and aquatic areas varies between States. In Pohnpei, land is both privately and State owned, while aquatic areas are managed by the State as public trusts. With the establishment of a system of chieftainship, all land in a given chiefdom theoretically came under the jurisdiction of the paramount chief. Individuals occupied small farmsteads as tenants. State's Legislature amended its laws in September 2018 primarily due to land issues and traditional land owner disputes.

The Constitution requires the Government of Pohnpei to protect the customs and traditions of Pohnpei and allows statutes to be enacted to uphold custom. However, in the event that a statute is challenged as being in violation of other Constitutional rights "*it shall be upheld upon the Pohnpei Supreme Court's determination that the statute has reasonably protected an existing, regularly practiced custom or tradition.*"

Article XII, § 1 states that "*no lease of land, except from the Government or as provided in Section 4 of this Article, may exceed twenty-five years.*" The right for option to renew and other protections shall be provided by statute

Article XII, § 2. limits ownership of land to a specified class of individuals. The Section states that "t*he acquisition of permanent interest in real property shall be restricted to Ponapean citizens*".

Article XII, § 3 prohibits any agreement that "*grants the user of land the unilateral authority to continue use for an indefinite term."*

Article XII, § 5 prohibits the sale of land "*except as authorized by statue.*

4.4.3 Demographics

Geographical isolation and poorly developed infrastructure are major impediments to FSM's long-term growth. Over the years, agriculture's socio-cultural role as a safety net for the disadvantaged has greatly diminished. Inequality of income and the incidence of families with incomes below the poverty line are among the highest in the Pacific region. Poverty is a concern and FSM has, in general, made only limited progress towards achieving the Millennium Development Goals (MDGs) by 2015.

4.4.4 Gender, GBV and Human Trafficking

The Gender Development Office has progressed implementation of the Pohnpei Domestic Issues Act 2017 and helped to establish the Pohnpei Domestic Violence Act Taskforce. In 2018, the Taskforce committed to implementing the protection order sections in the Act with the Adviser supporting the Pohnpei State Women's Interest Officer to submit a recommendation to the Governor – a significant step. The Pohnpei Police Domestic Violence Unit was formed following training provided by the Department of Health and Social Affairs Family Protection Adviser.

Each of Micronesia's four states has its own laws criminalizing trafficking offenses however, Pohnpei did not explicitly prohibit adult sex trafficking. Cases prosecuted at the state level may be heard subsequently at the national level, under national anti-trafficking law, depending on which court hears a case. In Pohnpei discourse on trafficking has mainly related to the resident fishing fleet. Incidences of prostitution (employment in bars and 'houses') and sexual exploitation (of underage women/girls) have been recorded in the past, however, there is a need to distinguish between the two. General opinion is that the sex-related activities are prevalent, however, this is something that is not reported and not discussed (ESIA, 2017).

Findings from the report assessing gaps in EVAW services (FSM, 2018) are being used to better assist women and children to access services relating to domestic violence including work progressing the reopening of the Pohnpei safe house.

4.4.5 Education

The FSM is eligible for selected US Federal Education Programs that contribute a significant amount to the overall education budget. FSM's only Institute of Higher

Education (IHE) is the College of Micronesia-FSM (COM-FSM) located in Pohnpei. The FSM Education system is composed of the State and National education. The FSM National education provides coordination for development of standards and assessment, reports on the status of education, provides technical assistance, coordinates external funding aid for education, and is responsible to provide support for the post-secondary development of the Nation. Instruction is the responsibility of the State Departments of Education (FSM, 2015).

4.4.6 Health

FSM health services are provided at the state level. Health services provide cost-free primary care for pregnant women and infants including basic and routine high-risk antenatal care, delivery, postnatal care, postpartum family planning counselling and contraceptives; and preventive and primary care for children and children with special needs.

The National Health Progress Report (2008–2011) covers annual monitoring of 14 national health indicators on health status, availability of essential drugs, health care utilization, quality assurance and functionality of biomedical equipment (UNICEF, 2013). Information available suggest that FSM generally, and Pohnpei State individually, have made some progress in addressing violence against women and children but generally lack quality essential services to eliminate violence against women and girls. This is especially the case for women and children with disabilities, those living in rural and remote areas and those made vulnerable by other circumstances e.g., poverty. Pohnpei State now has a Domestic Violence Act and an implementation plan is being drafted.

4.4.7 Fisheries and other industries

The mainstays of the FSM economy and in Pohnpei are subsistence farming and fishing. There is limited tourism due to lack of access and facilities, although it has increased in recent years with the opening of a number of small hotels. Geographic isolation and poorly developed infrastructure are major impediments to FSM’s economic growth and poverty is among the highest in the Pacific region. FSM has, in general, made only limited progress towards achieving the MDG by 2015.

4.4.8 Cultural Values

The traditional culture of Pohnpei, which involves strong land and resource management components, is very much alive today and is still in large a strong influence on Pohnpeians' lifestyle. The traditional system still exists within activities observed throughout the year. Despite Pohnpei being the melting pot of the FSM, where people of various races and from islands throughout FSM reside, the Pohnpei culture is very much practiced and respected by the island residents.

4.4.9 Infrastructure

A total of 29 bridges and causeways have been identified around Pohnpei. The location of these key infrastructural assets is shown in Figure 4-13.

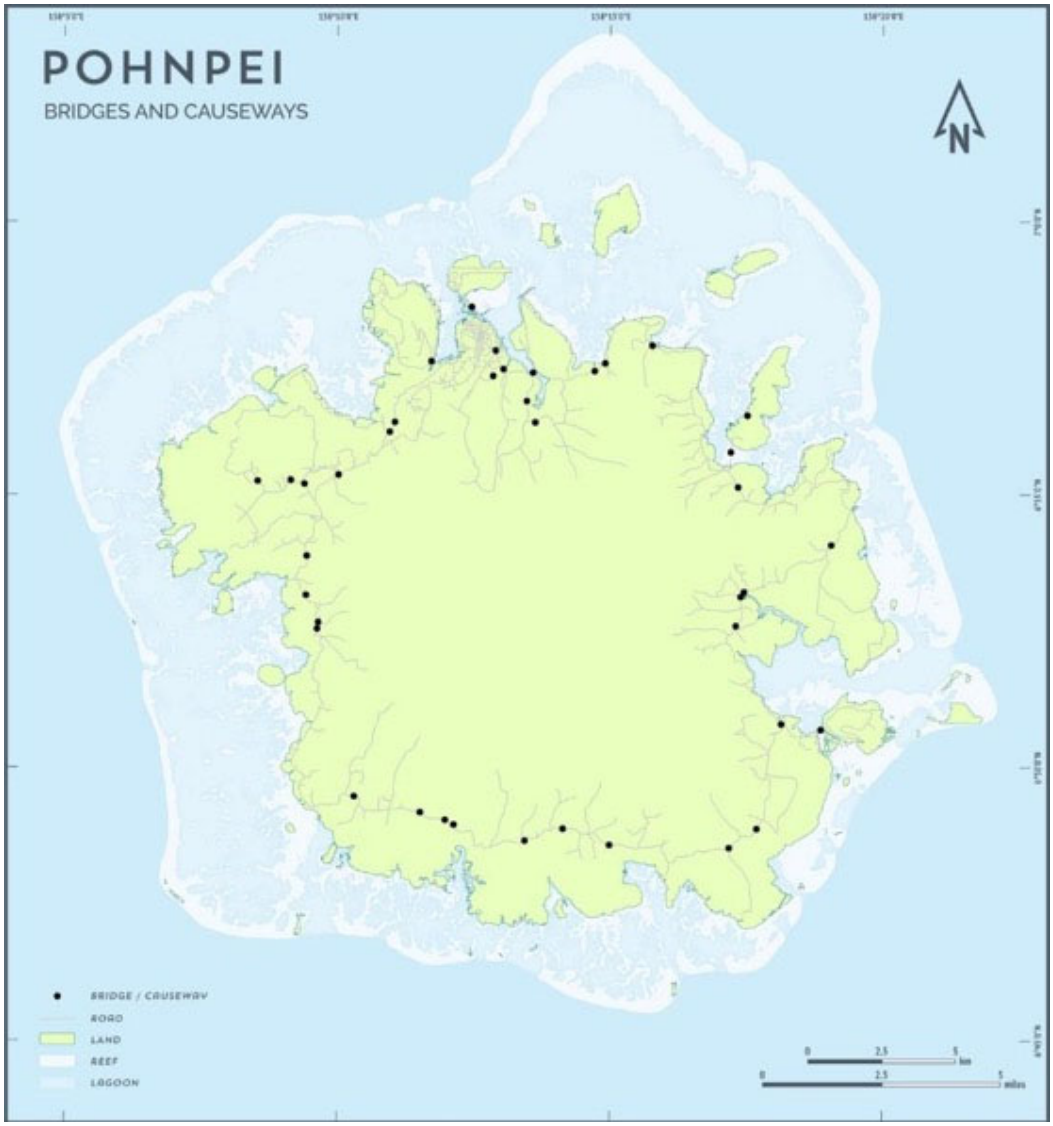


Figure 4-13: Location of bridges and causeways in Pohnpei

Piped water systems from Nanpil River and wells serve populations of 2,500 in Kolonia and Palikir (see

Table 2-16). The Kolonia Central Sewerage System, which consists of about 12 miles of sewers, a total of 7 lift stations and a package sewage treatment plant with a capacity of about a 0.8 million gallons a day. The system has about 1,200 connections. Treated sewage is discharged into the Sokehs harbor through a 12-inch diameter pipeline. The location of the key wastewater network assets are shown in Figure 4-14 and Figure 4-15 and the potable water network is shown in Figure 4-16.

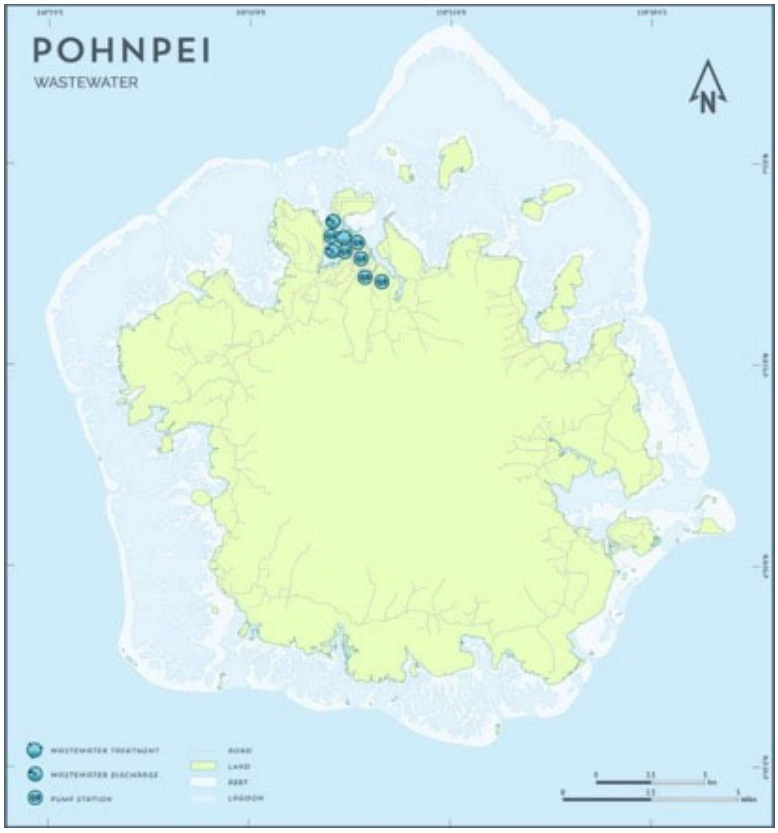


Figure 4-14: Location of wastewater assets in Pohnpei

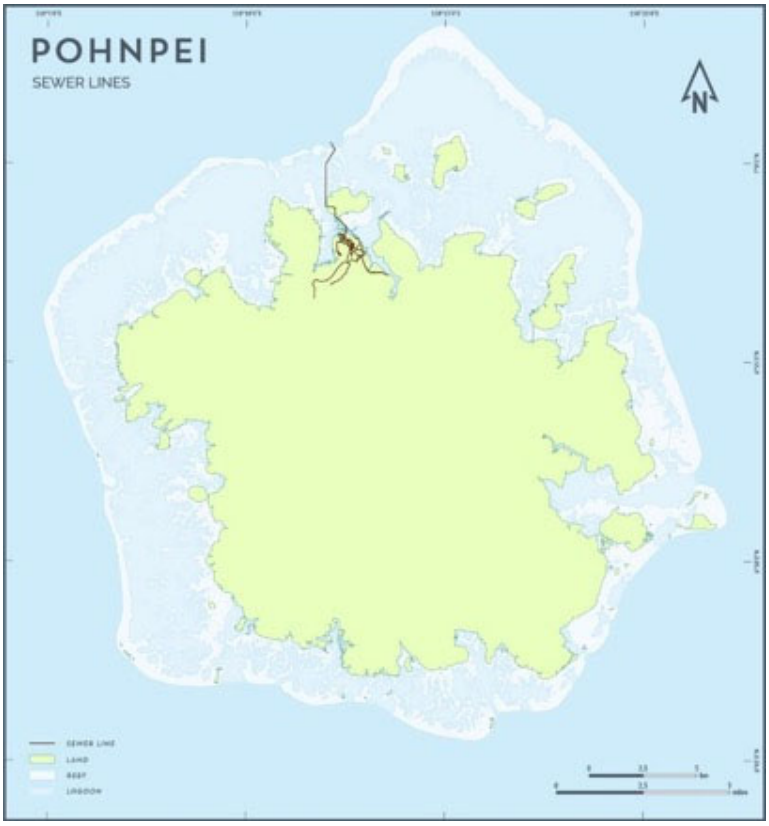


Figure 4-15: Location of sewer lines in Pohnpei

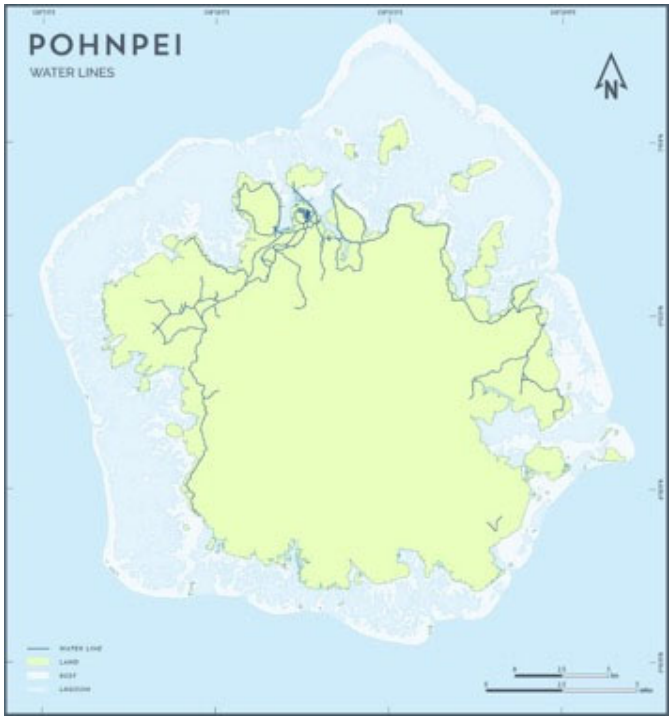


Figure 4-16: Location of potable water lines in Pohnpei

Quarry

Pohnpei has 45 coral sand dredge sites (33 inactive and 12 active) and two rock quarries (Figure 4-17). They all have permits from Pohnpei Environmental Protection Agent (EPA) and are mainly for road maintenance and construction. One of the hard rock quarries is located at Ipwal Sokes and is owned and operated by a company called APSCO (SOPAC 2005) (Figure 4-18).

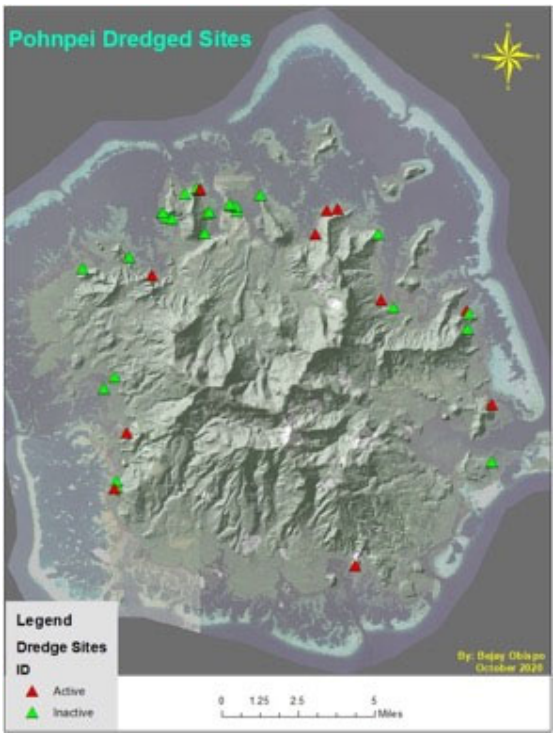


Figure 4-17: Map showing coastal coral 'quarries'

Figure 4-18: Images of quarry sites on Pohnpei

Solid Waste Management

The only solid waste facility on Pohnpei is the dumpsite on Dekethik Island on the east side of the causeway at its northern end (Johnston, 2011). The facility has an operations shed, a battery recovery shed, and separated areas for aluminium can compaction and storage and fuel drum sludge product extraction and storage. The larger portion of the area is used for trash intended for disposal, without recovery efforts. A private company, Pohnpei Waste Management Services (PWMS) provides most trash collection services, although the Kolonia Municipal Government provides collection services for about half the residents and commercial establishments in the town. Further investigation is required to determine whether the solid waste facility has the ability to dispose of any waste roading material generated from the PRIME and SCORE Projects.

4.5 Primary Data Collection

A range of assets located in the road corridor along the primary roads have been identified based on fieldwork undertaken during the PRIME assessment. In addition secondary road that leads to the island which houses the UNESCO cultural and heritage site of Nan Madol was included. A map showing the location of these assets (which includes as private fences/walls and gardens, fruit trees, buildings, bridges/culverts, etc.) and other key resources are provided in Figure 4-19. Appendix B presents further detail on this map. **Error! Reference source not found.** presents examples of these assets. This information has been used to identify E&S sensitivities for the ESMF.

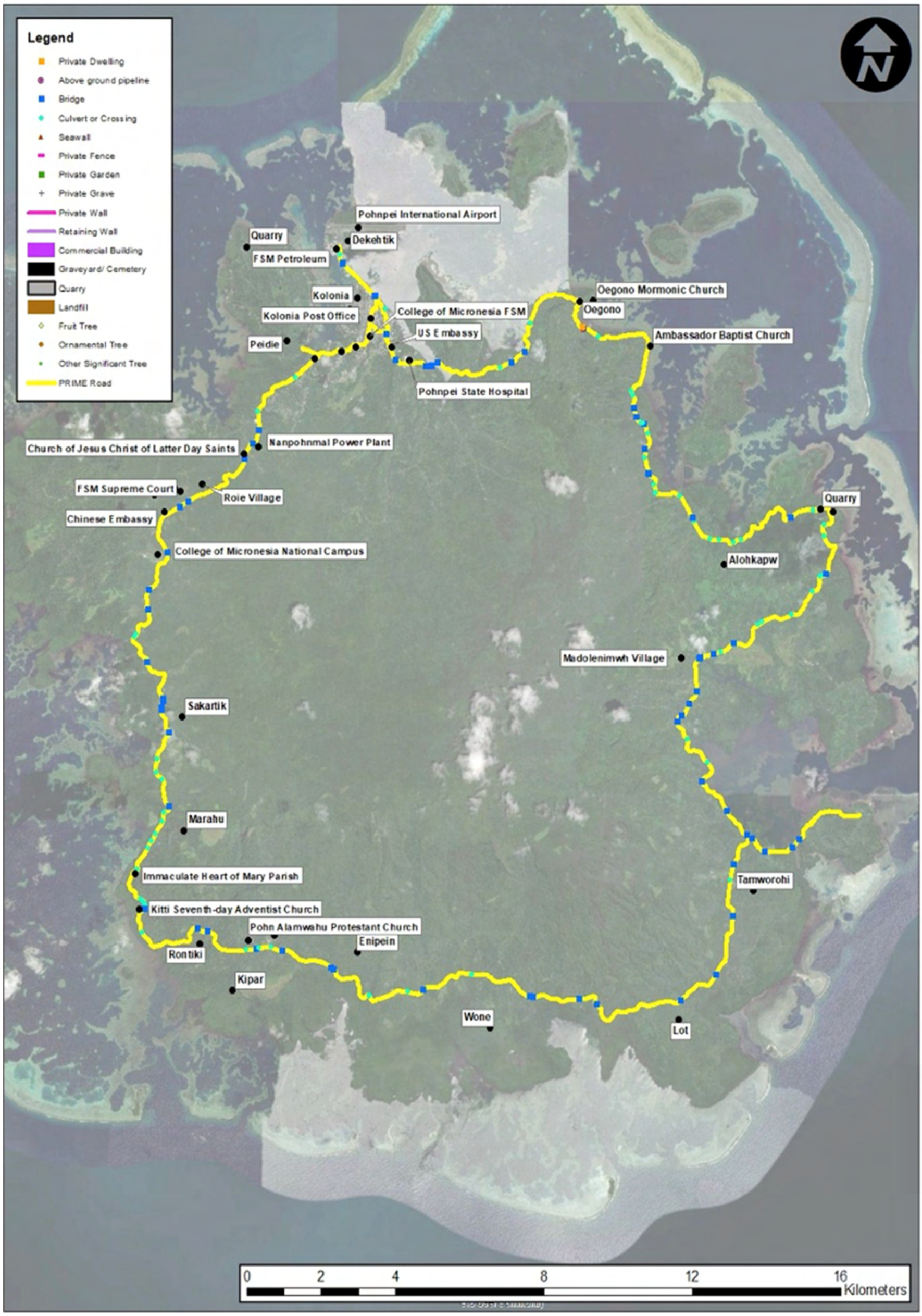


Figure 4-19: Assets within road corridor and location of sensitive social receptors - Pohnpei

Figure 4-20: Images showing examples of PRIME (a-f) and SCORE (g-h) assets located in close proximity to the roads on Pohnpei.

5. Chuuk

5.1 Physical Environment

5.1.1 Climate

Table 5-1Table 4-1: Key climate statistics for Pohnpei including temperature (°C) and rainfall (mm) presents key climate data for Chuuk (from https://en.climate-data.org/). The key point to note is the abundant rainfall Chuuk receives annually (352 cm).

Table 5-1: Key climate statistics for Chuuk including temperature (°C) and rainfall (mm)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Avg. Temperature	27.4	27.3	27.4	27.6	27.6	27.6	27.4	27.2	27.4	27.4	27.5	27.6
Min. Temperature	24.9	24.8	24.8	24.9	24.7	24.6	24.2	24	24.1	24.2	24.5	24.9
Max. Temperature	29.9	29.9	30.1	30.4	30.6	30.6	30.6	30.5	30.7	30.7	30.6	30.3
Rainfall (mm)	228	163	229	295	353	302	361	349	310	355	284	297

5.1.2 Topography, Geology, Soils & Hydrology

Chuuk State comprises a main atoll at Chuuk Lagoon, plus four outer island atoll groups: the Mortlocks (with 11 inhabited atolls or islets) and Oksorod (comprising three groups); Pattiw (having 4 inhabited atolls/ islets); Namonuito (5 inhabited atolls/ islets); and the Halls (4 inhabited atolls/islets). Total land area for all of Chuuk State is 49km^2.

The islands of Chuuk Lagoon are surrounded by a roughly circular barrier reef about 64 km in diameter. There are 19 high volcanic islands within the lagoon, and numerous low-lying coral islets or motu along the barrier reef. Weno (also known as Moen), the most populous of the islands, is the center of government and commerce.

Weno island is of volcanic origin consisting of olivine-basalt with minor andesite, with steep rugged uplands surrounded by coastal lowlands. The highest point on Weno, Mt. Tonoken, is a distinctive peak that rises some 369 m (about 1,000 feet) above sea level.

In terms of soil types, the five key map units can be grouped into two general landscapes for broad interpretative purposes (Laird, 1980).

1. **Coastal mangrove swamps.** Located on coastal strands and bottom lands and comprise 27% of this survey area and include:

    - Chla Insak Variant. Shallow and very deep, very poorly drained, level and nearly level soils in coastal mangrove swamps along the shoreline of many islands which are flooded daily with seawater at high tide. Slope is 0 to 2%.
    - Dublon-Typlc Troporthents (urban land). Very deep, somewhat poorly drained, level and nearly level soils, and urban land on coastal strands along the shoreline of many islands. Slope is 0 to 2%. Elevation is sea level to 2m.
    - Ngerungor. Very deep, very poorly drained, level and nearly level soils on bottom lands on the coastal plains of some islands making up about 6% of the survey area. Slope is 0 to 1%.

2. **Soils on uplands.** The soils in this group are nearly level to extremely steep and comprise about 73% of this survey area. Elevation is 6 to 300m. The soils in this

group are shallow, moderately deep, and very deep and are well drained. They formed in residuum and colluvium derived dominantly from basic igneous rock and include:

- Tolonler-Dolen**.** Very deep, well drained, sloping to extremely steep soils; on uplands. This map unit is in the interior of all islands in the survey area. Slope is 6 to 75%. The vegetation on this unit is mainly mixed forest. Elevation is 6 to 300m. This unit makes up about 65% of the survey area. It is about 60% Tolonier soils and 25% Dolen soils.
- Rocke outcrop Wahrekdam (variant Wahrekdam). Rock outcrop, and shallow and moderately deep, well drained, nearly level to moderately sloping soils; on uplands. This map unit is in the interior of many islands in the survey area. It is mainly on ridgetops. Slope is 2 to 8%. The vegetation on this unit is mainly mixed forest. Elevation is 10 to 300m. This unit makes up about 8% of the survey area.

Chuuk is drained by a number of streams most of them short with small drainage areas. The compacted volcanic material results in a shallow (unconfined) ground water lens.

Household water use within Weno is derived from either captured rainwater (typically through a roof-gutter system that feeds a large storage tank) or groundwater. Rain catchment water is preferred for most domestic purposes such as drinking and cooking, whereas groundwater, typically accessed through hand-dug wells lined with concrete or rocks, is used for bathing and washing clothes.

5.1.3 Coastal Erosion Hazards

Figure 5-1 presents an image showing areas of concern in relation to coastal stability in Chuuk based on ArcGIS data provided by Chuuk Environmental Protection Agency (EPA). Key areas considered to be of high coastal instability are primarily located along the northern (including Pou Bay) and south –eastern coastlines.

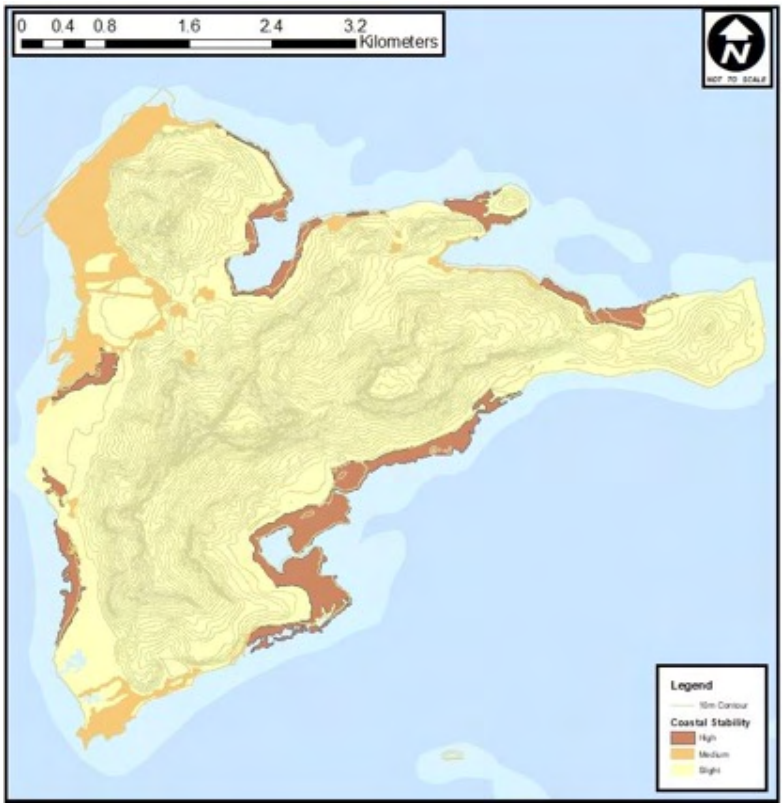


Figure 5-1: Coastal stability areas in Chuuk

5.2 Ecology

5.2.1 Terrestrial Ecology - Flora

Vegetation Types

Table 2-2 presents a summary of general vegetation types found in Chuuk. Key habitat sensitive to development disturbance as a proportion of total area ranges includes mangrove (7%), upland forest (16.2%) and marsh (5.6%) (from FSM, 2001).

Plant Species

A total of 470 species of ferns and flowering plants have been described in Chuuk. Approximately 298 species are native including about 45 species of ferns, 95 monocot species and 158 dicot species (Falanruw, 2002) (Table 2-3).

A total of 172 species of plants have been introduced to Chuuk (Zirkus, 2001). Some of these introduced species have become invasive pests (Table 2-4) and, of the key 11 invasive weed species in FSM, 8 are present in Chuuk including the widespread Siam weed *Chromolaena odorata*, *Merremia peltata* and *Wedelia trilobata* (FSM, 2002).

5.2.2 Terrestrial Ecology - Fauna

A range of avian, mammalian, reptilian species are present in Chuuk including 73 species of bird (including 17 native species, 21 resident and non-resident seabirds, 33 migratory shorebirds, and 2 introduced bird species) (Table 2-5). A number of mammals (including bats), reptiles (skinks, geckos, snakes), amphibians and freshwater fish are also likely to be present.

5.2.3 Coastal Marine Ecology

Recently collected data describing coastal marine habitats around Chuuk is currently being processed by Chuuk EPA and wasn't available at the time of wiring of this report. A review of existing information indicates that a total of 4 species were identified in a 2004 survey (see www.seagrasswatch.org).

5.2.4 Conservation Areas

Figure 5-2 presents designated protected / managed areas in Chuuk.

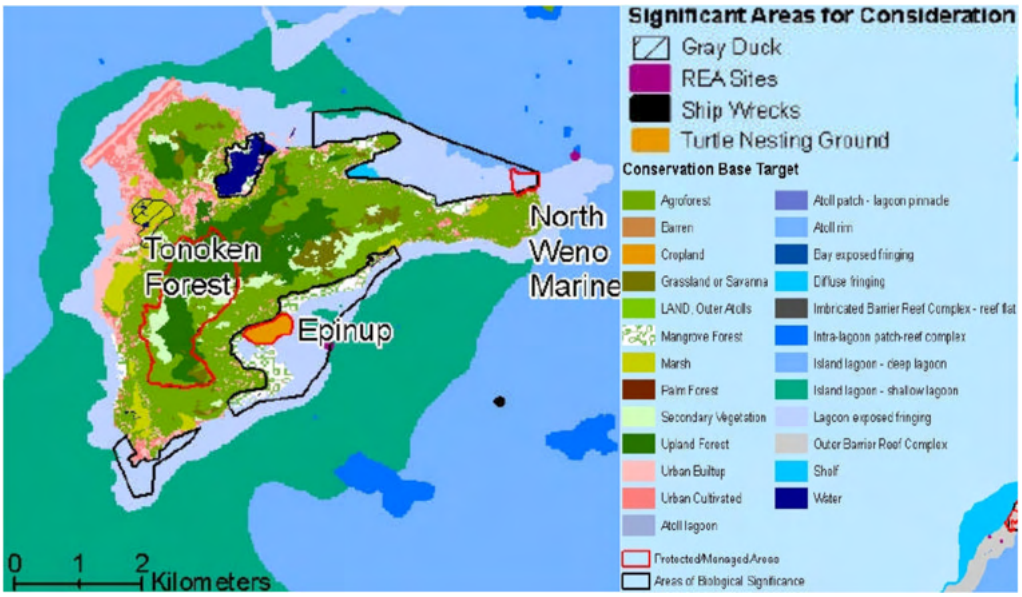


Figure 5-2: Chuuk conservation areas (FSM 2010)

A total of 50 Areas of Biodiversity Significance (ABS) have been identified for Chuuk including terrestrial (9), marine (10), coastal marine (20) and coastal freshwater sites (11) (Conservation Areas

Each State has a network of currently and proposed terrestrial and marine protected areas. In addition, 130 Areas of Biodiversity Significance (ABS) have also been identified in FSM (**Error! Not a valid bookmark self-reference.**) (TNC, 2019). The location of these areas in each State is described in detail in the following sections.

In summary, the combined sites encompass 291,753 hectares (ha) or 19% of the FSM's entire terrestrial and inshore area (including reefs and lagoon areas). Because the land area of FSM is very small, 50% of the ABS (64 sites) and a majority of the total area (61% or 178,191 ha) are coastal marine sites connecting terrestrial and coastal targets.

Marine-only sites, largely lagoons and coral reefs, comprise the second largest area at 28% (82,620 ha) of the total ABS area. Terrestrial sites, mainly upland native forests, make up just 8% (22,636 ha) of total ABS area, but total 23 sites. This reflects the relatively limited extent of natural terrestrial systems on small Pacific islands compared with the much larger marine systems surrounding them. Coastal freshwater areas, primarily coastal freshwater marshes, total just 3% (38,133 ha) of the total ABS area.

5.3 Socio-Economic Environment

5.3.1 Economy

Overview FSM GDP

The National Government, for the fourth consecutive year, showed a significant fiscal surplus of $35.8 million FSM's gross domestic product (GDP) was US$1.13b, or US$3,500 per capita, in 2015. In that year there as a trade balance deficit of US$314 million, with exports at US$20.6 million (-17.8% annualized) and imports at $162 million (+15.8% since 2010) (OEC 2017). National government revenue was at its highest level ever at $166.1 million in FY2017 when both domestic revenue and external grants reached record levels. Public Law 18-107 in FY2015 amended the tax collection allocation to the States from 50 percent to 70 percent of net taxes collected for import taxes, income tax, and gross revenue tax.

The impact of this tax policy change sees a $4.8 million decline in tax revenue for the National Government from FY2016 onwards. This revenue has not been passed directly to the States but by law is invested in the FSM Trust Fund on their behalf. It is estimated that $40 million will be invested in the Trust Fund on behalf of the States by 2023.

Table 2-8). The key ABS sites on Weno are Pou Bay and the North Weno Marine ABS as shown in Figure 5-2.

5.4 Socio-Economic Environment

5.4.1 Economy

In 2003 Chuuk's GDP was $83 million (Arnold, 2016). Chuuk then experienced a recession for the next 5 years following inception of COFA II. By 2008, Chuuk's GDP was $67 million the lowest since the 1980s due to a decline in public sector spending and private sector activities. After 2008, Chuuk State saw a rise in GDP due to the improvement of the sectors grants allocations. Chuuk State had adopted and implemented the Long Term Fiscal Framework requirements which allowed full utilization of funding sources from Compact II. By 2010, Chuuk had experienced 3% GDP growth and there was an increase in spending from both public and private sectors. Chuuk's economy grew at 1% and it experienced an expansion in the public sector by 4.4% and numbers of hours worked by civil servants increased.

In subsequent years Chuuk has experienced very little growth. Analysts have forecasted the decrease in compact funding ($1.7 million) will hinder government spending with little private sector growth.

5.4.2 Land Tenure & Access

In Chuuk, most land and aquatic areas are privately owned and acquired through inheritance, gift or, recently, by purchase. In early times, land was controlled by matrilineal descent groups or clans that resided in specific locales.

Chuuk State has taken action by passing leasehold mortgage law but has not yet promulgated regulations to implement the law. The extent to which land can be leveraged and mortgaged is important for increasing productive activity and incomes. Land assets that become locked outside the modern market economy cannot be leverage or redeployed for production. The overall effect is that many landowners are asset rich and income poor.

Article IV, § 4 provides recognition for traditional rights over reefs, tidelands, and other submerged lands, including their water columns, and successors rights thereto. It also authorizes the State legislature to regulate their "*reasonable use*." This Section strengthens customary land use practices in marine areas and is unusual in that it does not reference dry land areas. Sections 1 and 2 of this Article give authority to Chuukese custom and tradition as well as to the traditional leadership.

There are a number of provisions of the Chuuk State Constitution that indirectly affect land tenure. Most of these references bolster customary land tenure practices. In various ways, these references also influence the land tenure on Chuuk by limiting land use activities identified as environmentally harmful.

Article IV, §§ 1–2 strongly supports traditional and customary rights to the extent that even the bill of rights (Article III) may be compromised for the protection of Chuukese custom and tradition where a compelling social purpose is evidenced.

Article VII, § 14 supports the traditional culture of Chuuk requiring court decisions to be consistent with the Constitution, local traditions and customs, and the social and geographical configuration of the State.

5.4.3 Governance

Chuuk State is the only state in the FSM that has a bicameral legislature (House of Senate & Representative). There are 10 Senate members, two of whom represent a region - five regions all together. The House of Representatives aka 'House' has 28 members. They are elected by their respective districts. There are 13 districts with number of representatives depends on population size. All together there are 28 members.

Chuuk State has 40 municipalities with their own municipal government. Each municipality has an elected mayor act as the executive side. Legislative side is with the municipal council. Each habitable island in Chuuk has a Traditional Leader known as "Soupun and or Makal' who comes from a clan that rules the island. These Soupun and or Makal are equivalent to Chief of an island. Chuuk State has a council of traditional leaders composed of 42 active members. This council is a strong hold of customs and traditions therefore are the decision makers of such matters

5.4.4 Demographics

Chuuk State, population 53,106, also includes several additional sparsely populated outer island groups, including the Mortlock Islands to the southeast, the Hall Islands (Pafeng) to the north, Namonuito Atoll to the northwest, and the Pattiw Region to west The population of Chuuk State is (approx. 47% of FSM's total population. The main population centre of Chuuk State is the Chuuk Lagoon which has a population of 36,158 and includes FSM's largest city, Weno which has 12,000 people (2010, Census). Chuuk has a population density of 993 per square mile (383 per square kilometre), which is the highest density compared to other states. Chuuk also has a younger population on average than the other FSM states.

The Pattiw Region is of particular interest in that it contains some of the most traditional islands in the Pacific which are culturally related to the outer islands of Yap. Most of the roads and transportation systems are poor or in disrepair. Potholes in the coastal road of the business district of Chuuk are often filled with either saltwater at high tide or runoff that cannot drain due to the low elevation. Drinking water is un-potable (FSM, 2017). A large part of Chuuk State still rely heavily on subsistence base living. Food grown on land and

in the ocean are still big part of their source of food. Kon, a pounded breadfruit able to be eaten for a week long is a popular source of starch for many Chuukese.

5.4.5 Gender, GBV and Trafficking

The Chuuk Women's Council is the only non-government organisation in FSM providing GBV counselling services. Findings from the report assessing gaps in EVAW services (FSM, 2018) are being used to better assist women and children to access services relating to domestic violence. This includes the launch of the Chuuk Women's Council GBV counselling service.

Each of Micronesia's four states have its own laws that criminalize trafficking offenses however Chuuk State did not explicitly prohibit adult sex trafficking. Cases prosecuted at the state level may also be heard at the national level, under national anti-trafficking law, depending on which court hears a case. Each of the four states' anti-trafficking task forces are comprised of members of state and national law enforcement, the legal community, medical and mental health professionals, immigration officials, and women's empowerment and faith-based groups; only Chuuk (and Pohnpei's) task force were active during the reporting period.

5.4.6 Education

State governments in FSM have responsibility for education, with the majority of funds coming from Compact of Free Association sources. All children in FSM are required by law to attend school through to eighth grade, and many continue to college after graduating high school. As a result, FSM has a high literacy rate. All students learn English as it is the official language of FSM. The National Infrastructure Development Plan earmarked USD$135.4 million for education infrastructure spending across the 20 years between 2004 and 2023.

The Plan describes issues relating to education infrastructure including poor maintenance (including failure of water and power supplies); a number of schools in a highly deteriorated state; a shortage of supplies includes furniture, equipment, books and tools; a lack of diverse facilities (such as music rooms, auditoriums, vocational training facilities); inadequately qualified teachers; inappropriate school curricula; and a lack of vocational training. Grants and US education programs are used to support many FSM students to attend the College of Micronesia (COM), the University of Guam and US colleges.

5.4.7 Health

The primary health challenges affecting FSM include obesity induced illness and increasing substance abuse amongst youth. FSM has been declared as a Public Health Emergency for Non-Communicable Diseases (70% of all deaths are due to NCDs). Most of the divisions of the Chuuk Department of Health share some common challenges. The Chuuk State Department of Health Services (CSDHS) 6 divisions: Hospital & Management, Nursing, Dispensary, Public Health, Dentistry and Environmental Health and Sanitation (Chuuk Strategic Development Plan).

5.4.8 Infrastructure

Water Supply

The Chuuk Public Utility Corporation (CPUC) operates the public water supply on Weno Island, serving 378 residential customers (around 19% of total households) and 101

commercial and government customers (IEE, 2020). Figure 5-3 presents a map showing the water supply network.

Sewerage Network

The Weno sewerage network, the only centralized sewer system in Chuuk is located on the north and north-western side of Weno Island and was commissioned in 1973. Figure 5-4 presents a schematic of the sewerage network.

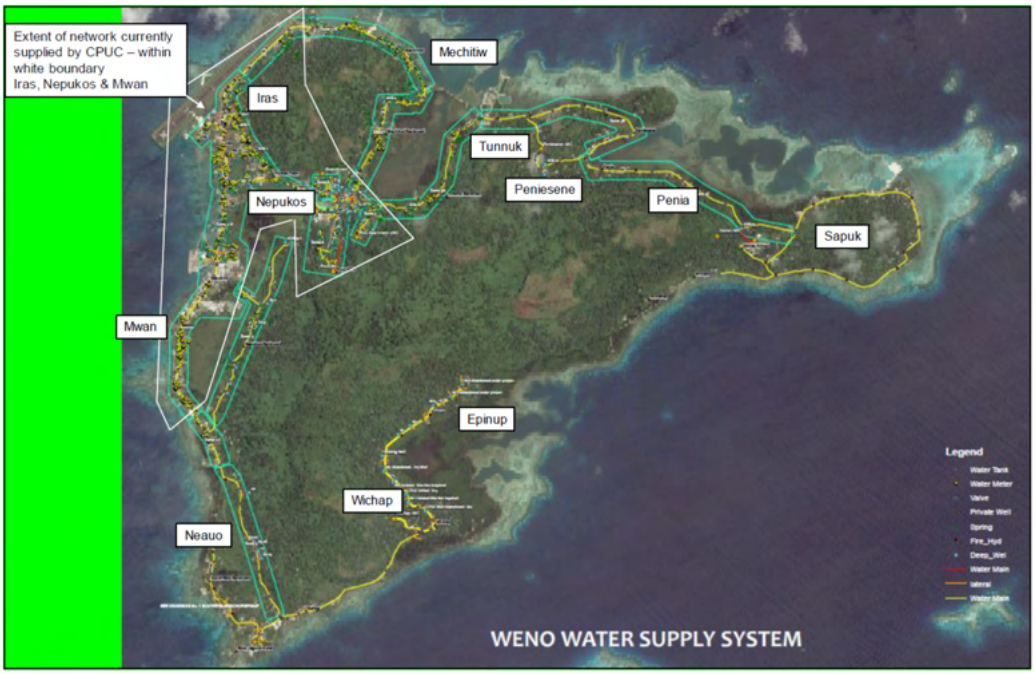


Figure 5-3: Extent of CPUC Water Supply Network (from IEE, 2020)

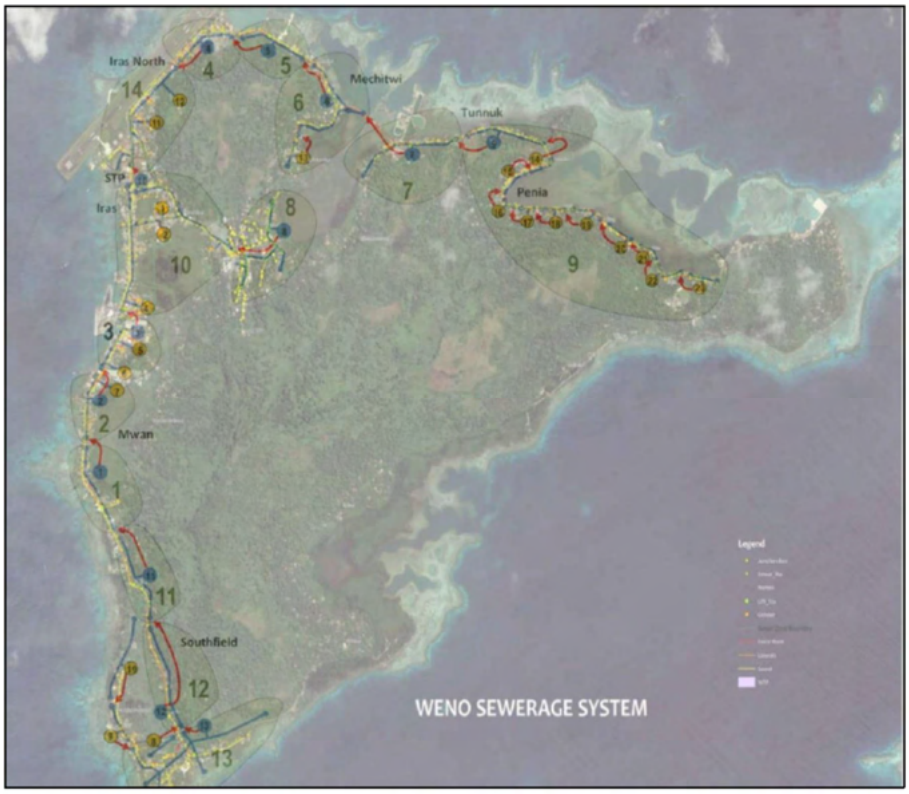


Figure 5-4: Schematic Layout of Sewerage System (from IEE, 2020)

The sewerage network is operated by CPUC with 384 residential households and 106 commercial and government customers. Sewage is treated at the Weno wastewater treatment plant (WWTP) which is located next to the Weno airport.

Beyond the sewerage network service area, septic tanks and pit toilets are widely used, particularly among poor communities. Septic tank and pit toilets discharge sewage randomly into shallow aquifers and contaminate Weno's groundwater sources.

Quarry

There are three basalt quarries located on Weno, Chuuk, two of which have not been in operation since the 90s. One of the sites has equipment and is still in operation but output is extremely limited.

There is also a basalt Quarry on Tonoas, Chuuk. Equipment and site are ready but not yet operational. Output Capacity is still unknown.

There are also three coral sand quarries on Weno, Chuuk. All sites are operational but capacity is limited. Equipment consists of excavators, loaders and dump trucks only.

It is considered that none of these sites could be considered to be used for any major project unless the Contractor is able to take over operations.

Solid Waste Management

Solid waste facilities on Weno consist of the Fanipat dumpsite located on the southwest coast (Johnston 2011). The Department of Public Works has the responsibility of solid waste management. There are also several unofficial dumpsites along Weno roads. Trash collection is scheduled three times a week, but is reportedly not reliably operated.

Further investigation is required to determine whether the solid waste facility has the ability to dispose of any waste roading material generated from the PRIME and SCORE Projects.

5.5 Primary Data Collection

A range of assets located in the road corridor along the PRIME and SCORE Roads have been identified based on fieldwork undertaken. A map showing the location of these assets (which includes as private fences/walls and gardens, fruit trees, buildings, bridges/culverts, etc.) and other key resources are provided in Figure 5-5. Appendix B presents further detail on this map. **Error! Reference source not found.** presents examples of these assets. This information has been used to identify E&S sensitivities for the ESMF.

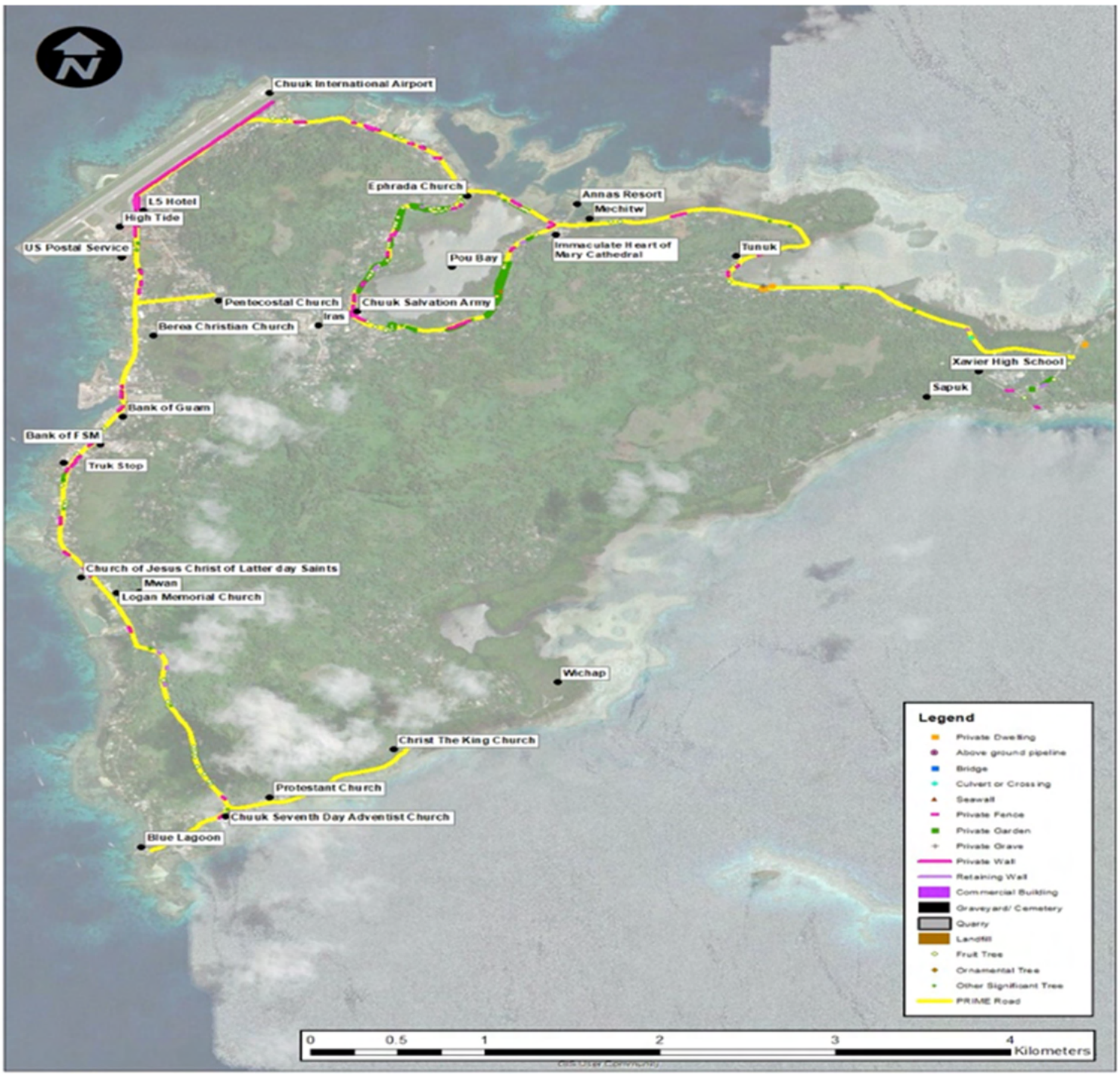


Figure 5-5: Assets within road corridor and location of sensitive social receptors - Chuuk

Figure 5-6: Images of Chuuk showing examples of PRIME (a-f) and SCORE (g-h) assets identified during the road corridor on Chuuk assessment.

6. Yap

6.1 Physical Environment

6.1.1 Climate

presents key climate data for Yap (from https://en.climate-data.org/). The key point to note is the abundant rainfall Yap receives annually (282 cm).

Table 6-1: Key climate statistics for Chuuk including temperature (°C) and rainfall (mm)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Avg. Temperature	26.8	26.9	27.1	27.5	27.5	27.4	27	27.1	27.3	27.3	27.2	27
Min. Temperature	23.6	23.7	23.8	24.1	24.1	23.9	23.6	23.7	23.8	23.7	23.8	23.8
Max. Temperature	30	30.1	30.5	31	31	30.9	30.5	30.6	30.8	30.9	30.7	30.3
Rainfall (mm)	201	146	146	149	232	313	360	371	330	319	238	24

6.1.2 Geology, Topography, Soils & Hydrology

The Yap Islands comprise an island arc system on the eastern convergent margin of Philippine Plate. They are composed of continental crust and consist of two distinct sequences: ancient weathered volcanic rock and weathered metamorphic schists, accompanied by coral sand and mangrove mud. The islands are surrounded by a broad fringing barrier reef. Yap itself has a low undulating topography with a maximum elevation of 178m at Mount Taabiywol in Fanif municipality.

There are four main soil types on the Yap Islands (FSM, 2010) that have been derived from the basement rocks (Figure 6-1) as follows:

- **Yap –** '*Very deep, well drained, level to moderately steep soils; on dissected volcanic plateaus*' This soil type is present throughout the islands of Yap and Gagil-Tamil where it has been derived from volcanic rock. The surface soils are loamy and subsoils consist of clay.
- **Gagil** - '*Very deep, well drained, nearly level to steep soils; on hills and plateau*'. This soil type is restricted to the islands of Gagil-Tamil and Yap. On Gagil-Tamil it is present throughout the island whereas it is confined to a small area on southern Yap. Gagil soil occurs on rounded hills that are actively eroding in drainage lines on rounded hills and on plateau. Similar to Yap soils this soil type is derived from volcanic rock. The surface soils are loamy and subsoils are clay.
- **Rumung-Weloy** – '*Shallow and moderately deep, well drained, nearly level to very steep soils; on hills and mountains*'. This soil type occurs on the hills and mountains of the islands of Yap and Rumung. These soils are shallow and well drained and are formed from the underlying schist. The surface is gravelly (from the presence of iron coated schist gravel) and loamy and the subsoil is very gravelly and clayey. Weloy soils also occur on hills and mountains and are similar to Rumung soils in that they are derived from the underlying schist but differ in that they are deeper but are still gravelly and loamy.
- **Gitam** – 'Moderately deep, somewhat poorly drained, level to strongly sloping soils; on top slopes and upland plains'. This soil type is present on the islands of Yap,

Maap, Gagil-Tamil and Rumung. These moderately deep soils have formed from the underlying schist. The surface is covered with gravel. The surface layer is gravelly and loamy over clayey subsoils.

Areas of depositional soils are also present including beach deposits fringing the islands and alluvium, mangrove peats, freshwater swamp and marsh deposits. The sandy beach deposits which occur adjacent to coastal beaches have formed from wind and water deposited coral sand.

Alluvium derived soils occur in valley bottoms and floodplains and are comprised of weathered and eroded material from volcanic rock and schist which has formed soils ranging from loams with gravels to clays. Freshwater marshes and swamps have formed on low lying poorly drained areas of alluvium. Most agricultural activity is undertaken on the alluvium soils in valley bottoms and floodplains.

Mangrove peats which have formed in the intertidal zone adjacent to the shoreline are present on Yap, Maap and Gagil-Tamil. The mangrove peats are saline, very deep and poorly drained and are predominantly derived from mangrove roots and litter.

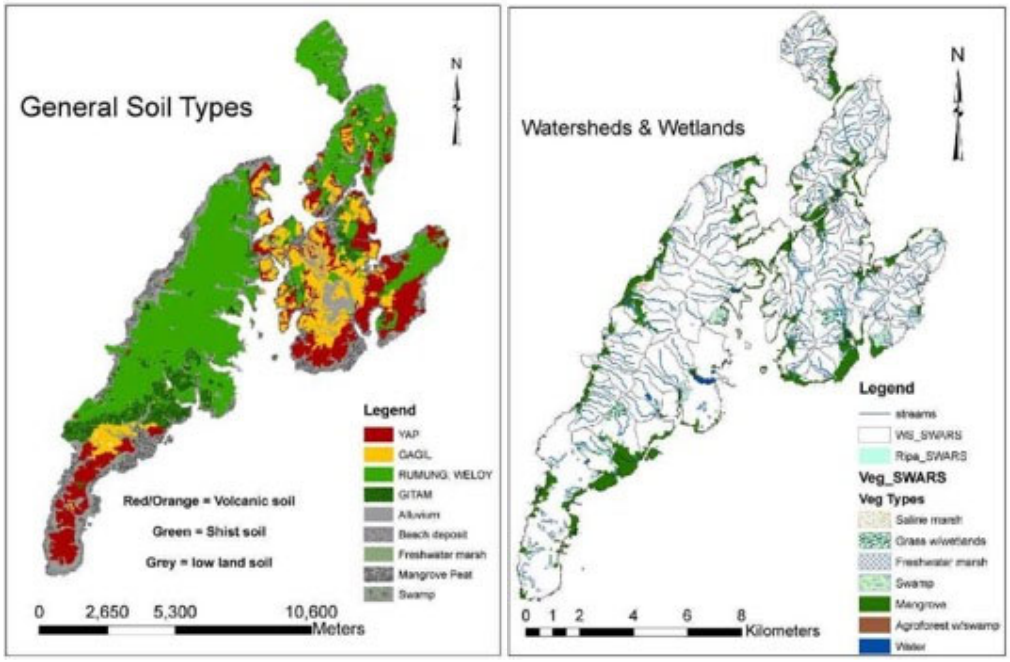


Figure 6-1: Soil types (left) and watersheds & wetlands (right) of Yap (IEE, 2019)

6.1.3 Hydrology

Surface water

The primary freshwater source on Yap proper is surface water (Figure 6-1). There are no perennial streams on Yap where most streams will be dry during part of the dry season, ranging from a few days to several months. The streams go dry because they have small drainage areas and the water retention of the soil and rock of their watershed is low. Mukong Stream and Tomil-Gagil streams are a few of the streams that do not dry up during periods of low rainfall. A large water reservoir on Yap proper was constructed to capture surface water in the stream drainage to the ocean.

The geological formation of Gagil-Tamil allows greater percolation of water to groundwater, and subsequent release to streams during long periods of dry weather. In addition, the drainage area of Mukong Stream is much larger than any stream on Yap proper.

Groundwater

A proportion of the surface water percolates into the soils recharging groundwater which eventually escapes as small springs or seeps directly into the ocean. However, given the bedrock on Yap is metamorphic and volcanic, it yields little groundwater for use.

6.2 Ecology

6.2.1 Terrestrial Flora

Vegetation / Habitat Types

Figure 6-2 presents a vegetation map for Yap and

Table 6-2 estimated coverage of key vegetation / habitat types. The major land class/habitat types are:

- Non-forest (28%) including grasslands, marshes, savanna grasslands, cropland, degraded sites and areas developed for urban use.
- Agroforest (26%) which includes areas under cultivation for food crops, fruit, wood, and other products. The dominant species on these managed lands include coconut palm, breadfruit, betel nut, papaya, banana, cassava, two species of taro, and a variety of medicinal and ornamental species (Mueller-Dombois & Fosberg, 1998).
- Secondary vegetation (6%) such as vines, shrubs, and small trees on recently disturbed areas.

The vegetation of Yap has been greatly modified; other than mangroves, little native forest remains (Figure 6-3). Several factors have contributed to disturbance to the native vegetation including pressure on natural resources to produce food, Japanese agricultural practices, droughts, and repeated burning. A combination of these factors are thought to have contributed to the destruction of the native vegetation and the development or expansion of savanna areas of degraded soils (Falanruw et. al., 1987).

Nothing is known of the original vegetation of the area and very little is known about the character of the vegetation prior to European contact (Zirkus, 2001). Yap is thought to have been mostly covered with broadleaf deciduous forests in the past.

Table 6-2: General vegetation / habitat types on Yap

Major land class/ habitat type	Vegetation/habitat type	Cover in 1976 (ha)	Percent cover
Forest	Mangrove	1,171	12%
	Swamp Forest	155	2%
	Upland Forest	2,556	26%
Agroforest	Agroforest	2,538	26%
Secondary vegetation	Secondary vegetation	553	6%
Nonforest	Grasslands	2,175	22%
	Marsh	165	2%
	Other nonforest	403	4%
Total Area		**9,716**	

Plant Species

Table 6-3 presents approximate numbers of native and introduced flora species in Yap. Of the 1,239 species of ferns and flowering plants found in FSM, approximately 618 occur in Yap including 376 native species (45 ferns, 144 monocots, and 187 dicots). Of the 457 species of plants introduced to FSM, a total of 242 species are found in Yap.

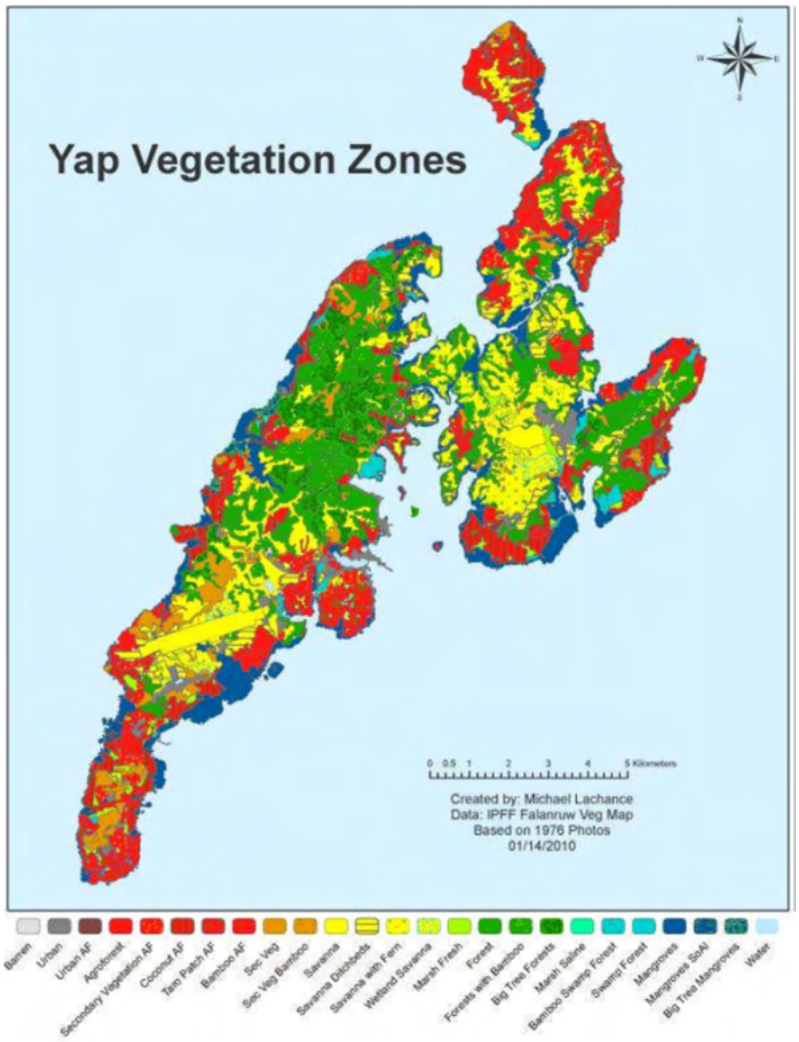


Figure 6-2: Vegetation map of Yap Islands (FSM 2010)

Table 6-3: Approximate number (and % of total) of native and introduced flora species in Yap.

	Native	Introduced	Total
Ferns	45 (12%)	2 (1%)	47 (8%)
Monocots	144 (38%)	64 (26%)	208 (34%)
Dicots	187 (50%)	176 (73%)	363 (59%)
Total	376	242	618

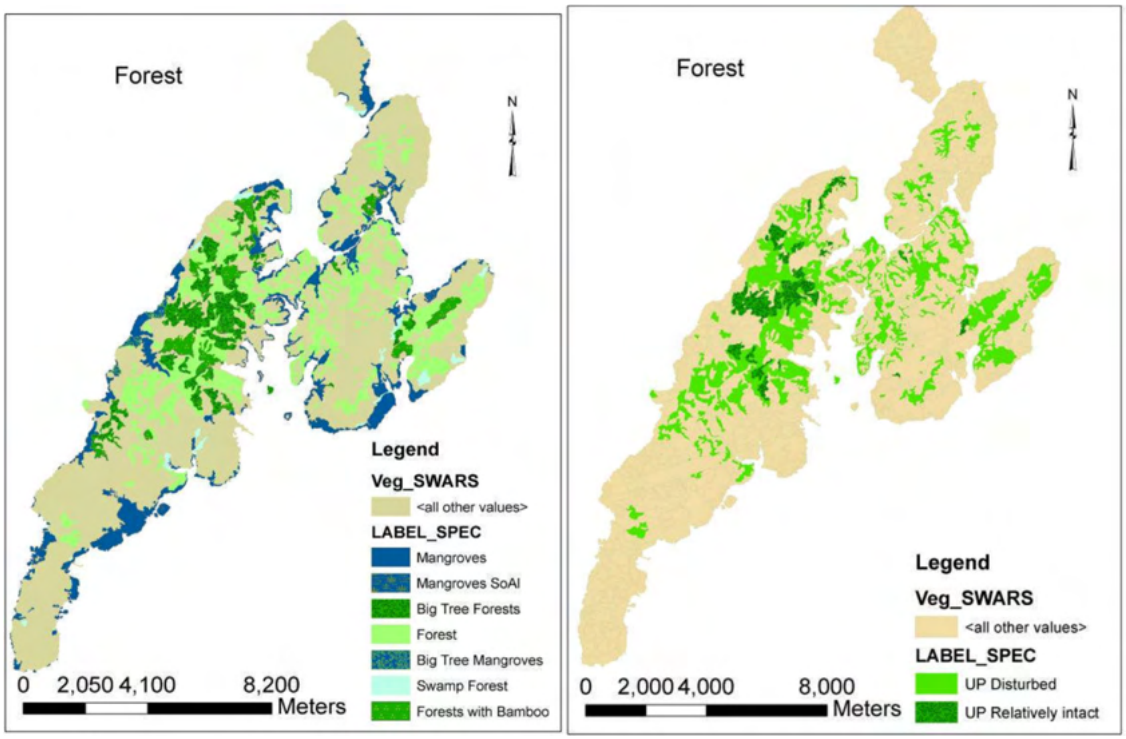


Figure 6-3: Areas of native forest including mangroves (in blue) and terrestrial forests including disturbed forests (left) and areas of relatively intact native forest (right) (from FSM, 2010).

Rare, regionally significant or protected flora species.

There are four threated (one 'Endangered' and three 'Vulnerable') and one "Near Threatened' (NT) floral species in Yap (see

Table 6-4) (IUCN, 2018). Of these species, one species (NT) is not endemic to Yap but instead a cultivar from the islands of Pohnpei and Chuuk (the Ivory nut palm *Metroxylon amicarum*).

All of the threatened species are trees with two (thorrot *Intsia bijuga* and lach *Pterocarpus indicus*) found in lowland forest, one (*Pericopsis mooniana*) from coastal forest and one (faltir *Cycas micronesica*) from closed forest.

Of the 364 vascular plant species considered endemic to Micronesia (Costion & Lorence 2012). Yap has nine endemic plant species, another two also found in either Chuuk or Pohnpei, with a further 16 endemic species found across the Western Carolines (Palau, Yap) (see Table 6-5). In addition, 17 endemic species are found across the Carolines, including Yap and there is a boxlike shrub, *Myrtella bennigseniana*, also endemic to the savanna environments of Yap and Guam (Zirkus, 2001 & USFS, 2010).

6.2.2 Terrestrial Fauna

Rare, regionally significant or protected fauna species

Yap contains four endemic bird species: the Yap cicadabird (*Coracina tenuirostris nesiotis*) which may be elevated to a separate species and is considered to be 'Endangered', and three 'Near Threatened' species, the Yap monarch (*Monarcha godeffroyi*) and two white-eyes (Yap Olive White-eye *Zosterops oleagineus*) and Yap Plain White-eye Zosterops hypolais) (

Table 6-6) (IUCN, 2018).

Table 6-4: Threatened or near threated flora species of Yap.

Common name	Scientific name	IUCN Category	Comments	Habitat
"faltir"	*Cycas micronesica*	Endangered	Population decreasing. Plants occur on Palau Island and on Guam and Rota Islands of the Marianas group and on Yap Island of the Caroline Islands group	Shrub to tree that occurs in closed forest on coral limestone or coral sand, or occasionally on volcanic soils on islands where these occur.
"thorrot"	*Intsia bijuga*	Vulnerable	Throughout Micronesia, native from Indian Ocean east to Polynesia. Produces one of the most valuable timbers of South East Asia	Lowland rainforest tree (growing up to 25m tall), often found on sand and coral beaches, but also in periodically inundated localities further inland. It also occurs in dryland mangroves.
	Pericopsis mooniana	Vulnerable	Found in Indonesia (Sulawesi - rare, Papua, Jawa, Sumatera, Maluku, Kalimantan); Malaysia (Sabah - almost extinct, Peninsular Malaysia - rare); FSM (Yap, Pohnpei); Palau; Papua New Guinea - possible extinct; Philippines; Sri Lanka	A fairly large tree mainly found scattered within coastal forests
"lach"	*Pterocarpus indicus*	Vulnerable	Widespread in tropical Asia, Malaysia, and the Philippines. Indigenous to western Carolines (Yap, Palau), planted and naturalized in eastern Carolines (Kosrae, Pohnpei, Chuuk)	Found in lowland primary and some secondary forest, mainly along tidal creeks and rocky shores. Occurs at a wide range of altitudse from 600 to 1,300 m above sea level
Ivory nut palm	*Metroxylon amicarum*	Near Threatened	This species is endemic to the islands of **Pohnpei and Chuuk**, but now planted occasionally throughout Micronesia.It also occurs on Guam, but the lack of local name indicates that it is probably not a native species.	A few trees have been planted in moist areas in Yap. Occurs from sea level up to 550 m asl.

Table 6-5: Endemic plant species of Yap.

Species	Distribution	Form	Notes
Endemics limited to Yap			
Casearia cauliflora	Yap	Tree	
Drypetes carolinensis	Yap	Tree	
Drypetes yapensis	Yap	Tree	
Garcinia volkensii	Yap	Tree	
Hedyotis cushingiae	Yap		Occurs in open savannas, clearings, and under the forest canopy
Pandanus japensis	Yap	Tree	Do well along the coast and in poor soils but can occur in all habitats
Psychotria arbuscula	Yap	Shrub	
Timonius albus	Yap	Tree/shrub	
Trichospermum ikutai	Yap	Shrub	

Other birds endemic to FSM are also present in Yap including the Caroline Reed-warbler, *Acrocephalus syrinx* and the Caroline Swiftlet *Aerodramus inquietus*.

Table 6-6: Restricted-range and threatened birds of Yap (BirdLife International, 2018, IUCN, 2018).

Common name	Scientific name	IUCN Category	Occurence	Habitat
Non-migratory species				
Beck's petrel	*Pseudobulweria becki*	Critically Endangered	Only known from Papua New Guinea and Solomon Islands. Has been seen in the Vanuatu archipelago. May occur in FSM as the extent of its breeding range and at-sea distribution is still unknown.	Marine species that is likely to nest in burrows on the slopes of high mountains on larger islands, but may also breed on small islets.
Yap cicadabird	*Edolisoma nesiotis*	Endangered	**Endemic** to Yap. Surveys in the 1980s found the species widely spread but at low density.	Recorded in both forest and savanna habitat, but at four times the density in forest than savanna, and sightings away from forest appear very rare. It is suspected that the species is highly dependent on remaining forest for much of its life cycle, but is likely to roam over relatively large areas.
White-throated ground-dove	*Alopecoenas xanthonurus*	Near Threatened	Known from Guam where it is rare, Mariana islands (uncommon) north of Guam and Yap (uncommon) where the population was estimated at c.195 in 1983.	Inhabits native forest, secondary forest, plantations, introduced tangan-tangan *Leucaena leucocephala* thickets and habitat mosaics including fields, but appears more frequent in native forest than in disturbed habitats. It is largely arboreal; feeding in the forest canopy taking fruits, seeds and flowers.
Yap monarch	*Metabolus godeffroyi*	Near Threatened	**Endemic** to the islands of Yap occurring on Yap, Gagil-Tomil, Rumung (presumably) and Maap, where it is widespread. In 1984, it was estimated to number 26,961 individuals.	Inhabits virtually all forest types including mangroves and secondary growth. Unlikely to be affected by habitat degradation as it is able to utilise the scrubby vegetation which often invades forest-cleared sites.
Yap plain white-eye	*Zosterops hypolais*	Near Threatened	**Endemic** to the four islands of Yap where it is common and in 1984, was estimated to have a population of 86,864 individuals.	Found in nearly all forest and vegetation types, including brushy thickets in open savannas and meadows.
Common name	**Scientific name**	**IUCN Category**	**Occurence**	**Habitat**
Yap olive white-eye	*Zosterops oleagineus*	Near Threatened	**Endemic** to the four islands of Yap. In the 1970s, it could be readily found in any forest area. In 1984, it was estimated to have a total population of 19,619 individuals and was expected to remain common. However, more recently, it appears to have become scarcer.	Widely distributed in all types of forest and woody vegetation, including mangroves, but shows a preference for better-developed forests. Loss of habitat from fire is a threat.
Caroline Reed-warbler	*Acrocephalus syrinx*	Least Concern	**Endemic** to FSM.	Found in subtropical/tropical dry grasslands but has also been recorded in subtropical/tropical moist montane forest and rural gardens.
Caroline Swiftlet	*Aerodramus inquietus*	Least Concern	**Endemic** to FSM and is described as common to abundant. The population on Yap has not been quantified but the species' population in the rest of its range is estimated to be 83,500 individuals.	Breeds in colonies in caves forages over subtropical and tropical moist lowland forest.
Micronesian starling	*Aplonis opaca*	Least Concern	Known from Guam, FSM, Northern Mariana Islands and Palau. Population trend is difficult to determine because of uncertainty over the impacts of habitat modification on population sizes.	Found in across a range of forest and shrubland habitats from heavily degraded former forest to subtropical/tropical moist to dry shrubland or forest. It has a medium dependency on forest habitat.
Micronesian myzomela	*Myzomela rubratra*	Least Concern	Known from Guam, FSM, Northern Mariana Islands and Palau. Population trend is not known, but the population is not believed to be decreasing sufficiently rapidly to approach the thresholds under the population trend criterion (>30% decline over ten years or three generations).	Found in across a range of habitats from urban areas, rural gardens and plantations to mangrove forests and subtropical/tropical moist lowland forest to an altitude of 800 m. It has a low dependency on forest habitat.
Migratory species				
Great knot	*Calidris tenuirostris*	Endangered	Migratory species that has been recorded in FSM during the non-breeding season.	In its wintering range the species occurs in sheltered coastal habitats such as inlets, bays, harbours, estuaries and lagoons with large intertidal mud and sandflats, oceanic sandy beaches with nearby mudflats, sandy spits and islets, muddy shorelines with mangroves and occasionally exposed reefs or rock platforms.

Table 6-7: Restricted-range and threatened birds of Yap (cont.)

Common name	Scientific name	IUCN Category	Occurence	Habitat
Far eastern curlew	*Numenius madagascariensis*	Endangered	Migratory species that has been recorded in FSM during the non-breeding season.	In the non-breeding season it is essentially coastal, occurring at estuaries, mangrove swamps, saltmarshes and intertidal flats, particularly those with extensive seagrass (Zosteraceae) meadows. It often roosts in salt-marshes, behind mangroves, or on sandy beaches.
Buller's shearwater	*Ardenna bulleri*	Vulnerable	Migratory species. The species migrates to the northern Pacific Ocean, from Japan to North America and east to California, and is occasionally found off South America.	Pelagic marine species in non-breeding season.
Bristle-thighed curlew	*Numenius tahitiensis*	Vulnerable	Migratory species that has been recorded in FSM during the non-breeding season.	It winters on coral reefs, sandy beaches, intertidal flats, rocky shores and in palm forests and dense vegetated understorey.
White-necked petrel	*Pterodroma cervicalis*	Vulnerable	Migratory species that has been recorded in FSM during the non-breeding season.	Pelagic marine species in non-breeding season.
Stejneger's petrel	*Pterodroma longirostris*	Vulnerable	Migratory species that has been recorded in FSM during the non-breeding season.	Pelagic marine species in non-breeding season.
Pycroft's petrel	*Pterodroma pycrofti*	Vulnerable	Migratory species. Studies utilising geolocators have shown that, when not breeding, birds disperse to the central and eastern tropical Pacific.	Pelagic marine species in non-breeding season.
Providence petrel	*Pterodroma solandri*	Vulnerable	Migratory species. Its non-breeding distribution is across the western Tasman Sea with some dispersing to the north and northwest Pacific Ocean perhaps as far north as the Bering Sea.	Pelagic marine species in non-breeding season.
Flesh-footed shearwater	*Ardenna carneipes*	Near Threatened	Migratory species that has been recorded in FSM during the non-breeding season.	Pelagic marine species in non-breeding season.
Sooty shearwater	*Ardenna grisea*	Near Threatened	Migratory species. The species migrates to the northern hemisphere during the austral winter.	Pelagic marine species in non-breeding season.
Curlew sandpiper	*Calidris ferruginea*	Near Threatened	Migratory species that has been recorded in FSM during the non-breeding season.	In the winter the species chiefly occurs on coastal brackish lagoons, tidal mud- and sand-flats, estuaries, saltmarshes, exposed coral, rocky shores and tidewrack on sandy beaches, and also inland on the muddy edges of marshes, large rivers and lakes (both saline and freshwater), irrigated land, flooded areas, dams and saltpans.

Common name	Scientific name	IUCN Category	Occurence	Habitat
Red-necked Stint	*Calidris ruficollis*	Near Threatened	Migratory species that has been recorded in FSM during the non-breeding season.	In the non-breeding season it mainly uses coastal and intertidal mudflats, sheltered inlets, bays and lagoons but it also uses freshwater, brackish and saltwater wetlands and occasionally sandy beaches and rocky shorelines.
Buff-breasted sandpiper	*Calidris subruficollis*	Near Threatened	Mibratory species, recorded as a vagrant in FSM.	During migration it is found on many short grass habitats.
Streaked shearwater	*Calonectris leucomelas*	Near Threatened	Migratory species that has been recorded in FSM during the non-breeding season.	Found over both pelagic and inshore waters during non-breeding season.
Micronesian imperial-pigeon	*Ducula oceanica*	Near Threatened	This species occurs in the Micronesian islands of Palau, Yap, Chuuk, Pohnpei and Kosrae, including many small offshore islands. It is probably extinct on Kiribati and many or all of the Marshall Islands. There were estimated to be 572 birds on Yap, 51 on Chuuk, 822 on Pohnpei, 7,474 on Kosrae in 1983-1984. Numbers on Pohnpei are known to have declined by about 70% between 1983 and 1994. The population on Kosrae is inferred to have declined less severely due to the lower rate of forest loss and smaller human population on that island.	Forest species, found predominantly in the mountains of Pohnpei and Kosrae, but widespread where not hunted, including secondary forest, beach forest and mangroves.
Bar-tailed godwit	*Limosa lapponica*	Near Threatened	Migratory species that has been recorded in FSM during the non-breeding season.	During the winter it is more common in intertidal areas along muddy coastlines, estuaries, inlets, mangrove-fringed lagoons and sheltered bays with tidal mudflats or sandbars.
Black-tailed godwit	*Limosa limosa*	Near Threatened	Migratory species that has been recorded in FSM during the non-breeding season. The subspecies *Limosa limosa melanuroides* breeds in disjunct populations in Mongolia, northern China, Siberia (Russia) and the Russian Far East. These birds migrates across a broad front to winter from western South Asia to Australia, encompassing India, Indochina, Taiwan, the Philippines, Indonesia, and Melanesia.	The subspecies *Limosa limosa melanuroides* often winters in saline habitats such as sheltered estuaries and lagoons with large intertidal mudflats, sandy beaches, salt-marshes and salt-flats.
Tahiti petrel	*Pseudobulweria rostrata*	Near Threatened	Migratory species that has been recorded in FSM during the non-breeding season.	Pelagic marine species in non-breeding season.

Common name	Scientific name	IUCN Category	Occurence	Habitat
Mottled petrel	*Pterodroma inexpectata*	Near Threatened	Migratory species. It migrates to the north Pacific as far as the northern Gulf of Alaska and the southern half of the Bering Sea and in summer can range as far south as the pack ice.	Pelagic marine species in non-breeding season.
Grey-tailed Tattler	*Tringa brevipes*	Near Threatened	Migratory species that has been recorded in FSM during the non-breeding season.	In the non-breeding season it is found on sheltered coasts with reefs and rock platforms or with intertidal mudflats, as well as shorelines with rocks, shingle, gravel or shells, often roosting in mangroves. On migration, it is predominantly coastal, but may occur at inland wetlands.

In addition, there are four additional, restricted-range bird species including the 'Critically Endangered' migratory species, Beck's petrel *Pseudobulweria becki*, White-throated ground-dove *Alopecoenas xanthonurus* ('Near Threatened'), the Micronesian starling *Aplonis opaca* and Micronesian myzomela rubratra, both of which are of 'Least Concern'. Yap may also be visited by 21 IUCN listed migratory bird species including one 'Critically Endangered' species, two 'Endangered', six 'Vulnerable' and 12 'Near Threatened' species.

A major threat to native bird species is loss of habitat, due to human-set fires during the dry season. In addition all endemic and native bird species on the Yap Islands are at risk

from introduced predators, the most notorious being the brown tree snake *Boiga irregularis*, which is responsible for many extinctions on Guam. At present the snake is not known in Yap. The tree sparrow *Passer montanus*, which was introduced in late 1970s from Eurasia, may also pose a threat as it is known to carry exotic diseases.

Two endemic species of flying foxes of the genus Pteropus occur in Yap state; the Yap flying fox *Pteropus pelewensis* ssp. *Yapensis* ('Vulnerable') which is endemic to the four adjacent small main islands of Yap, and Marianas flying fox *Pteropus mariannus* ('Endangered') which is endemic to the northern Mariana Islands, Guam and Ulithi. The sub species, Ulithi fruit bat Pteropus mariannus ulthiensis is endemic to Ulithi Island (

Table 6-8).

Three threatened reptiles are known to occur in Yap: two migratory marine turtle species that nest on beaches and the Micronesia saw tailed gecko *Perochirus ateles* which is endemic to the Marianas Islands and FSM are 'Vulnerable' (Table 6-9). In addition, there is one restricted range species thought to occur on Ulithi Atoll, in Yap State, the Giant Micronesian gecko *Perochirus scutellatus*.

Table 6-8: Threatened mammals of Yap (IUCN, 2018).

Common name	Scientific name	Listing	Category	Comments	Habitat
Marianas flying fox	*Pteropus mariannus*	IUCN Yap State Code, Tilte 18 Conservation & Resources, Chp 11 Fruitbats	Endangered The taking, hunting, exporting, purchasing or selling of or in any way intentionally interfering with the population growth of fruitbats in the State of Yap is prohibited.	This species ranges from the Northern Mariana Islands, Guam, and the Ulithi Atoll (and possibly from nearby atolls) in FSM. The sub species, Ulithi Fruit bat *Pteropus mariannus ulthiensis*, is endemic to Ulithi Atoll.	Found in areas of native tropical forest, coastal strand, and mangroves. roosting within healthy forest – both atoll and upland forests.
Yap flying fox	*Pteropus pelewensis* ssp. *yapensis*	IUCN Yap State Code, Tilte 18 Conservation & Resources, Chp 11 Fruitbats	Vulnerable The taking, hunting, exporting, purchasing or selling of or in any way intentionally interfering with the population growth of fruitbats in the State of Yap is prohibited.	Endemic to the four adjacent small main islands of Yap.	Found in forest, mangroves, and agroforest. Although there is virtually no primary forest remaining on the islands, there is significant secondary forest and agroforest, which this species utilizes.

Table 6-9: Restricted-range and threatened reptiles of Yap (IUCN, 2018).

Common name	Scientific name	Category	Comments	Habitat
Hawksbill turtle	*Eretmochelys imbricata*	Critically Endangered	Migratory species. Has a circumglobal distribution throughout tropical and, to a lesser extent, subtropical waters of the Atlantic Ocean, Indian Ocean, and Pacific Ocean.	Marine species that nests on insular and mainland sandy beaches in more than 70 countries worldwide.
Green turtle	*Chelonia mydas*	Endangered	Migratory species. Has a circumglobal distribution, occurring throughout tropical and, to a lesser extent, subtropical waters. Listed as Endangered on US Endangered Species Act 1973.	Marine species that nests on beaches in more than 80 countries worldwide.
Micronesia saw-tailed gecko	*Perochirus ateles*	Vulnerable	Species is distributed throughout the Marianas Islands (including Guam, where it is now presumed to be extinct); FSM where it is present on about a third of the islands (including Yap, Truk, Chuuk, Pohnpei, Kosrae, Kapingamarangi Atoll); and the Marshall Islands.	This species has been collected from palm leaf axils, in shrubs and bushes, and under loose flaking bark on standing trees. It is apparently highly arboreal and appears to be somewhat adaptable, occurring on islands where the only vegetation consists of coconut and breadfruit trees, as well as in natural forest.
Giant micronesian gecko	*Perochirus scutellatus*	Least Concern	Known only on Kapingamarangi and Ulithi atolls. Its occurrence on Ulithi requires verification.	It is only known to occur a few metres above sea level. It is primarily diurnal and arboreal, with a predilection for Guettarda trunks. There is no remaining primary forest on Kapingamarangi Atoll, and this species has adapted well to occurrence on coconut and breadfruit trees.

There is one threatened freshwater fish species that may occur in Yap, the Japanese eel (*Anguilla japonica*; 'Endangered') which has previously been recorded as a vagrant in FSM (Table 6-10). No threatened invertebrate species listed on the IUCN Red List are known to occur in Yap.

Table 6-10: Threatened fishes of Yap (Pippard 2012).

Common name	Scientific name	Category	Comments	Habitat
Japanese eel	*Anguilla japonica*	Endangered	Migratory species. Occurs as a native species in Japan, China, Taiwan and Korea. The range of this species extends from the southern Pacific coast of Japan and further south to Hainan Island covering large areas of mainland China, Taiwan and the Republic of Korea. It has been recorded as a vagrant in FSM.	The species is catadromous, spending its lifetime in freshwater, estuaries and coastal environments, including rivers, streams and wetlands, but migrates thousands of kilometres to spawn

6.2.3 Conservation Areas

There are 8 protected marine areas in Yap (Figure 6-4). There are currently no legally protected terrestrial areas and all land is privately owned. The use of natural resources has been regulated by customary management but, as populations grow, this is becoming more problematic.

Of the 130 Areas of Biodiversity Significance (ABS) identified in FSM, a total of 32 are located in Yap State (YSESC, 2018) including five terrestrial, six marine and 21 coastal marine ecosystems. Figure 6-5 shows areas of biological significance in Yap (identified in 2002) and known areas of importance i.e. dive, cultural heritage or fruit bat/flying fox sites.

Figure 6-4: Protected areas in Yap Island (Weeks, 2016)

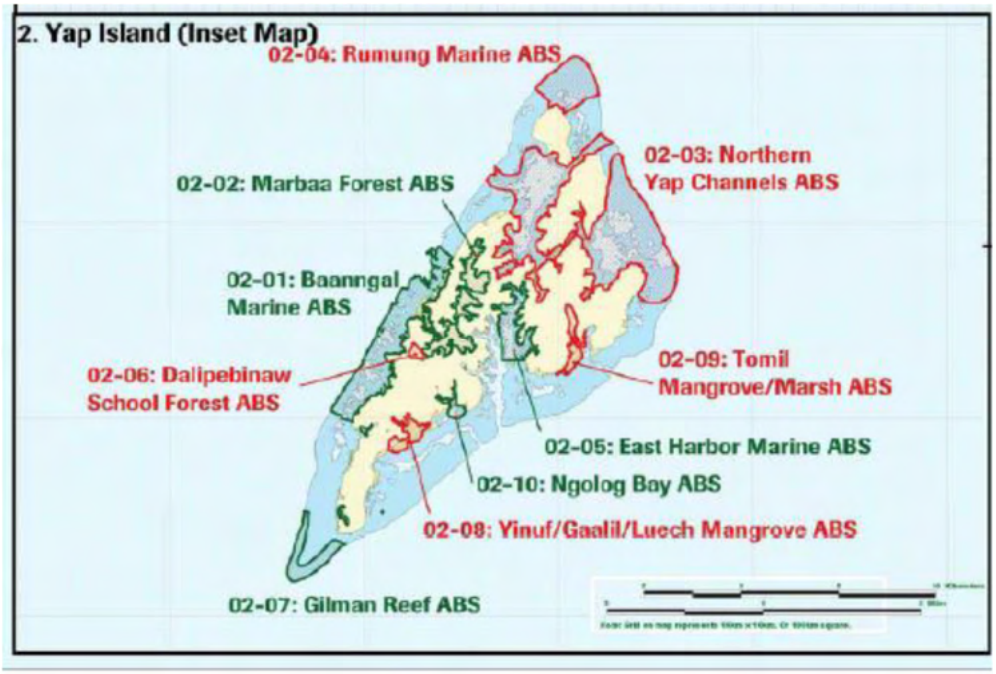


Figure 6-5: Areas of biodiversity significance in Yap (TNC, 2002)

6.3 Socio-Economic Environment

6.3.1 Economy

The FSM economy, and the Yap State economy, is firmly dependent on funding from the US, which provides about 75% of revenue. With one of the most productive tuna fishing grounds in the world, the ocean is clearly the FSM's most important natural resource.

On smaller islands and atolls, subsistence or artisanal fishing is often the principal livelihood. But overharvesting, lack of regulation and poor environmental practices, are threatening inshore and near-shore fishing resources.

The Yap state economy achieved the highest rate of economic growth of the FSM states during the original Compact period. Growth of the private sector was the most impressive, achieving an annual average of 5.8% during the 17 years. While the state underwent a public sector contraction similar to the other states after the second step-down, the private sector managed to remain buoyant and assisted the state in maintaining positive GDP growth during the period.

The state achieved the best outcome in the PSRP reform program meeting its ERP targets and achieving the cost-savings anticipated. These policies have been maintained through the end of the original Compact period, and the state has avoided the temptation to utilize the bump-up funds to temporarily inflate public expenditures. The main weakness in the state's performance is a failure to transform investment in public enterprises, which have failed to produce a profit in all but one fiscal period since commencement of operations in the early 1990s.

Economic performance during the last 4 years of the Compact were disappointing reflecting the inability of the private sector to sustain growth, prudential fiscal policies, and poor results of the state owned tuna purse seine fishing company (FSM, 2003).

6.3.2 Land Tenure & Access

Almost all land and aquatic areas are owned or managed by individual estates and usage is subject to traditional control (FSM, 2010). With respect to land tenure, the Yap State Constitution recognizes the authority of traditions and custom, establishment of the Councils of Traditional Leaders,61 prohibits ownership of land by non-FSM citizens and provides for the possibility of 50-year leases involving foreign interest if approved by the State Legislature.

Article II, § 11 deals with the issue of eminent domain and compensation for land appropriated by the government. The Section authorizes the legislature to "*provide by general law for the taking of private property for a public purpose*." The Section requires that such a general law "*provide for just compensation, good faith negotiations for lease or purchase and consultation with appropriate local government prior to the taking, and the manner of taking."*

Article XIII, § 3. This Section requires the title to land to be "*acquired only in a manner consistent with traditions and customs*."

Article XIII, § 5 provides recognition for "*traditional rights and ownership of natural resources and areas within the marine space of the State, within and beyond 12 miles from island baselines."* The Section also states that "*[n]o action maybe taken to impair these traditional rights and ownership, except the State Government may provide for the conservation and protection of natural resources within the marine space of the State within 12 miles from island baselines.*"

Article XIV, § 8 identifies a citizen of the FSM domiciled in Yap as a citizen of Yap State. This provision also allows for land ownership in Yap by citizens of the FSM. Traditional leadership is thus accorded a powerful means by which to influence governance in matters of custom. Thus tradition and customs heavily still influence land access, ownership and use.

6.3.3 Demographics

In 2009 the population was 11,780. Yap is comprised of two regions: Yap Islands (or Yap Proper) and the Outer Islands. On Yap Island, the population (7,731) is about twice that of the outer islands (4,006), however the population density is greatest in the Outer Islands (572 people/sq mile) compared with Yap Islands (189). The distribution of Yap's population varies considerably between rural (10,537 people) and urban (840) areas, with the population in rural growing at an average annual rate of 0.52% and declining in urban areas (-3.84%). The greatest population in Yap Islands is located in Rull municipality (2,100) followed by Tomil (1,231) and Weloy (1,030). Tomil recorded the greatest average annual growth rate since 2000 (1.85%), followed by Gagil (1.62%). By comparison, Rull only recorded a 0.39% growth rate and Weloy -1.50%.

In Yap state the average household size (4.9) is smaller than the national average, as is the average family size (3.7).

In 2010, the median age in FSM was 21.5 years, compared to 25 years in Yap State and 26.4 in the Yap Islands. There are 2,311 households in Yap State with 1,680 households in Yap Islands. Of the Yap Islands households:

(i) 1,330 households (79%) source power from a public utility.

(ii) 1533 (91%) have access to drinking water via public or community water supply or household tank.

(iii) 862 (51%) are connected to a sewer or have a septic tank.

(iv) 1179 (70%) have access to a car, bus/truck or motorbike.

(v) 1290 (77%) have access to a mobile phone.

(vi) 301 (18%) have access to a computer, with 179 (11%) having access to the internet.

6.3.4 Gender, GBV and Human Trafficking

In a survey conducted in 2017 on gender and human trafficking, stakeholders in Yap were mainly concerned with the age consent issues and awareness of internet risks for young people (for their own communities); and with migrant smuggling (of foreigners into Guam). Communities on the outer islands observed suspect behaviour at land and sea but with no understanding of the potential significance of reporting such behavior or of the reporting process. The episode of a migrant ship landing on Yap shores a few years ago pointed at the lack of preparedness to deal with such incidents, both in terms of institutional (procedural) preparedness as well as general awareness and logistics (ESIA, 2017).

6.3.5 Education

According to the 2010 census in Yap state 102% of 6-13 year olds go to elementary school (indicating students repeating years), 95% of 14- 17 year olds attend high school and 22% of 18-24 year olds attend college. In addition, 79% of Yapese aged 25 years and over had completed elementary education; 59% had completed high school level and 30% had attended college or other higher level education institute with approximately 16% graduating. A further 7% were recorded as never having attended school.

6.3.6 Physical & cultural resources

Yap is known as the most traditional island group in the FSM, maintaining many cultural practices and heritage sites. There are three key types of traditional material culture and the associated cultural practices associated with Yap including: Stone fish weirs (aech): Traditional canoes: and stone money. Other items of tangible cultural heritage include traditional stone platforms or foundations, men’s and community meeting houses, stone paths, traditional trails and historic sites, and WWII relics.

A number of the buildings, sites, districts, and objects in FSM have been listed on the US National Register of Historic Places. There are currently 26 listed sites located FSM with five listed in Yap (

Table 6-11).

Table 6-11: Heritage sites listed on the US National Register of Historic Places (USG 2018).

Name on the Register	Date listed	Location	Municipality	Description
Rull Men's Meetinghouse (faluw)	September 30, 1976	Rull 9°30'19"N138°07'21"E 9.5053°N 138.1226°E	Rull	historic meeting house in Rull village set on a raise stone platform. The faluw, although not the first built on this platform, has historically occupied a central place in the civic life of the community, serving as a place where the men of the village could meet in seclusion, and as a place for social rites
O'Keefe's Island (Tarang)	September 30, 1976	Located roughly in the center of the harbor east of Colonia 9°31'38"N138°07'54"E 9.527222°N 138.131667°E	Weloy	The island has local historical importance as the home of Captain David O'Keefe, an enterprising American who arrived on Yap in the 1870s, and was responsible for not only significant economic growth, but also for the depreciation of the distinctive Yapese currency, the large rai stones which became devalued after O'Keefe introduced iron tools that made manufacture of the stones easier. O'Keefe settled on Tarang, where he had a boat landing, coal warehouse, and house. Of these structures, only the boat landing has survived
Spanish Fort	September 30, 1976	Colonia 9°30'50"N138°07'36"E 9.513889°N 138.126528°E	Weloy	Historic seat of power on the island of Yap. Only foundational remnants of the 19th-century Spanish fortification survive, on a property now occupied by the local government. The site was also where German and Japanese administrators had their headquarters during their respective periods of administration in the decades of the 20th century before World War II.
Dinay Village	April 14, 2004	Dinay 9°30'37"N138°06'12"E 9.510139°N 138.103333°E	Rull	Dinay village in Rull is unique in Micronesia as the site of an ancient pottery complex, and is probably one of the earliest settlements on the island. The ancient village complex includes more than a dozen family platforms (daf) of such age that local folklore has forgotten their lineages, normally a significant cultural feature of such sites. The period of occupation is estimated to have been between about 3000 BCE and 1600 CE
Bechiel Village Historic District	June 19, 1983	Address Restricted	Maap	While now only having a small population (~10) the village was once larger, with a documented population of about 200 in the early 20th century. There are a significant number of stone platforms sites where houses would have stood and the village site is considered archaeologically sensitive.

World Heritage nomination

The Yapese Disk Money Regional Sites World Heritage nomination involves two countries, Palau and FSM. The World Heritage nomination consists of two sites in Yap namely Mangyol Stone Money Bank and O'Keefe Island. The Mangyol site (located in Makiy village, Gagil municipality) has been selected as it represents the most traditional stone money bank and it is the only site in Yap that has intersecting pathways and dancing grounds. In addition, two sites have also been included in Palau namely Uet el Daob ma Uet el Beluu and Chelechol ra Orrak in a Rock Island in Airai State was where the oval / round disk money were quarried by the Yapese before they were transported back to Yap.

6.3.7 Infrastructure

Piped water systems from Gitam Reservoir and wells serve the population of 3,150 in Colonia (see

Table 2-16). The sewerage system in Colonia, with about 700 connections provides primary treatment with a capacity of 1,290 m^3 per day.

Quarry

A disused quarry site (see Figure 6-6) is located on the northern side of the western end of the existing Airport runway in Kanif.

Figure 6-6: Disused quarry site in Yap.

Solid Waste Management

The only solid waste management facility is the Fitkabeetinaem landfill located adjacent to the YSPSC power plant west of Colonia (Johnston, 2011). Waste is regularly collected once or twice a week from a wide area by Department of Public Works and Transportation for delivery to the landfill for compaction. It is estimated that about 60% of the waste generated in Yap is being collected.

6.4 Primary Data Collection

A range of assets located in the road corridor along the primary roads have been identified based on fieldwork undertaken during the PRIME road assessment. A map showing the location of these assets (which includes as private fences/walls and gardens, fruit trees, buildings, bridges/culverts, etc.) and other key resources are provided in Figure 6-7.

Appendix B presents further detail on this map. **Error! Reference source not found.** presents examples of these assets. This information has been used to identify E&S sensitivities for the ESMF.

Figure 6-7: Assets within road corridor and location of sensitive social receptors – Yap.

Figure 6-8: Images showing examples of PRIME (a-f) and SCORE (g-h) assets located in close proximity to the roads on Yap.

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Appendix A Gap Analysis Table

Table A-1: Identification of information outlined in the Gap Analysis undertaken during the PRIME road assessment.

Information Type	Kosrae	Pohnpei	Chuuk	Yap	Comment
Environmental					
Protected/Biological Significance areas	✓	✓	✓	✓	Sourced from secondary data / reports, EPA, KIRMA
Coastal erosion data / information	✓	✓	✓	✓	Sourced from secondary data / reports
Watercourses / Streams	✓	✓	✓	✓	Sourced from secondary data / reports
Watersheds / Catchments	✓	✓	✓	✓	Sourced from secondary data / reports
Sensitive ecological communities (adjacent to PRIME roads or works)	✓	✓	✓	✓	Identify during field survey (where possible). Confirmed from secondary data / reports
Riparian vegetation	×	×	×	×	Data unable to be source.
Freshwater ecology (flora & fauna)	×	×	×	×	Apart from some freshwater fish info for FSM, detailed data unable to be sourced
Landfill location EPA permits (or other relevant licenses), construction details (lined), etc	✓	✓	✓	✓	Identified during field survey / consultation or sourced from secondary data / reports. EPA / KIRMA permits still to be provided
Aggregate sources – Quarry (incl. EPA permits or other relevant licenses)	✓	✓	✓	✓	Identified during field survey / consultation or sourced from secondary data / reports. EPA / KIRMA permits still to be provided
Aggregate sources – Dredging (incl. EPA permits or other relevant licenses)	-	✓	✓	-	Identified during field survey / consultation or sourced from secondary data / reports. EPA / KIRMA permits still to be provided
Sources of potential land contamination (e.g. contaminated sites, storage of hazardous substances etc)	-	-	-	-	Data not available.
Groundwater resource info	✓	✓	×	✓	Information sourced from secondary data / reports.
Air quality / Noise / Vibration Data	-	-	-	-	Data not identified/available. Field measurements to be taken prior to construction

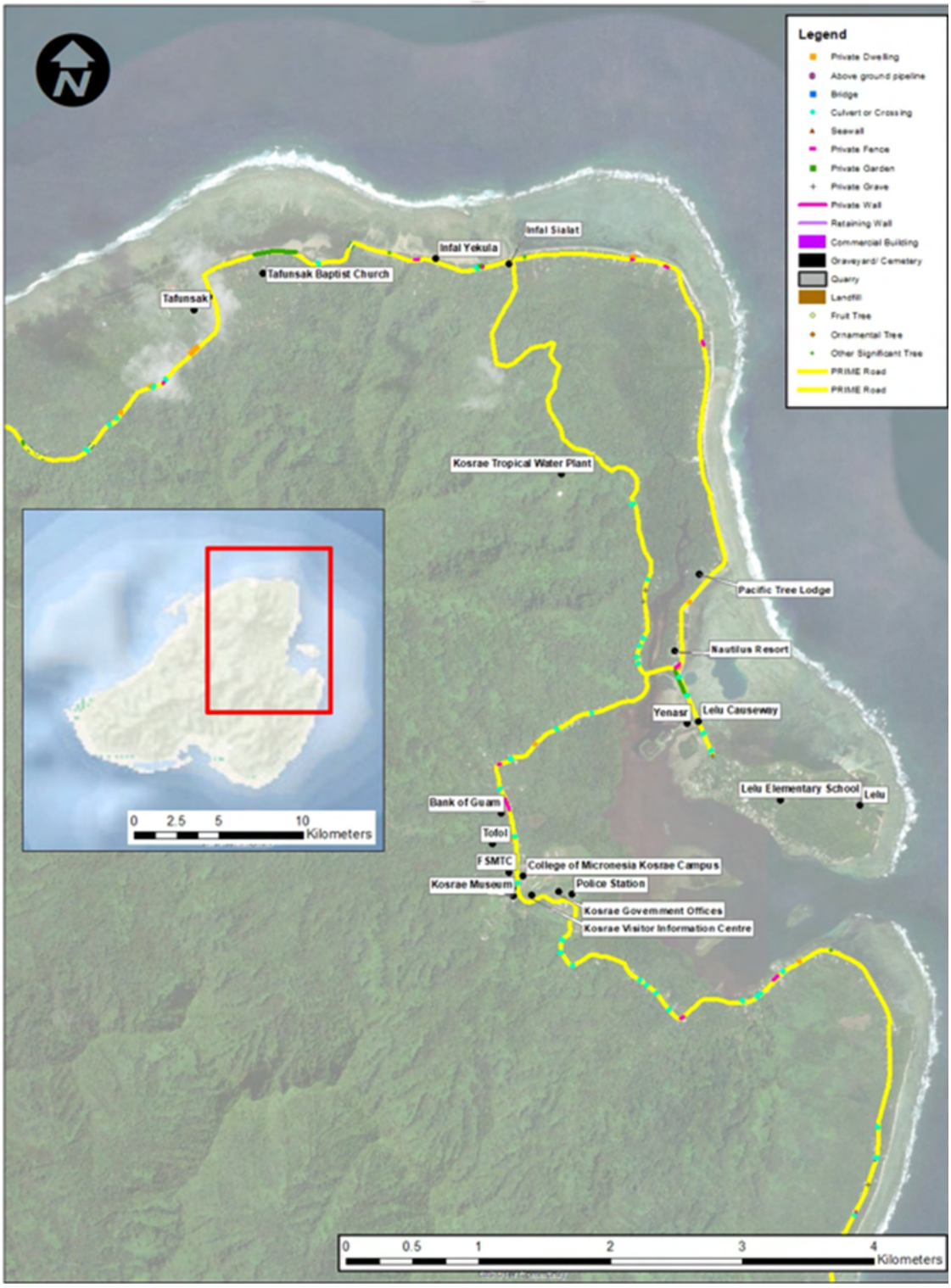
Information Type	Kosrae	Pohnpei	Chuuk	Yap	Comment
Contour Data (10 m resolution)	✓	✓	✓	✓	Sourced from secondary data / reports
Natural Hazard Data (e.g. flood prone / low lying areas, landslides)	✓	✓	✓	✓	Sourced from secondary data / reports
Climate Change Projections	✓	✓	✓	✓	Information for FSM available but not individual States
Social					
Land Tenure / Ownership	✓	✓	✓	✓	Extent of road easement information is known in vicinity of urgent works. These documents can be acquired once scope of works known.
Key Project Stakeholders	✓	✓	✓	✓	Identified during discussions with DoTC&I.
Land / assets encroaching on Road Reserve	✓	✓	✓	✓	A range of encroachments identified
Land Use	✓	✓	✓	✓	Sourced from secondary data / reports
Public utilities (e.g. power, telecom, water) near urgent works	✓	✓	✓	✓	A range of utilities identified during field survey
Sensitive communities and receptors (e.g. schools, health facilities etc)	✓	✓	✓	✓	Sourced from secondary data
Traffic Data	✓	-	-	-	Lelu causeway data only. Any additional traffic data to be sourced prior to preparation of site-specific ESMP (if required)
Cultural heritage sites (e.g. cemeteries, graves sites)	✓	✓	✓	✓	Identified during field survey / consultation or sourced from secondary data / reports.
OHS (Local examples of OHS practice in project situation)	×	×	×	×	Not able to be obtained.
Labor grievance (Local examples of Labor Grievance practice in project situation)	×	×	×	×	Not able to be obtained.
Design & Engineering					

Information Type	Kosrae	Pohnpei	Chuuk	Yap	Comment
Primary Road Network	✓	✓	✓	✓	Extent determined through consultation with DoTC&I
Bridges / Causeways / Crossings	✓	✓	✓	✓	Identified during field survey. Sourced from secondary data / reports
Current Coastal Protection Areas	✓	✓	✓	✓	Identified during field survey. Source from secondary data / reports
Priority Project design	×	×	×	×	DoTC&I to provide once available
Construction material requirements	×	×	×	×	DoTC&I to provide once available
VA & CRRS Studies	×	×	×	×	DoTC&I to provide once available

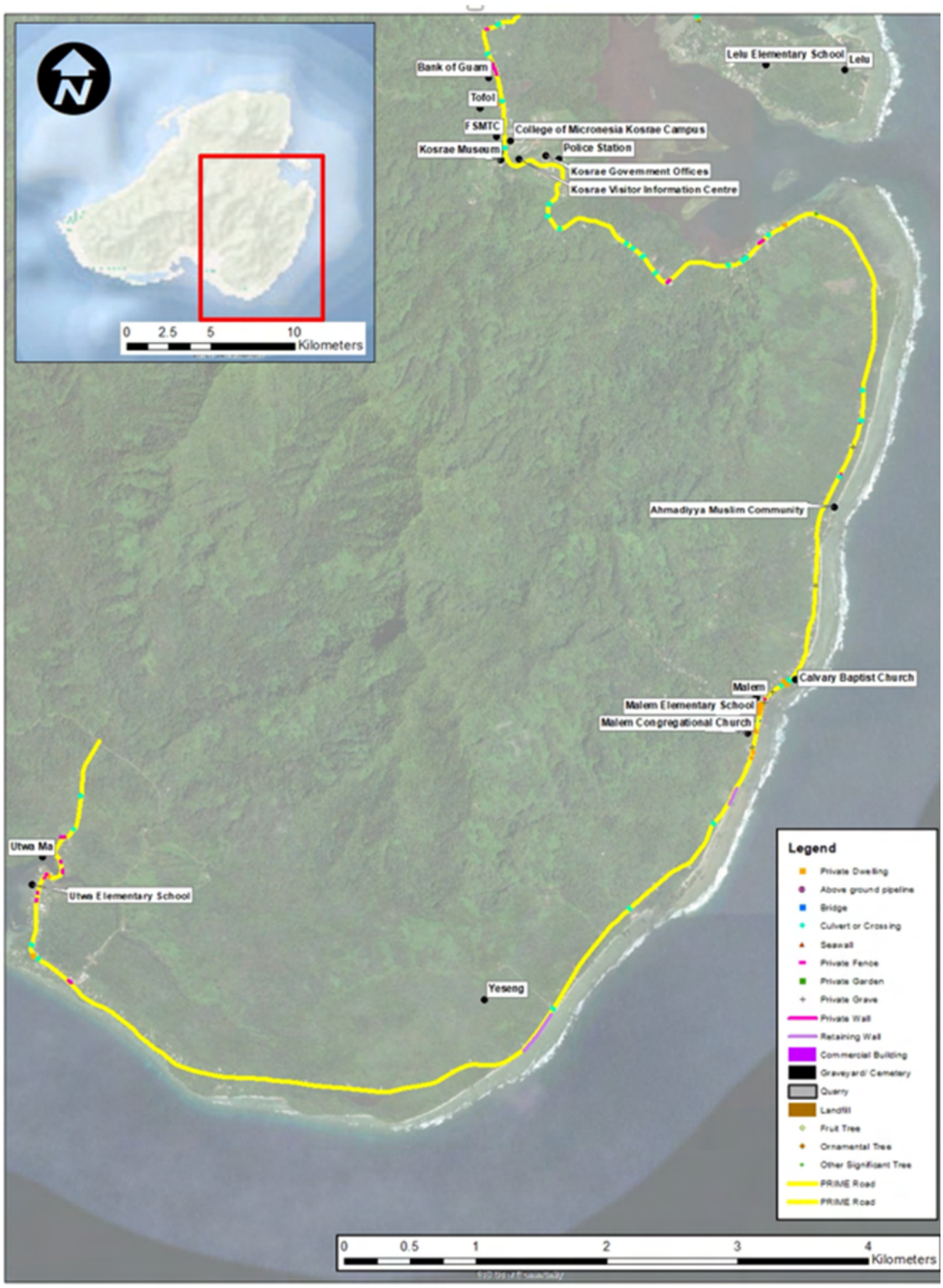
Notes: ✓ = Information / data identified / obtained. × = no information / data available. – No information / data obtained.

Appendix B Detailed Asset Maps

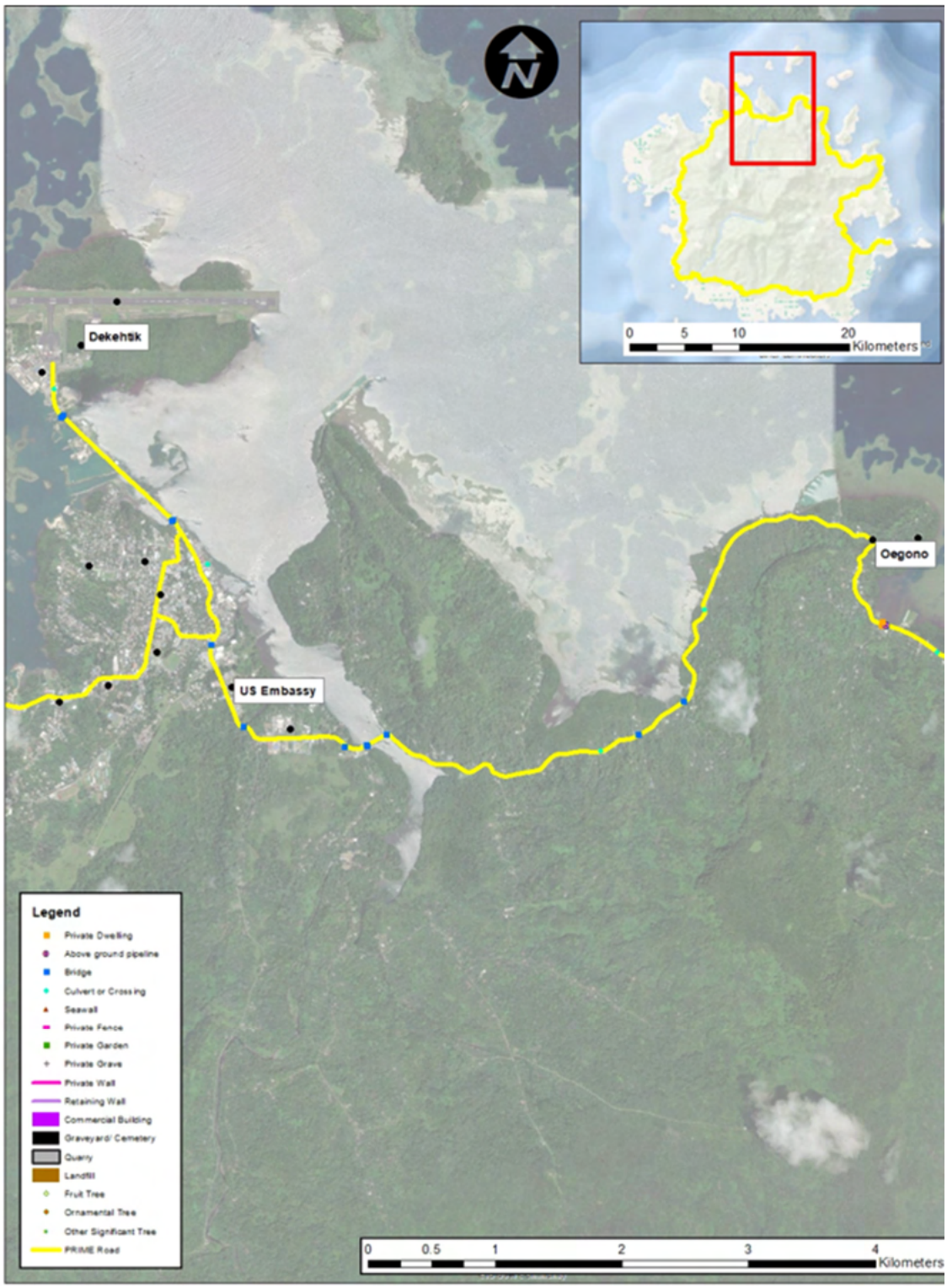
FSM PRIME Road Assets Kosrae State – Map 1



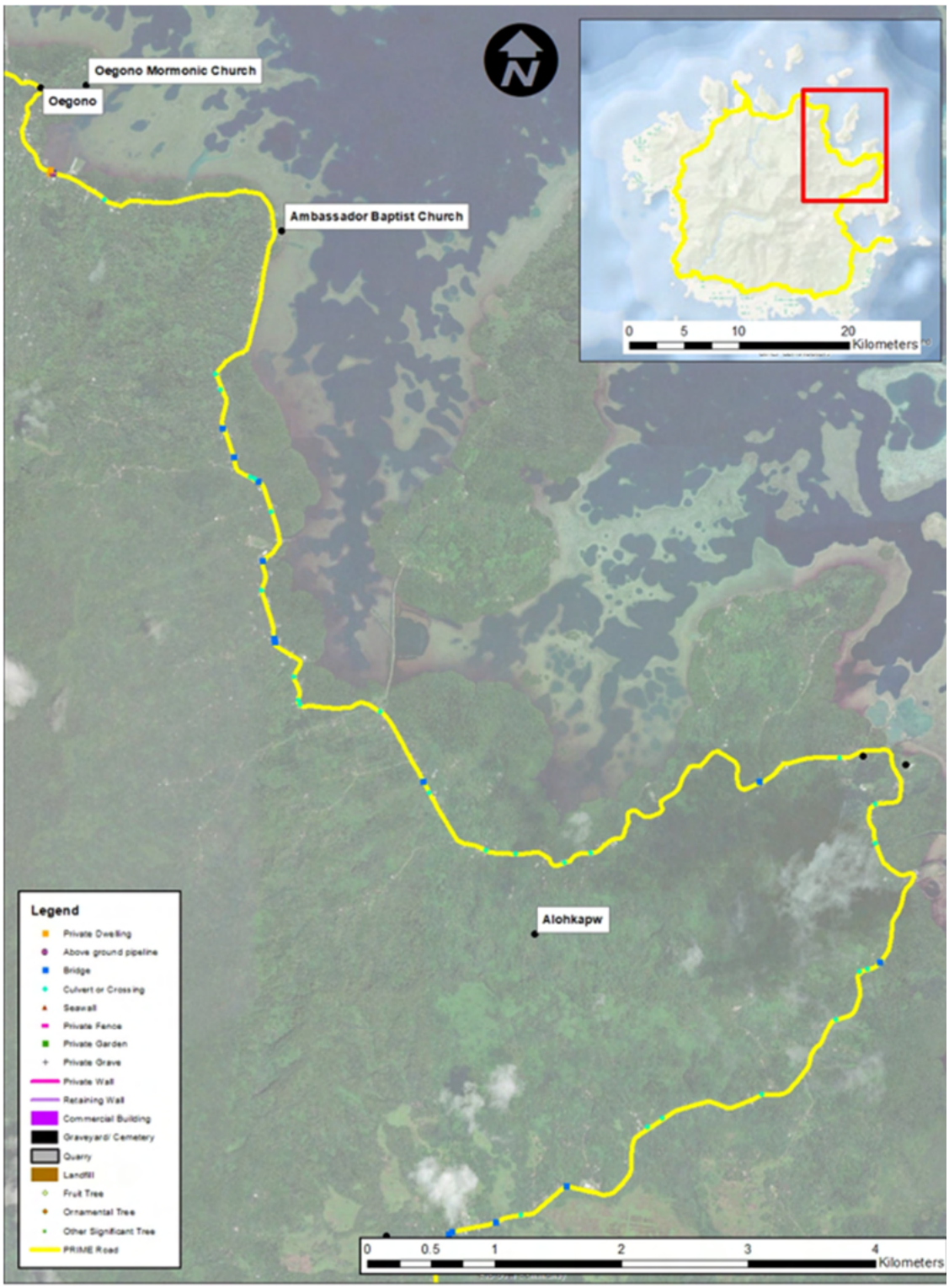
FSM PRIME & SCORE Road Assets Kosrae State – Map 2



FSM PRIME Road Assets Kosrae State – Map 3



FSM PRIME Road Assets Pohnpei State – Map 1



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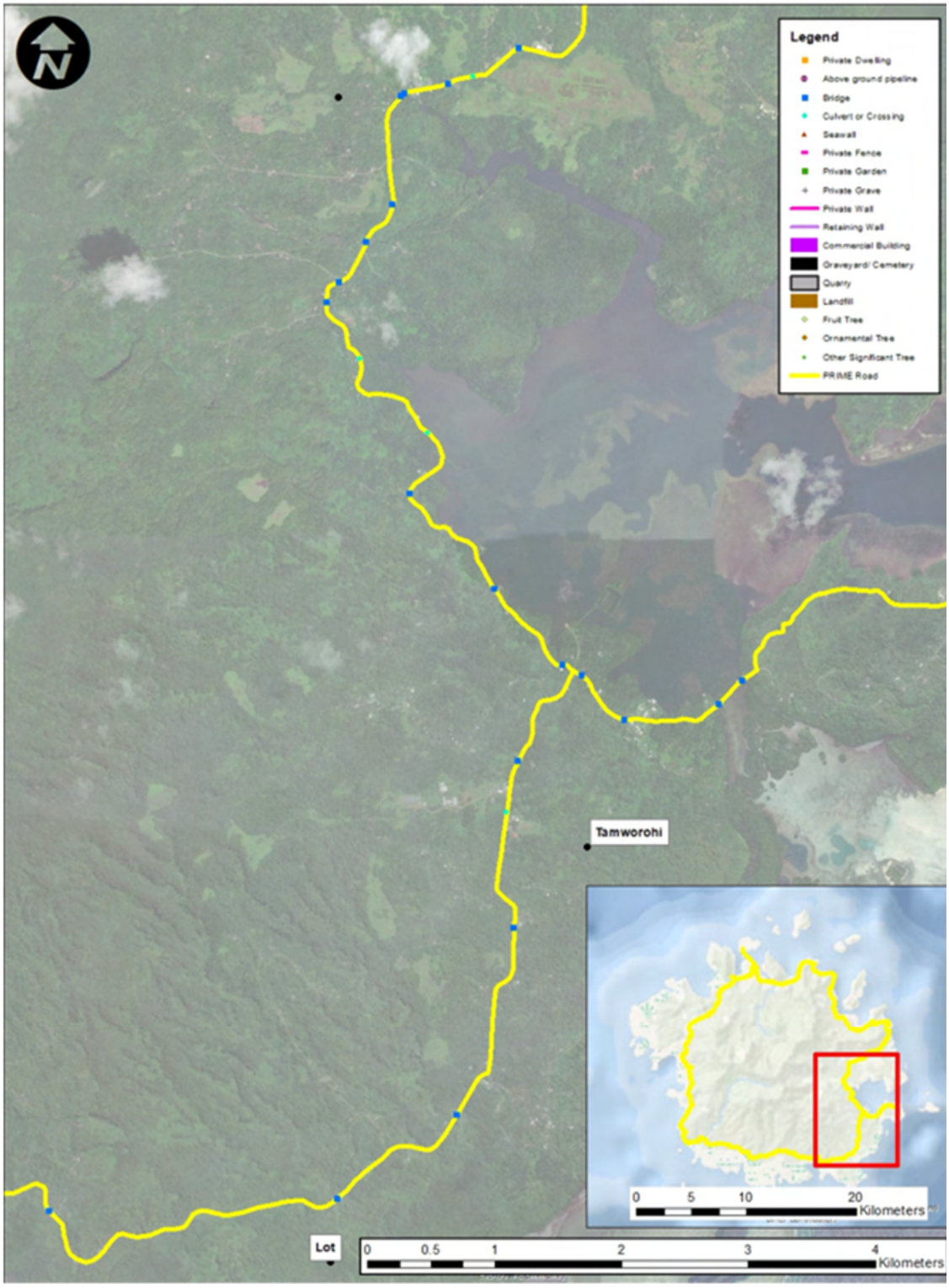

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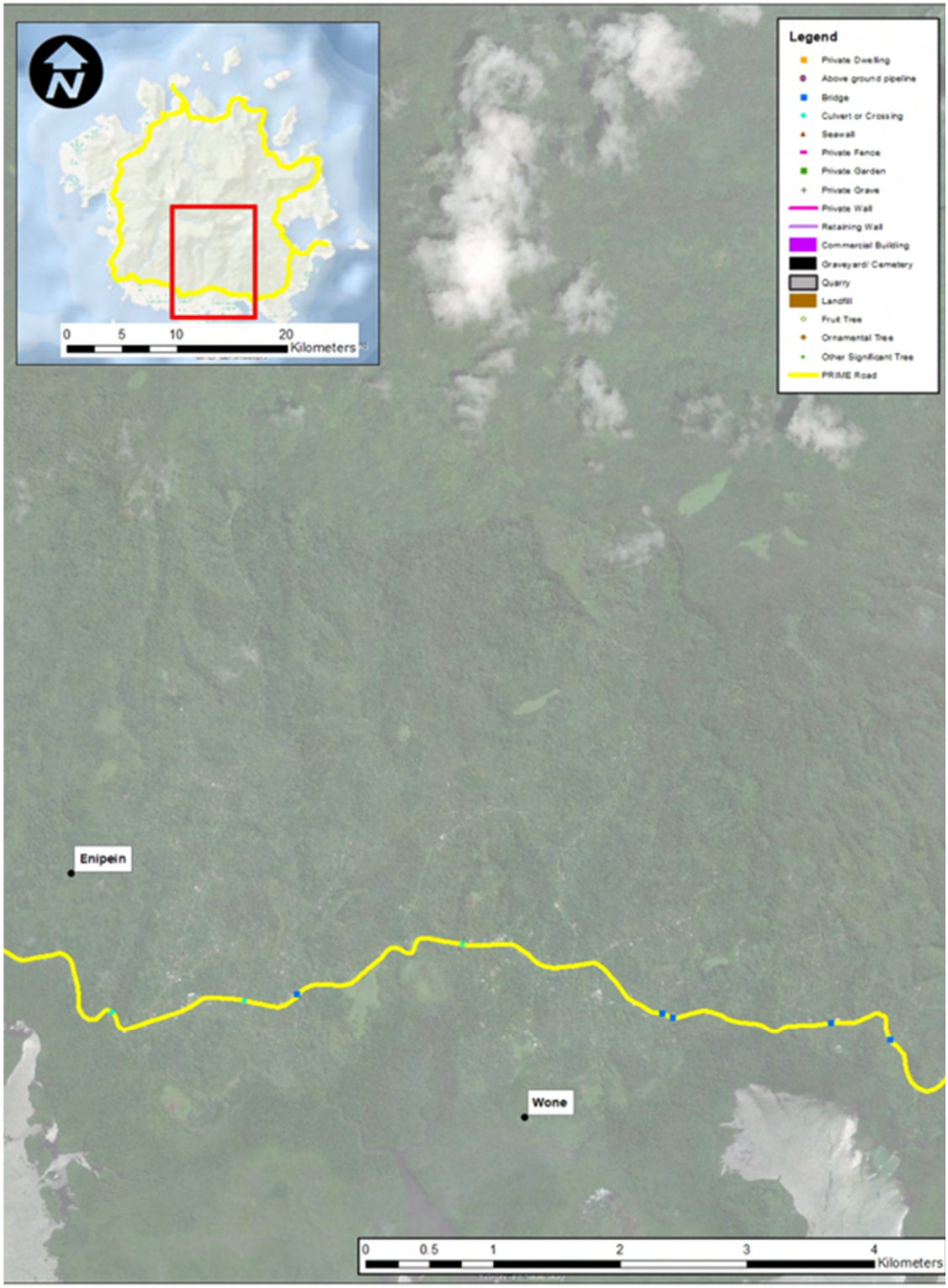
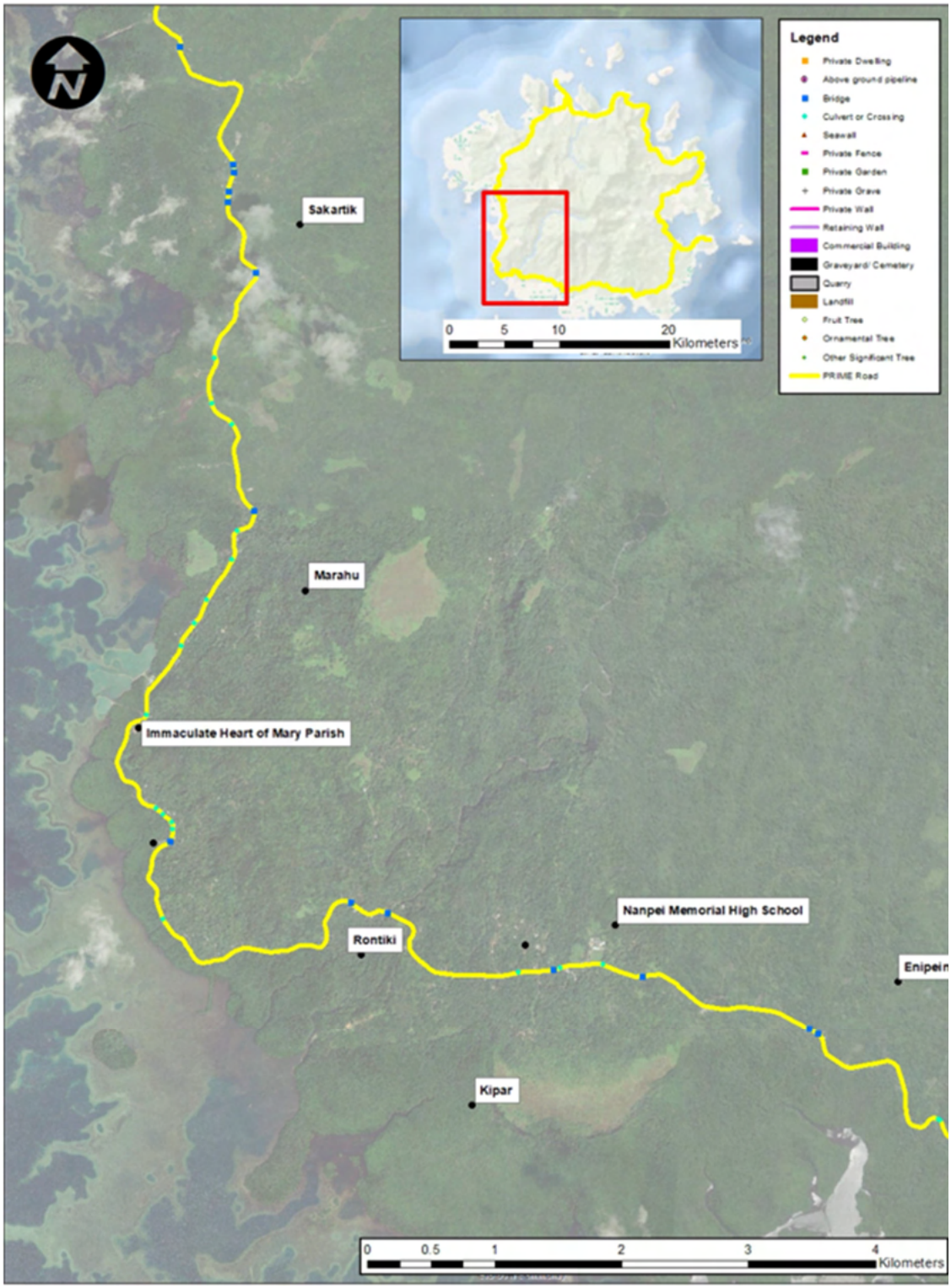
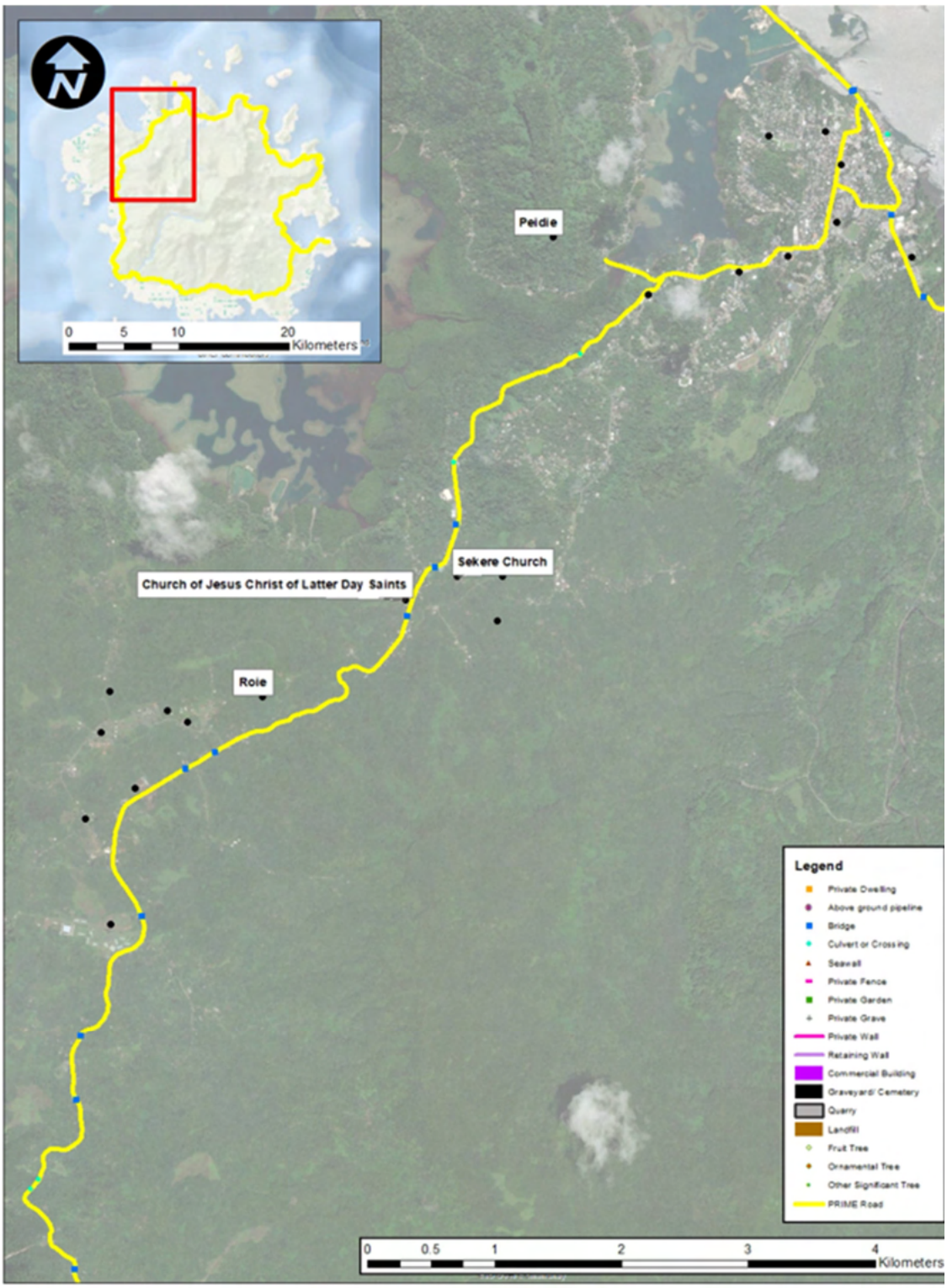


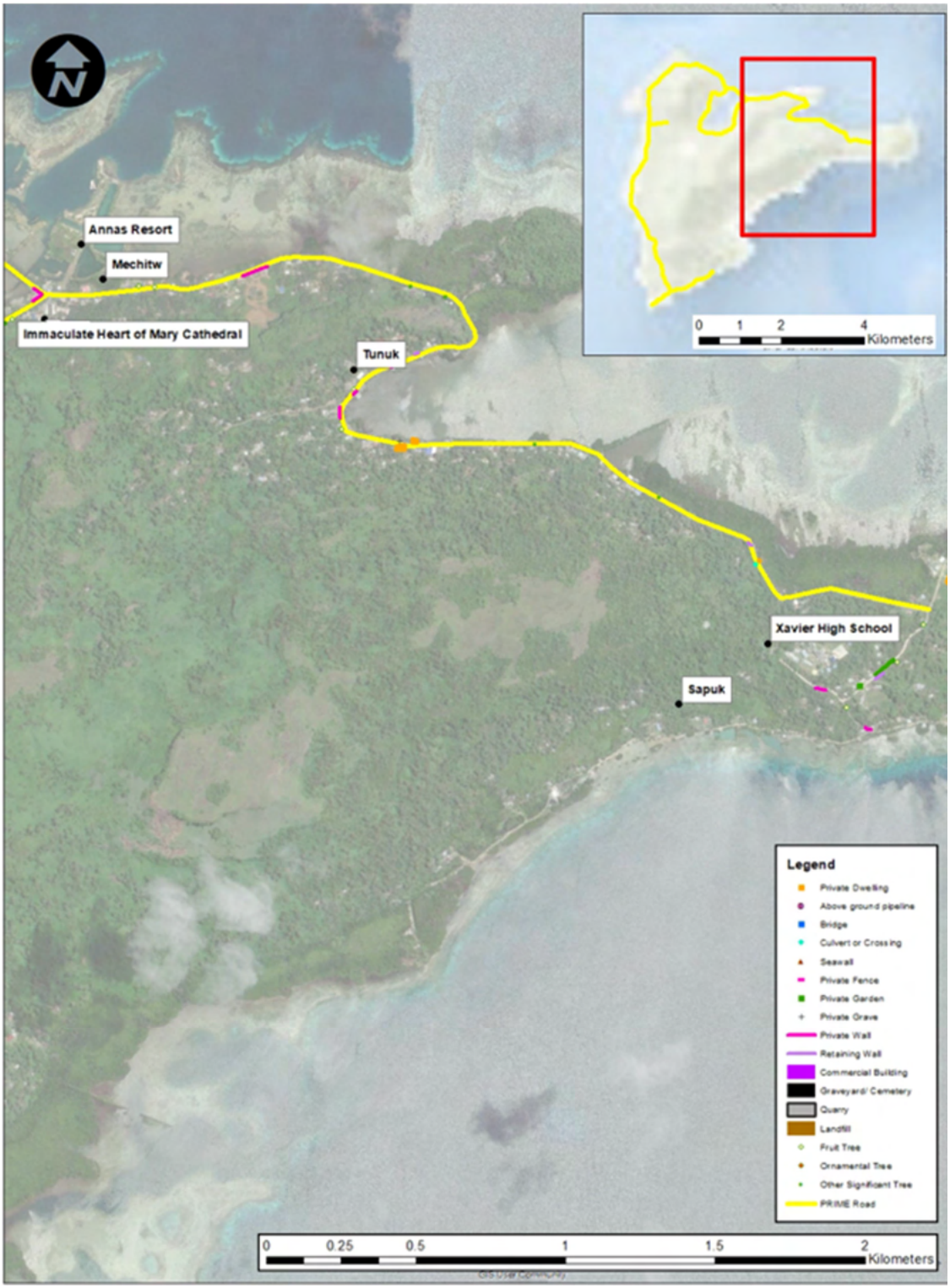
FSM PRIME Road Assets Pohnpei State – Map 4



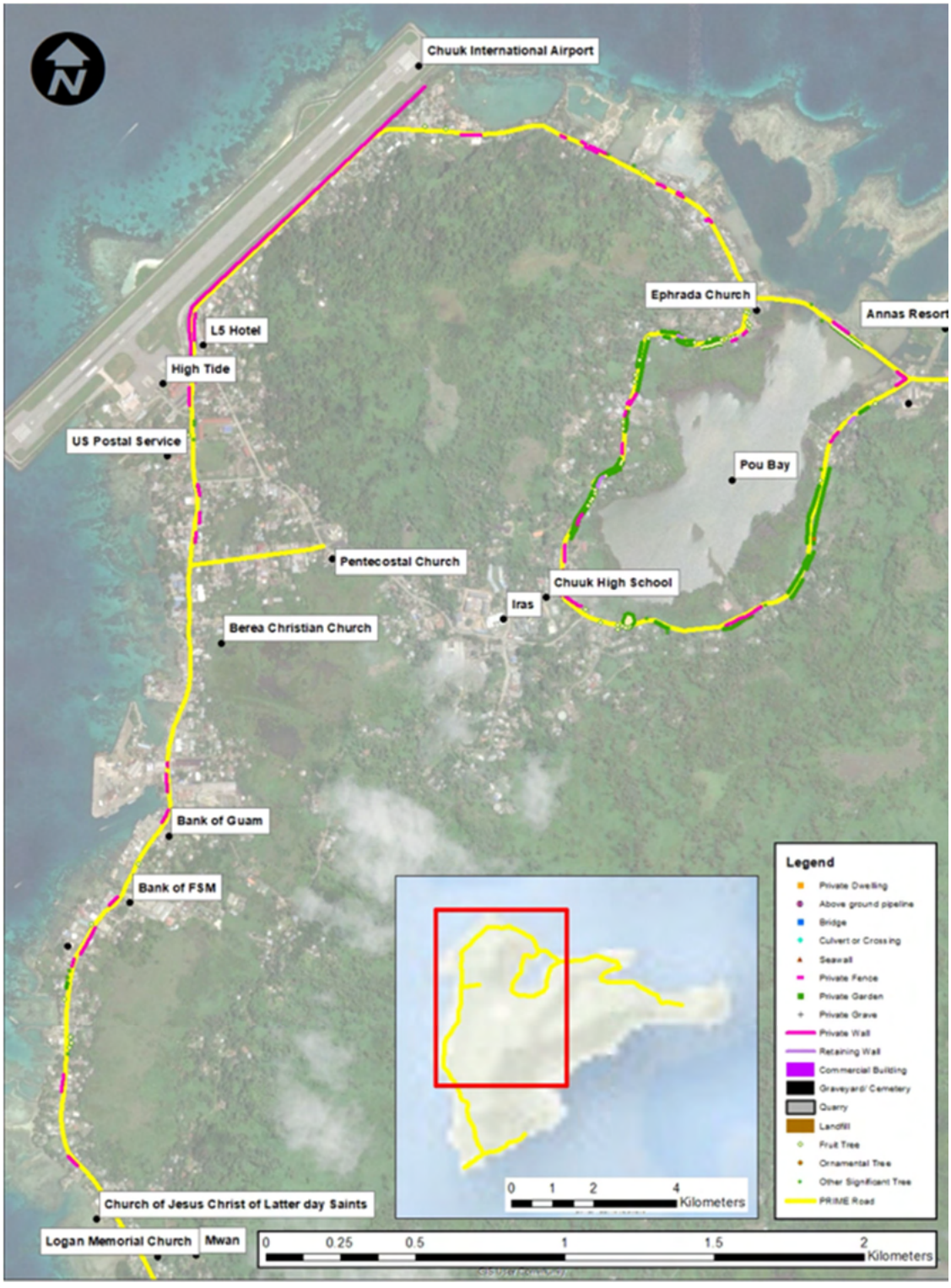
FSM PRIME Road Assets Pohnpei State – Map 5



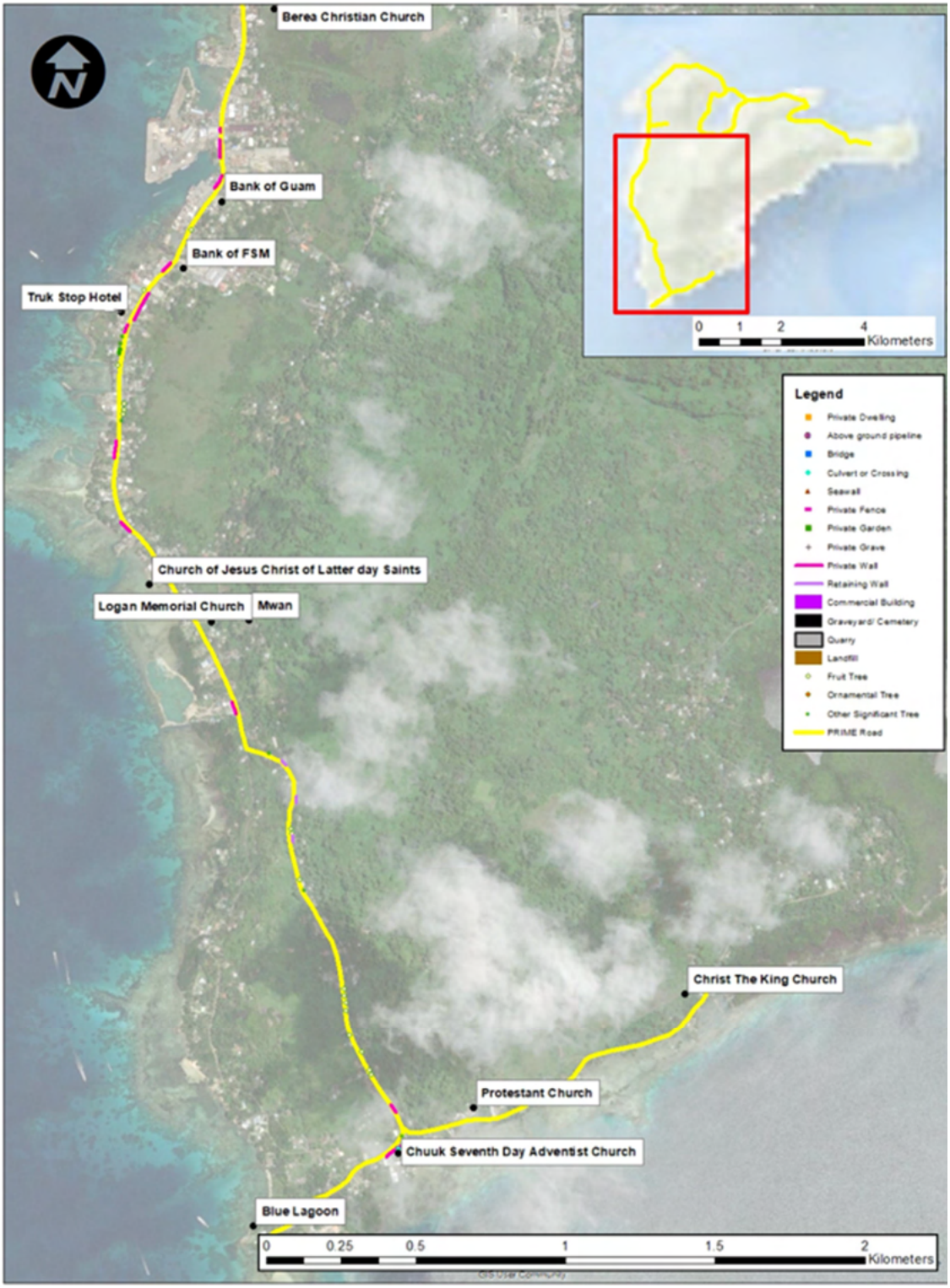
FSM PRIME Road Assets Pohnpei State – Map 6



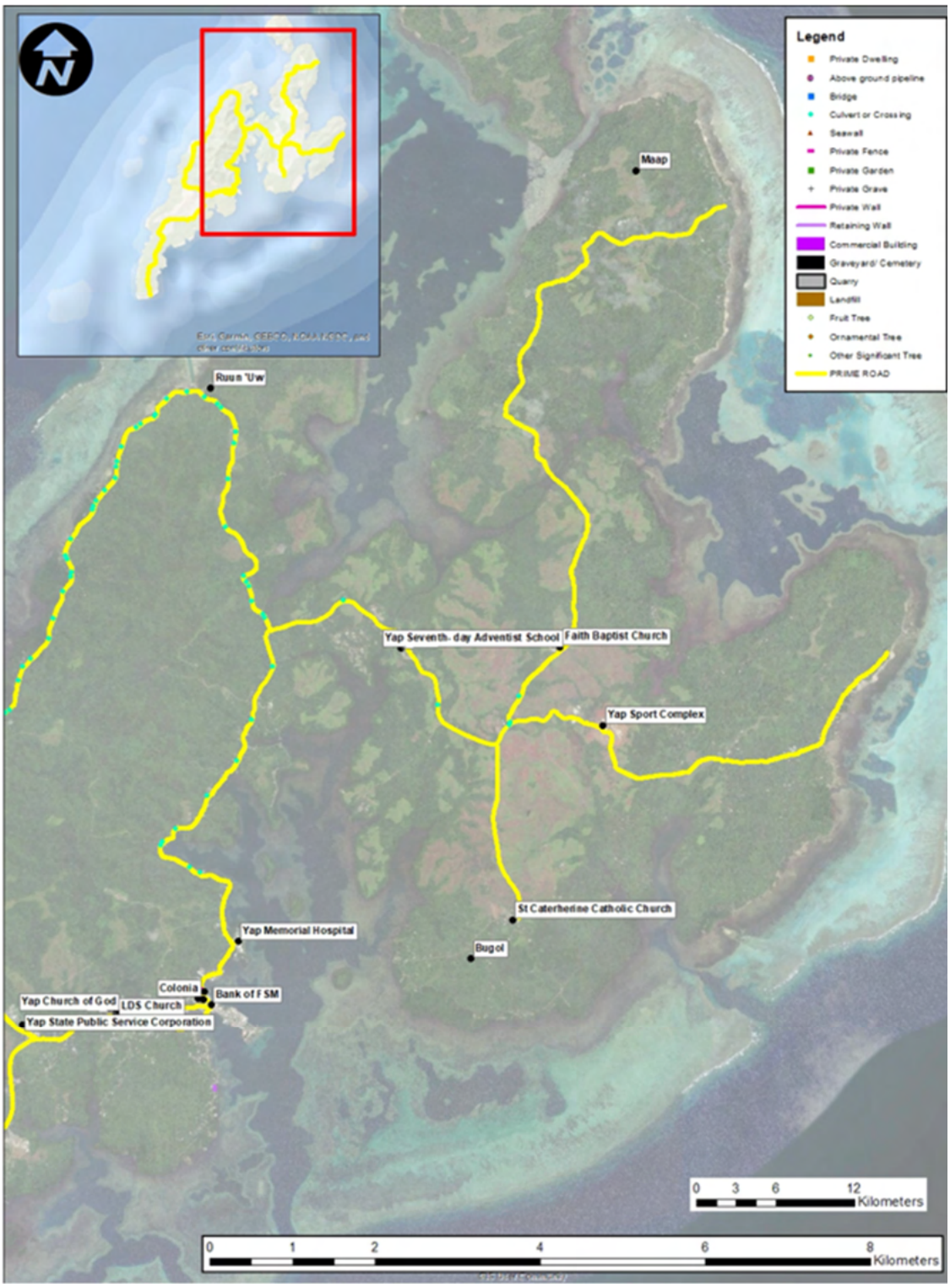
FSM PRIME Road Assets Chuuk State – Map 1



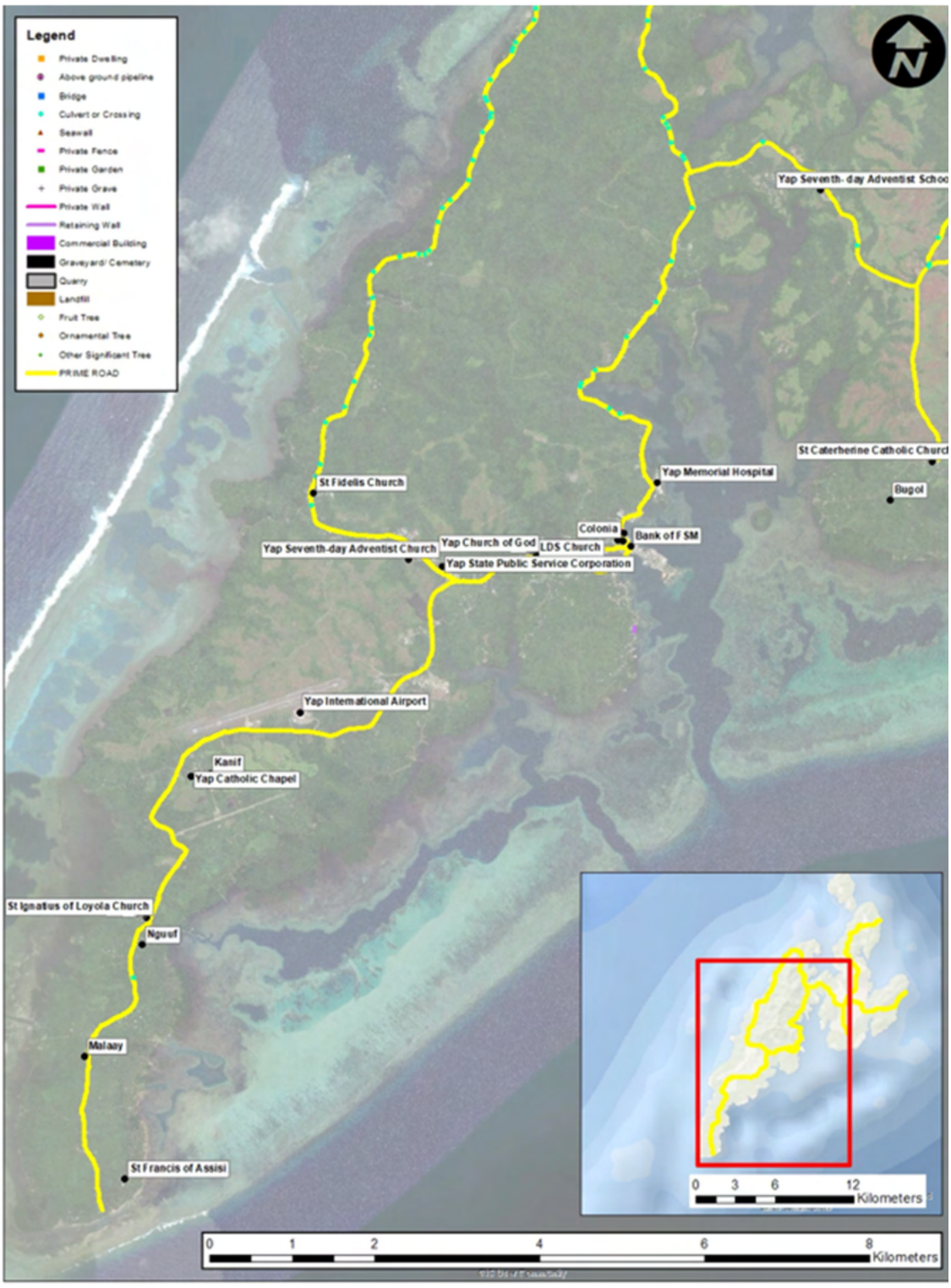
FSM PRIME & SCORE Road Assets Chuuk State – Map 2



FSM PRIME Road Assets Chuuk State – Map 3



FSM PRIME Road Assets Yap State – Map 1



FSM PRIME Road Assets Yap State – Map 2