Initial Environmental Examination

49450-023
July 2019

FSM: Renewable Energy Development Project

Prepared by the Ministry of Finance, Federated States of Micronesia for the Asian Development Bank.

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ABBREVIATIONS

ADB	Asian Development Bank
AP	Affected Person
BESS	Battery Energy Storage System
CEMP	Construction Environmental Management Plan
EA	Executing Agency
EARF	Environment Assessment and Review Framework
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMMP	Environmental Management and Monitoring Plan
EPA	Environmental Protection Authority
ESD	Environmental Significance Declaration
DFA	Department of Finance and Administration
FSM	Federate States of Micronesia
FSMEPA	Federated States of Micronesia Environmental Protection Act
GDP	Gross Domestic Product
GEF	Global Environment Fund
GHG	Green House Gas
GRM	Grievance Redress Mechanism
GWh	Gigawatt Hour
HV	High Voltage
IA	Implementing Agency
IEA	Island Environmental Authority
IEE	Initial Environmental Examination
IUCN	International Union for Conservation of Nature
kW	Kilowatt
LV	Low Voltage
MW	Megawatt
NES	National Environmental Service
PEIS	Preliminary Environmental Impact Statement
PMU	Project Management Unit
PPE	Personal Protective Equipment
PREIF	Pacific Renewable Energy Investment Facility
PV	Photovoltaic
SPS	ADB *Safeguard Policy Statement 2009*
Yap EPA	Yap Environmental Protection Agency
Yap HPO	Yap Heritage Protection Office
YSPSC	Yap State Public Service Corporation

CURRENCY EQUIVALENTS

FSM uses the United States dollar (US$) as of November 2018

AU$1.00	=	US$0.72
US$1.00	=	AU$1.39

NOTES

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EXECUTIVE SUMMARY

1. **The project**. The Federated States of Micronesia (FSM) Renewable Energy Development Project: Yap (the project) will assist the FSM to meet the objectives of its National Energy Policy to provide cost effective, safe, reliable and sustainable energy. The FSM National Energy Policy sets goals to increase renewable energy generation to 30%, increase electricity efficiency by 50% and reach a rural electrification rate of 90% by 2020. Currently approximately 19% of energy generation in FSM is from renewable sources whilst 67% of households have access to electricity. Nearly 15% of GDP is spent on imported fuel, making energy the costliest sector of the FSM economy.

2. The project will undertake feasibility assessments and prepare procurement documents for subprojects in two of the four States of the FSM; Yap and Kosrae. Subprojects are designed to help the FSM meet the goals of its National Energy Policy and each State to meet the targets set in its corresponding State Energy Action Plan.

3. The power system on Yap has recently been upgraded to allow increased renewable energy generation through the installation of improved communications with distributed generation, automation of power system operation and replacement of diesel generators with high speed units. The feasibility assessment identified two subprojects to increase renewable energy generation on Yap and a further subproject to facilitate the integration of increased renewable energy into the Yap power system. Combined the subprojects are expected to increase the percentage of energy generated from renewable sources on Yap to approximately 38% and result in diesel fuel savings of at least 150 thousand gallons per year and the avoidance of 1500 tonnes of CO2e in year 1. This outcome will enable Yap to exceed its 2020 State targets and also help FSM achieve the goals of the National Energy Policy and commitments under the Paris Accord.

4. **Implementation arrangements**. The FSM Department of Finance and Administration (DFA) will be the executing agency and the FSM Department of Resources and Development (R&D) will be the implementing agency. A Project Management Unit (PMU) will be set up to manage the project and will be supported by a Project Implementation Consultant (PIC).

5. **Screening and categorisation**. The project has been classified as Category B for environment following the ADB's Safeguard Policy Statement 2009 (SPS). A category B project requires an environmental assessment commensurate with its level of impact, and this IEE, has been prepared to satisfy this requirement.

6. **Potential Impacts**. No critical habitat will be impacted by the project. The main negative environmental impact will be the loss of vegetation associated with the subproject to install a ground mounted solar photovoltaic (PV) system. The other three subprojects are not expected to have any environmental impact. A detailed flora and fauna assessment has been completed at the site of the ground mounted subproject that found that the site contains savannah vegetation that is disturbed and does not contain any flora species either listed on the IUCN Red List or endemic to Yap. Of the four flora species listed on the IUCN Red List that occur in Yap none are associated with savannah vegetation. The subproject site provides potential habitat for three fauna species listed on the IUCN Red List however, the vegetation on the subproject site does do not provide priority habitat for these species and or habitat that is unique on Yap (or in Micronesia). The clearing of these sites is unlikely to have a significant impact on these species.

7. **Environmental Management and Monitoring Plan.** Potential environmental impacts are expected to be able to be managed and reduced to acceptable levels through the implementation of the measures identified in the Environmental Management Plan (EMP). Environmental mitigation measures will be incorporated into the design of the subprojects. The IEE and EMP will be included in technical specifications and bidding documents. The successful construction contractor shall prepare a construction environmental management plan (CEMP) that will be reviewed and approved by the PMU and PIC. The IEE and EMP will be submitted to Yap State

Environmental Protection Agency (Yap EPA) accompanying a preliminary environmental impact statement (PEIS) and, if required, a full environmental impact statement (EIS) will be prepared to satisfy requirements under the *Yap State Environmental Quality Protection Act (YSL 3=73)*.

8. **Consultation, participation and disclosure**. The project continues work toward developing and implementing the objectives and goals of the National Energy Policy. Consultation for the National Energy Policy was undertaken in 2009 and 2010. Further consultation was undertaken in 2017 and 2018 by Castalia and ITP who were commissioned by the FSM National Government to prepare an Energy Masterplan for FSM.

9. For the current subprojects a range of stakeholders from State and National Government, Government agencies, YSPSC and municipal representatives have been consulted. Feedback from consultation has been considered in the selection and initial design of subprojects as part of the feasibility assessment. YSPSC are committed to undertaking further stakeholder and community consultation.

10. **Grievance redress mechanism**. A grievance redress mechanism (GRM) has been established for the subprojects. The GRM will be implemented through all stages of the project including design, construction and operation. The community will be informed of the GRM through the consultation programme and by prominent display of the GRM process at the subproject sites and in the YSPSC office prior to the commencement of onsite works. There will be full and free access to the grievance focal point. The contractor will also be responsible for implementing relevant elements of the GRM and this will be reflected in their CEMP.

11. **Monitoring and reporting**. Environmental monitoring will be carried out through all phases of project development to ensure that the identified environmental mitigation measures are effective and that actual environmental impacts accord with predicted impacts and are in compliance with Yap EPA regulations and ADB safeguard standards.

12. Reporting will include contractor's monthly reports to the PMU, quarterly progress reports prepared by the PIC/YSPSC for the FSM DoF and ADB, and semi-annual safeguards monitoring reports prepared by the PIC/YSPSC and FSM DoF and submitted to ADB. ADB will disclose the monitoring reports.

13. **Conclusion**. This IEE has identified potential environmental impacts associated with the proposed subprojects. Measures required to mitigate or minimise impacts have been summarised and in the EMP which, together with this IEE, will be updated during the detailed design of the subprojects. Provided the mitigation measures outlined in this IEE and EMP are appropriately implemented the subprojects are not be expected to have any widespread, irreversible, significant or long-term environmental impacts.

INTRODUCTION

A. Project Background

14. **Location.** The Federated States of Micronesia (FSM) is located in the western Pacific and is approximately 2700 km from east to west (Figure 1). It includes 607 islands, 74 of which are inhabited, and is comprised of four States; Yap, Chuuk, Pohnpei and Kosrae.

15. The Yap Islands group is located approximately 450 km northeast of Palau, near 10˚N latitude and 140˚E longitude. Islands in the Yap Islands group have a low undulating topography with a maximum elevation of 178 metres/584 feet at Mount Taabiywol in Fanif municipality on Yap island proper.

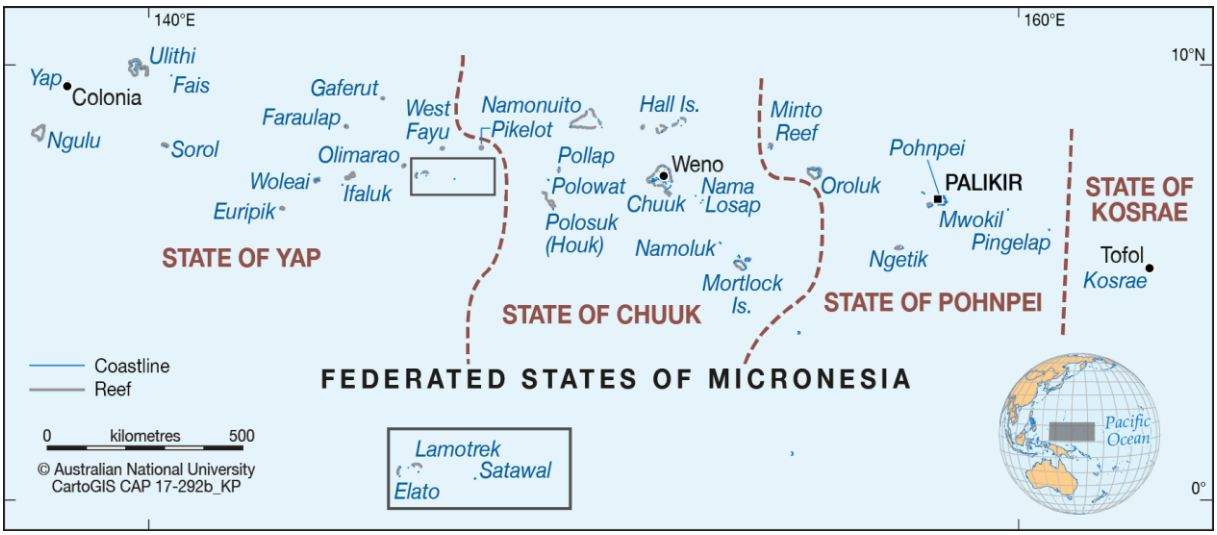

Figure 1: Map showing locations of the Federated States of Micronesia

16. The FSM, like many Pacific Nations, has traditionally relied on imported fossil fuels for electricity generation. However, the impacts of high and often variable cost of imported fuels on economic growth has led to the development of policies aimed at reducing reliance on fossil fuels thereby reducing the cost and increasing security of electricity supply. In FSM these policies have been articulated in the 2012 National Energy Policy which sets an objective to provide cost effective, safe, reliable and sustainable energy services as well as goals to increase renewable energy production to 30%, increase electricity efficiency by 50% and reach a rural electrification rate of 90% by 2020.

17. Despite the National Energy Policy the FSM currently has approximately 9% renewable energy generation and 67% of households have access to electricity according to the Energy Master Plans for the Federated States of Micronesia[1]. Nearly 15% of GDP is spent on imported fuel, making energy the costliest sector of the FSM economy. Yap State currently has around 20% renewable energy generation, and an 85% electrification rate.

18. The Pacific Renewable Energy Investment Facility (PREIF), approved by ADB in May 2017, has been set up to support 11 small pacific island countries, including the FSM, transition electricity generation from diesel to sustainable renewable energy generation sources. The PREIF will benefit economies through (i) improved balance of trade by reducing fossil fuel imports, (ii) improved energy security, (iii) downward pressure on tariffs, and (iv) reduced greenhouse gas

[1] Castalia & ITP Renewables, "Energy Master Plans for the Federated States of Micronesia," Castalia, 2018 [2] ADB. 2009, Safeguard Policy Statement (Manila, Philippines)

emissions. The ongoing facility will support regional approaches to energy sector reform, private sector development and capacity building and will finance projects with an overall estimated cost of $750 million.

19. The FSM Renewable Energy Development Project: Yap (the project) is a component of the PREIF aimed to identify subprojects that will assist the FSM to increase renewable energy generation. A feasibility assessment has identified four subprojects in Yap State; roof and ground mounted solar generation, upgrades to the existing integration and control system and a battery energy storage system (BESS) all located on Yap proper.

20. **Implementation arrangements**. The FSM Department of Finance and Administration (DFA) will be the executing agency and the FSM Department of Resources and Development (R&D) will be the implementing agency.

B. Objectives and Scope of IEE

21. This document provides an initial environmental examination (IEE) of three of the subprojects located in Yap. The fourth subproject consisting of an upgrade to the existing integration and control system does not have any potential environmental impacts and is not considered within the IEE. The IEE has been prepared with the YSPSC and following the requirements of the ADB's Safeguard Policy Statement 2009 (SPS)[2].

22. The overall objective of the assessment process is to identify impacts as well as measures to avoid, minimise/mitigate or compensate for them. The objectives of the IEE are to:

- Identify and describe the existing environmental conditions—physical, biological and socio-economic—in the subproject areas including the identification of Critical Habitat (as defined in ADB SPS) potentially impacted by the project;
- Assess the proposed location, design, construction, and operation activities to identify and evaluate their potential impacts (positive and negative), and determine their significance;
- Propose appropriate mitigation and monitoring measures that are incorporated into an environmental management and monitoring plan (EMP) that will avoid or minimise adverse impacts so that residual impacts are reduced to acceptable levels;
- Consult with stakeholders on the potential impacts and understand the issues and concerns about the impacts and how they might be affected; and
- Ensure that all statutory requirements for the project such as applicable legislation and regulations, permits required (if any) and policies have been considered.

23. A feasibility assessment has been completed that identified four subprojects on Yap. The scope of this IEE includes three of these four subprojects (the fourth is a modification to an existing control system with no physical footprint).

24. The scope of the IEE includes the footprint of the subprojects as well as the area of influence of the subprojects to ensure that secondary or indirect impacts can be identified and managed.

25. The IEE is based on primary sources of information derived through field studies and consultations during site visits and secondary sources of information available in relevant reports and databases.

[2] ADB. 2009, Safeguard Policy Statement (Manila, Philippines)

1. LEGAL AND POLICY FRAMEWORK

A. Legal and Policy Framework of Yap

26. **Institutional arrangements for environmental protection**. The FSM is made up of four semi-autonomous States, each with their own government and legislative system, with an overarching national government retaining responsibility for negotiating and entering into multilateral environmental agreements.

27. Each State takes the lead role in restricting development in vulnerable areas and ensuring that critical natural systems are protected. Each State has made efforts to control development and manage natural resources through the creation of land use plans, coastal zone plans, legislation and regulations. The National Government provides guidance and technical assistance to the States when requested on matters related to planning, economic development, natural resources, fisheries, and the environment.

28. Each State has an Environmental Protection Agency (EPA) and has autonomous responsibility for state environmental impact assessment regulations and other environment-related legislation. Activities undertaken by the national government, or its agencies, are assessed under the National the *Federated States of Micronesia Environmental Protection Act (1984)* (FSMEPA). Otherwise, activities are assessed under the state-level Acts and regulations.

29. The State EPAs manage environmental assessment and management of projects. Projects require an EIA to be completed before implementation can begin. An initial statement of potential impacts and mitigation is required to identify potential environmental risks. If no potential risks are raised in the initial assessment, then the project can proceed. If the initial assessment identifies potential issues, then a full assessment is required.

30. The Yap State Environmental Protection Agency (Yap EPA) is responsible for environmental protection in Yap. The Yap EPA has capacity to provide environmental compliance monitoring of subprojects.

31. **National Energy Policy.** In 2012, the FSM put in place the National Energy Policy, which calls for a 30% reduction in use of fossil fuels, 50% increase in energy efficiency and a rural electrification rate of 90% by 2020. The "National Vision" for energy as outlined in the policy is:

> "*To improve the life and livelihood of all FSM citizens with affordable, reliable and environmentally sound energy." The "National Objective" is: "to promote the sustainable social and economic development of FSM through the provision and utilization of cost-effective, safe, reliable and sustainable energy services."* FSM Energy Policy 2012

32. The National Energy Policy includes a series of State energy plans that describe activities and programs planned to be implemented to enable FSM to achieve the National Energy Policy Goals. This project is aligned to both the State Energy Action Plans and the National Energy Policy.

33. **Energy Masterplans for the FSM 2019-2039**. The FSM National Government prepared an Energy Masterplan for each State of FSM[3]. The Masterplan covers a 20-year period from 2019 through to 2039. Within this period, plans have been broken into five-year periods typical of funding agency windows. The State plans set out the technical projects in the electricity sector that are required to achieve the National Energy Policy, as well as financing and implementation plans.

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[3] Castalia & ITP Renewables, "Energy Master Plans for the Federated States of Micronesia," Castalia, 2018[4] Hafiz Ur, R., Hideo, N. and Kei, K. (2013). Geological Origin of the Volcanic Islands of the Caroline Group in the Federated States of Micronesia, Western Pacific. *South Pacific Studies* Vol.33 (2): 101-118.

34. **FSM Environmental Policy**. The environmental policy of the FSM is to use all practicable means, consistent with other considerations of national policy, to improve and coordinate governmental plans, functions, programs, and resources to the end that the inhabitants of the FSM may:

- fulfil the responsibilities for each generation as trustee of the environment for succeeding generations;
- enjoy safe, healthful, productive, and aesthetical and culturally pleasing surroundings;
- attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable or unintended consequences;
- preserve important historic, cultural, and natural aspects of our Micronesian heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice; and
- remain responsible members of the global community by complying with the international legal obligations accepted by the Federated States of Micronesia upon ratifying or acceding to international environment agreements.

35. **The Federated States of Micronesia (FSM) National Biodiversity Strategy and Action Plan (NBSAP)** outlines the state of the nation's biological resources and the biological and anthropogenic threats that are affecting their continued existence. The NBSAP vision is:

> *"The FSM will have more extensive, diverse, and higher quality of marine, freshwater, and terrestrial ecosystems, which meet human needs and aspirations fairly, preserve and utilize traditional knowledge and practices, and fulfil the ecosystem functions necessary for all life on Earth".*

36. The FSM NBSAP addresses a broad and comprehensive range of issues organized into 11 themes and calling for some 198 actions. It places responsibility for the implementation and monitoring of the NBSAP with the States. This resulted in the finalisation of the Yap BSAP.

37. **The Yap State Biodiversity Strategy and Action Plan 2004** is about striving for successful action to conserve Yap State biodiversity and must address the full range of causes of its current loss through conservation programs, protection of biodiversity, sustainable use of natural resources, restoration of endangered species, and build-up of individual human capacity for conserving biodiversity through awareness programs.

38. **Legal framework**. The principle environmental Act of the FSM is the FSMEPA together with its subsidiary instruments. The act seeks to provide the legislative basis for the protection of the environment, including cultural, historic and natural aspects of Micronesian heritage, throughout FSM. The FSMEPA acknowledges that close co-operation between the National and State Governments is required to support this objective.

39. The Yap EPA was established in 1994, with the passing into law of the Yap State *Environmental Quality Protection Act (YSL 3=73).* The environmental assessment of actions is covered by regulations required under this Act. The current regulations are the Yap State Environmental Protection Agency Regulations issued by the Chairperson of the Yap EPA pursuant to 18 YSC 1509 (a) as amended.

40. The regulations require that all projects require a Preliminary Environmental Impact Statement (PEIS), unless exempted. The purpose of a PEIS is to determine whether environmental impacts associated with a project are sufficiently significant that a full Environmental Impact Statement is required. The PEIS also ensures that projects without significant environmental impacts are still provided with appropriate impact mitigation and impact minimisation measures.

41. The contents of a PEIS are prescribed by the Regulation. At a minimum, it should contain the following information:

- A brief description of the project;
- A description of the environmental setting of the project;
- A general description of the project's technical, economic, social, health and environmental effects;
- The further identification of possible environmental impacts by use of the checklist provided in Appendix A (of the Regulation);
- Possible alternatives to mitigate any adverse impacts;
- A brief description of the need for the proposed project (e.g. community benefit, environmental benefit); and
- The name of the person or persons who prepared or participated in preparing the Preliminary EIS.

42. The guidelines for the determination of significance under the regulations includes whether an action:

- Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;
- Curtails the range of beneficial use of the environment;
- Conflicts with the Yap's long-term environmental policies or goals and guidelines as expressed in the Environmental Quality Protection Act, and any revisions thereof and amendments thereto, any regulations promulgated there under or court decisions;
- Substantially affects the economic or social welfare of the community;
- Substantially affects public health;
- Involves substantial secondary impacts, such as population changes or effects on public facilities or infrastructure;
- Involves a substantial degradation of environmental quality;
- Has individually limited but cumulatively considerable effect upon the environment or involves a commitment for larger actions;
- Substantially affects a rare, threatened or endangered species, or its habitat;
- Detrimentally affects air or water quality or ambient noise levels; or
- Affects an environmentally sensitive area such as flood plain, erosion-prone area, geologically hazardous land, estuary, lagoon, reef area, mangrove swamp, fresh water, or coastal waters.

43. Where the Board finds that impacts under the above heads of consideration may be significant, a draft Environmental Impact Statement is required.

Other relevant legislation

44. Yap EPA has adopted the *Regulation for Earthmoving Activities (1994).* These require all developments or activities involving earthmoving be conducted in such a way as to prevent accelerated erosion and acceleration of sedimentation. To accomplish this, all persons engaging in earthmoving activities shall notify the Agency, and are required to design, implement and maintain erosion and sedimentation control measures which effectively prevent accelerated

erosion and sedimentation. These erosion and sedimentation control measures shall be set forth in a plan.

45. *Federated States of Micronesia Climate Change Act 2013 builds* upon FSMs Nationwide Integrated Disaster and Climate Change Policy by introducing legal obligations for departments and agencies of the FSM government. This act and the policy will provide an overarching framework for further detailed legislation on climate change.

46. The Yap Historic Preservation Office (HPO) was established under the Preservation of Culture section of the Yap State Code. It requires the State Government, before permitting, assisting or engaging in any activity which may have an impact on historic properties, to notify the HPO. Upon notification the HPO must analyse potential impacts on historic or traditional culture. Historic preservation provision exists in the Yap State Code as well as in the State Constitution. An HPO is established pursuant to the Preservation of Culture Code Sections. Under this legislation, no person may wilfully remove historic property from Yap or disturb, damage or destroy such property without the express written permission of Governor, a local member of the Council of Traditional Chiefs, and an HPO.

47. The HPO has the responsibility to eliminate or mitigate any harmful effects to historic properties from the proposed activity. Further, the HPO is charged with —increasing the beneficial effect on historic properties – i.e. to promote their preservation, conservation and interpretation.

48. **International agreements and conventions.** FSM have a number of ratified environmental related international and regional agreements (Table 2.1).

Table 2.1: International Conventions and Treaties.

Year	Convention or Treaty
6 September 1995	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
20 June 1994	Convention on biological diversity
18 November 1993	United Nations Framework Convention on Climate Change
16 June 1993	Agreement establishing the South Pacific Regional Environment Programme (SPREP)
26 January 1996	Convention to ban the importation into Forum island countries of hazardous and radioactive wastes and to control the transboundary movement and management of hazardous wastes within the South Pacific Region (Waigani Convention)
21 June 1999	Kyoto Protocol to the United Nations Framework Convention on Climate Change
21 January 2014	Doha Amendment to the Kyoto Protocol to the United Nations Framework Convention on Climate Change

B. ADB Safeguard Policy Statement

49. The goal of the ADB's Safeguard Policy Statement (SPS) is to promote the sustainability of project outcomes by protecting the environment and people from any potential adverse impacts of the project.

50. The SPS has the objectives to (i) avoid adverse impacts of projects on the environment and affected people; (ii) where possible; minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and (iii) help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks. To help achieve the desired outcomes, ADB adopts eleven policy principles for guiding the assessment of projects that trigger environmental risks and impacts.

51. The SPS contains three safeguard requirements (SR); SR1: environment, SR2: involuntary resettlement and SR3: indigenous peoples. Each of the safeguard requirements comprises an objective, scope and triggers, and a set of policy principles that must be met. Each of the safeguard requirements follows a due diligence process of screening, categorization, scoping, consultation, impact assessment, management, and monitoring and reporting. Documentation of the due diligence is subject to disclosure as per the requirements of the Public Communications Policy 2011.

52. ADB will not finance projects that do not comply with the SPS and the host country's social and environmental laws and regulations, including those laws implementing host country obligations under international law. The SPS also contains a prohibited activities list identifying specific activities that ADB will not finance.

53. ADB categorizes projects into categories A, B, C, and FI according to the significance of likely impacts. As per SR1, the project has been screened as Category B. Category B projects are assessed to have some adverse impacts, but of lesser degree and/or significance than category A, the impacts are site-specific and can be managed or mitigated to satisfactory levels. Category B projects require an initial environmental examination (IEE), the assessment concludes whether or not there will likely be significant environmental impacts warranting an EIA. If an EIA is not needed, the IEE is regarded as the final environmental assessment report. Accordingly, this assessment also constitutes an IEE and meets the requirements of the SPS.

2. PROJECT DESCRIPTION

A. Rationale

54. The FSM National Energy Policy sets an objective to provide cost effective, safe, reliable and sustainable energy services as well as goals to increase renewable energy production to 30%, increase electricity efficiency by 50% and reach a rural electrification rate of 90% by 2020.

55. FSM has also committed to reducing greenhouse gas (GHG) emissions by 28% from the 2000 emissions level by the year 2025 under the Paris Accord. In absolute terms, this relates to an emissions target of below 108,000 tCO2e.

56. In line with National targets the Yap State Energy Targets are for 30% of generation to be from renewable energy by 2020, and 50% by 2030. Electrification for the Yap population is to be above 95% by 2020 (already achieved).

57. The ADB administered Yap State Renewable Energy Development Project (YREDP) helped develop the Yap power system to accommodate an increased level of renewable energy contribution. This was achieved through the installation of renewable energy (wind and solar generation), improved communications with distributed generation, automation of power system operation and replacement of old, inefficient diesel generators with new, efficient, high speed units better equipped to react to rapid changes in the wind and solar output.

58. Renewable energy generation installed in the YREDP project included three wind turbines (825 kW) and solar PV arrays at various locations (503 kWp). According to YSPSC the renewable energy generation on Yap Island in 2019 is approximately 19%.

59. The subprojects proposed as part of this Project are modelled to increase Yap's renewable energy generation by 2700 MWh in year 1 and increase the renewable energy contribution to approximately 38%. This equates to diesel fuel savings of around 150 thousand gallons and the avoidance of 1500 tonnes CO_2e. This outcome will enable Yap to exceed it State targets and also help FSM achieve the goals of the National Energy Policy and commitments under the Paris Accord.

B. Proposed Works and Activities

60. Four subprojects have been identified in Yap; ground mounted solar at a site near the existing power station, roof top solar at the Yap Sports Complex, a battery energy storage system (BESS) to be located at the existing YSPSC power station, and an upgrade to the existing integration and control system. The four subprojects are outlined in Table 2 and shown in Figure 2.

Table 2: Outline of Yap subprojects.

Subproject	Description
1 – BESS at power station	800 kW / 800 kWh
2 – Upgrade of integration and control system	
3 – Rooftop solar PV extension at Yap Sports Complex	300 kW PV
4 – Ground mount solar PV array near power station	1.67 MW PV

61. **Subproject 1 – BESS.** Subproject 3 will install an 800kW / 800kWh BESS into the existing Yap power system. The BESS will be located at the existing Yap power station. The BESS will have grid forming properties that will allow the power system to operate in zero diesel operation. It will have sufficient capacity to provide approximately one hour of storage depending on the demand at the time but will mostly be used to provide ramping for wind and solar generation and to avoid starting existing diesel generation.

62. **Subproject 2 -** Yap's power system controls were upgraded during the Yap Renewable Energy Development Project. The SCADA and control upgrade proposed for this subproject is to integrate the additional solar, and BESS systems into the power grid, and allow full communications between all components. The existing proprietary "Hybrid Wizard" control system will also require upgrades to integrate the subprojects into the YSPSC power system.

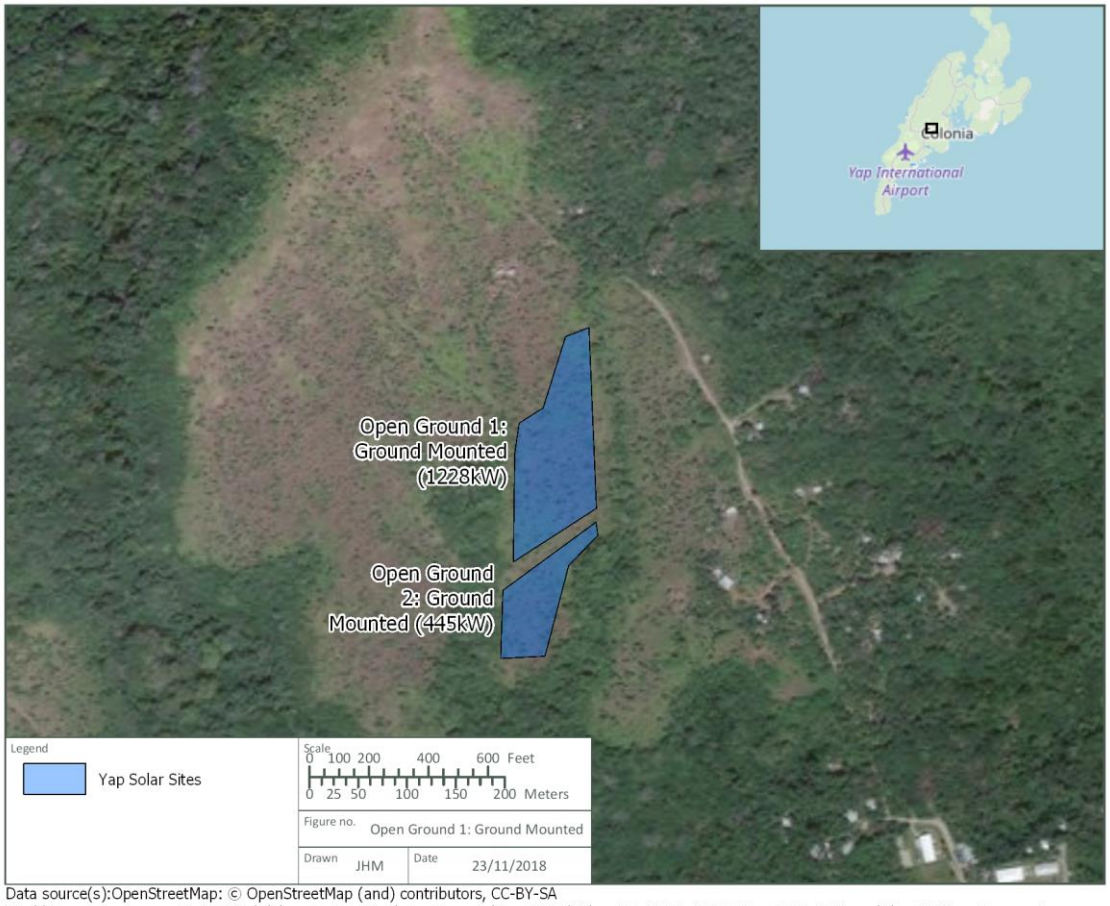
63. **Subproject 3 – Rooftop solar.** Subproject 2 will install up to 300 kW of new solar PV arrays on the roofs of the sports stadium and adjacent grandstands (Figure 3). The sports stadium already houses a 194.5 kWp solar PV system that occupies two of the three roof surfaces. The subproject will install modules on the remaining roof surface which is estimated to support up to an additional 130kW. In addition, solar PV arrays will be installed on the two grandstands located within the sports ground complex which are estimated to be capable of supporting up to 170kW. The new solar PV arrays will be connected to the existing 13.8 kV feeder.

64. **Subproject 4 - Ground mounted solar**. Subproject 1 will install a 1.67 MW solar photovoltaic (PV) array at a site located between the power station and the existing wind converter along the 13.8 kV overhead distribution line (Figure 4). The solar PV array will be connected to the existing 13.8 kV distribution line.

Figure 2: Location of proposed subprojects in Yap

Data source(s):OpenStreetMap: © OpenStreetMap (and) contributors, CC-BY-SA
World Imagery: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Figure: "\\hydrotasmania\consult$\Project\ConsultDM\E306xxx\E3065xx\E306525\P513364\GIS\P513364_GIS06\P513364_GIS06 - FSM Feasibility Study.aprx"

Figure 3: Subproject 3 roof top solar sites



Data source(s):OpenStreetMap: ⓒ OpenStreetMap (and) contributors, CC-BY-SA
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Figure 4: Subproject 4 ground mounted solar site

65. **Project components**. A description of the anticipated key components of the subprojects are provided below.

66. Solar PV arrays (ground and roof mounted):

- Fixed-tilt **solar PV modules** are recommended as they are a low-maintenance technology with a strong track record in island electrical grids. Solar PV modules will be modern, high quality panels with a temperature / loss co-efficient suitable for the climate of FSM.
- Solar PV modules will be installed on a pre-manufactured solar PV array **mounting system** constructed of stainless steel, anodised aluminium and/or galvanised steel mounted on either directly to the roof structure (rooftop) or on concrete blocks (pre-cast or cast on site) or piles (ground mounted).
- Solar PV string **inverters** will be installed within the solar PV array to convert direct current (DC) electricity produced by PV panels to alternating current (AC) for injection into the electrical grid.
- **Cabling** will either be buried in conduit or attached to the rear of PV modules and connect the solar PV modules to solar PV inverters and inverters to ancillary electrical infrastructure.
- **Ancillary electrical infrastructure** (e.g. transformer) to allow connection of the array to the existing distribution system.

67. BESS:

- High capacity **batteries** (likely to be lithium ion or sodium sulphur technology) will be installed. Battery inverters will also be installed to convert AC to DC for charging batteries and DC back to AC for injection into the electrical grid.
- A **power conversion system** (inverter) will be used to convert electricity from AC to DC for charging batteries and DC back to AC for connection to the substation.

68. **Associated infrastructure**. A perimeter security fence will be established around subproject 4 - the ground mounted solar PV array.

69. **Existing infrastructure**. Local infrastructure including roads and Yap Port will be used for the subprojects. Roads and port facilities were inspected during the site visits and found to be suitable for use for the subprojects.

70. **Project construction**. Construction of Subproject 4 (ground mounted solar PV) will generally include:

- Clearing of existing vegetation (where required).
- Spreading of fill material, compaction and levelling (where required).
- Installation of site drainage, erosion and runoff controls.
- Installation of security fencing.
- Trenching and installation of underground cables and conduit (ground mounted systems).
- Installation of foundation (e.g. mass concrete block anchor) for solar PV mounting system.
- Installation of solar PV mounting system.
- Installation of solar PV panels on mounting system.
- Landscaping of site including planting low growing vegetation (e.g. grasses) beneath the solar PV modules to help stabilise the site.
- Commissioning (load testing) of all equipment.

71. Construction of Subproject 3 (rooftop solar) will generally include:

- Installation of solar PV mounting system on existing rooftops.
- Installation of solar PV panels on mounting system.
- Installation of cabling, ancillary electrical infrastructure and connection to the existing 13.8kV feeder.

72. There are few construction works required for Subproject 1. The BESS will be sited somewhere within the YSPSC power station compound, either in containers, a dedicated building or within in existing building if there is a suitable facility available.

73. **Project operation**. The subprojects will increase renewable energy generation to approximately 38% in year 1 of operation declining to 22% by year 25, the anticipated lifespan of the project. The existing control system at the YSPSC power station will be upgraded to integrate the new solar PV installations and the BESS into the power system to ensure grid stability by controlling the source of electricity into the grid as the solar PV systems fluctuate and demand changes. The control system will manage the operation of the power system to minimise diesel consumption while ensuring reliability of customer electricity supply.

74. **Project decommissioning**. The subprojects are expected to have a lifespan of approximately 25 years. It is likely that the system will be replaced with similar equipment and solar PV modules at this time to extend the life of the projects. Batteries, inverters and other electronics and metal will be collected for recycling in the FSM (where facilities exist) or be transported to another country for recycling.

75. **Implementation schedule.** The proposed implementation schedule is shown in Table 3.

Table 3: Implementation schedule

Activity	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021
Award EPC Contract								
Subproject detailed design, procurement and mobilisation.								
Earthworks & Civil works								
Install PV and electrical equipment								
BESS Factory Acceptance Test								
BESS Site delivery Acceptance Test								
BESS installation								
Commissioning								
Integration with YSPSC								
Integration and control upgrade								
Training of YSPSC operators and handover of manuals								

3. BASELINE INFORMATION

A. Physical Resources

76. **Topography and geology.** The Yap Islands group is located approximately 450 km northeast of Palau, near 10˚N latitude and 140˚E longitude and are located in the western zone of Federated States of Micronesia. The Yap islands have a low undulating topography with a maximum elevation of 178 metres/584 feet at Mount Taabiywol in Fanif municipality on Yap island proper.

77. The Yap islands are considered to have been formed from volcanic activity associated with a hot spot in combination with fractures in the earth crust caused by the subduction of the Philippine Sea Plate where it meets the Pacific Plate[4]. The period of island arc volcanism that resulted in the formation of Yap is thought to have ended in the Late Oligocene or Miocene (approximately 23 million years ago) and there has been no evidence of more recent volcanic activity[5].

78. The Yap Islands are composed of two distinct geological sequences; weathered metamorphic schists which comprise most of the surface rock and the underlying Miocene volcanic rock which can be seen on the surface as small isolated areas as old lava flows. The low lying parts of the islands also have surface layers of coral sand and mangrove mud.

Figure 5: Satellite image of Yap Islands

79. **Soils**[6]**.** There are four main soil types on the Yap Islands that have been derived from the basement rocks (Figure 6):

- 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

[4] Hafiz Ur, R., Hideo, N. and Kei, K. (2013). Geological Origin of the Volcanic Islands of the Caroline Group in the Federated States of Micronesia, Western Pacific. *South Pacific Studies* Vol.33 (2): 101-118.

[5] Weissel, J.K. and Anderson, R.N. (1978). Is there a Caroline Plate? *Earth and Planetary Science Letters* 41: 143-158.

[6] Smith, C. W. (1983). Soil Survey of Islands of Yap, Federated States of Micronesia. Soil Conservation Service, United States Department of Agriculture.

it has been derived from volcanic rock. The surface soils are loamy, and the subsoils are clayey.

- Gagil 'Very deep, well drained, nearly level to steep soils; on hills and plateaus. 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 plateaus. Similar to Yap soils this soil type is derived from volcanic rock. The surface soils are loamy, and the subsoils are clayey.
- 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 toe 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.

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

81. The 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.

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

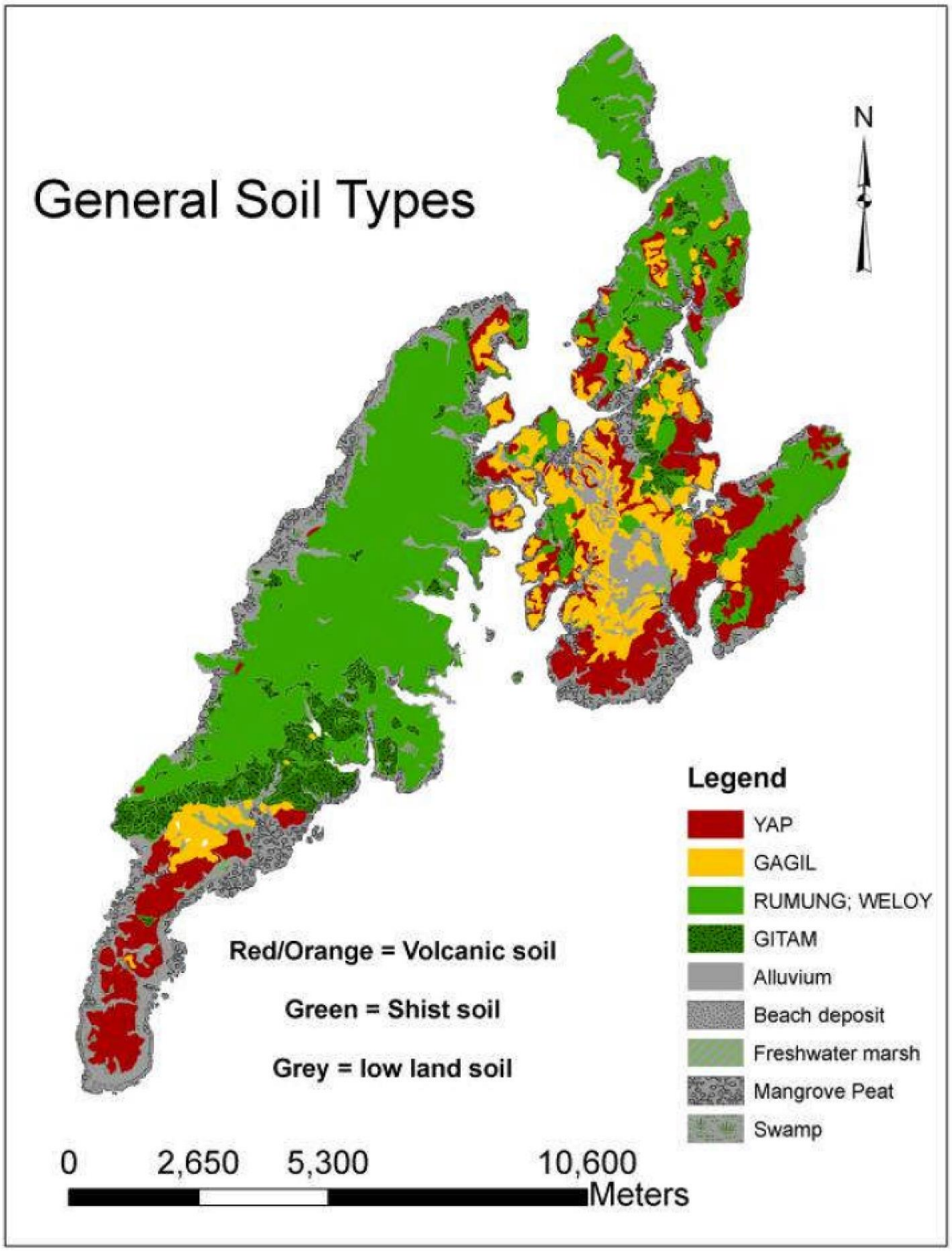


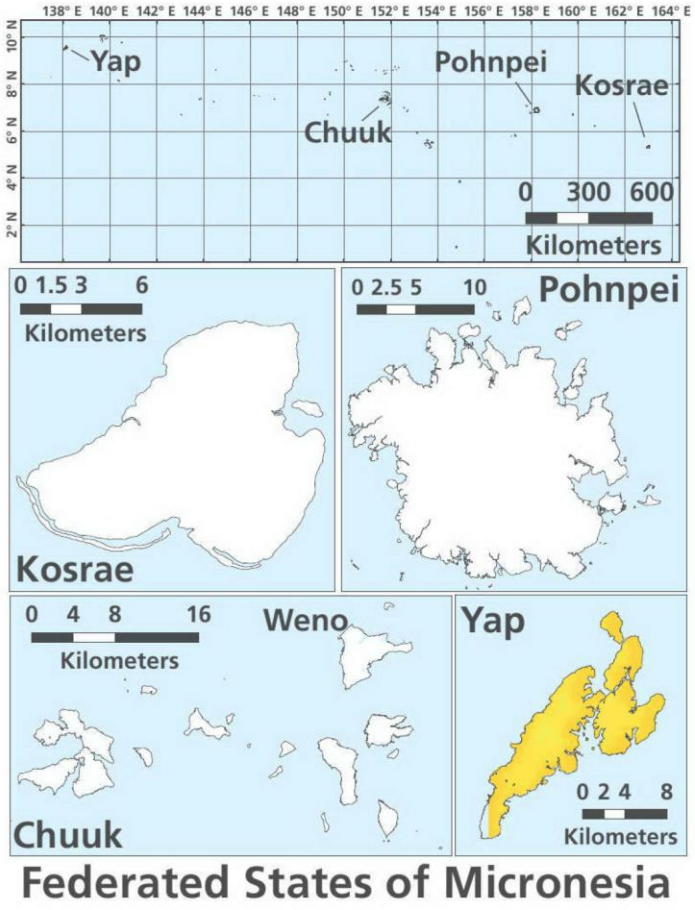
Figure 6: Soil types of Yap Islands[7]

83. **Seismicity.** The majority of the FSM islands are situated in a relatively quiet seismic area, with the exception of the Yap State which is situated close to the Pacific 'ring of fire'.

[7] U.S. Forest Service and the FSM (2010) *Federated States of Micronesia State-Wide Assessment and Resource Strategy 2010–2015+*.

These tectonic plate boundaries are extremely active seismic zones capable of generating large earthquakes.

84. According to the World Bank's Country Risk Profile for the Federated States of Micronesia[8], the island of Yap has a 40% chance in the next 50 years of experiencing, at least once, light to moderate levels of ground shaking. Such levels of shaking are expected to cause minor damage to well-engineered buildings. No significant earthquakes have been observed in recent history.



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 7: Peak horizontal acceleration of the ground (Note: 1g is equal to the acceleration of gravity) that has about a 40% chance to be exceeded at least once in the next 50 years[8].

85. **Climate**. The climate of the Yap Island group is tropical with a mean annual temperature of 27°C and a mean annual rainfall ranging from 2,250 to 3,400 mm (1981-1988). Rainfall is seasonal, with a distinct dry season lasting from November through to April and a corresponding wet season with frequent heavy rains from May through October.

86. Tropical cyclones (typhoons) generally affect the FSM between June and November. The tropical cyclone archive of the Northern Hemisphere indicates that between the 1977 and

[8] ADB Country Risk Profile: Federated States of Micronesia. http://documents.worldbank.org/curated/en/379211468000603774/pdf/96744-BRI-Box391446B-PUBLIC-FSM.pdf

2011 seasons, 248 tropical cyclones developed within or crossed the FSM Exclusive Economic Zone (EEZ). Inter-annual variability in the number of tropical cyclones in FSM's EEZ is large, ranging from zero in 1999 to 12 in 1979 and 1978. Tropical cyclones are least frequent in La Niña years.

87. Yap is subject to typhoons, and frequent heavy rains from May to November. Yap normally sits outside the path of the tropical storm systems, so is affected by typhoons every two decades or so.

88. 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.

89. **Climate change[9][10].** Annual and seasonal maximum temperatures have increased in Yap since 1951, with maximum temperatures having increased by a rate of 0.23˚C per decade. The cooling trends in Yap annual and half-year minimum temperatures are inconsistent with regional and global trends. This could potentially be due to remaining inhomogeneity's in record which cannot be resolved due to lack of metadata. Strong cooling trends in the minimum air temperature are responsible for no significant trends in the mean air temperatures at Yap.

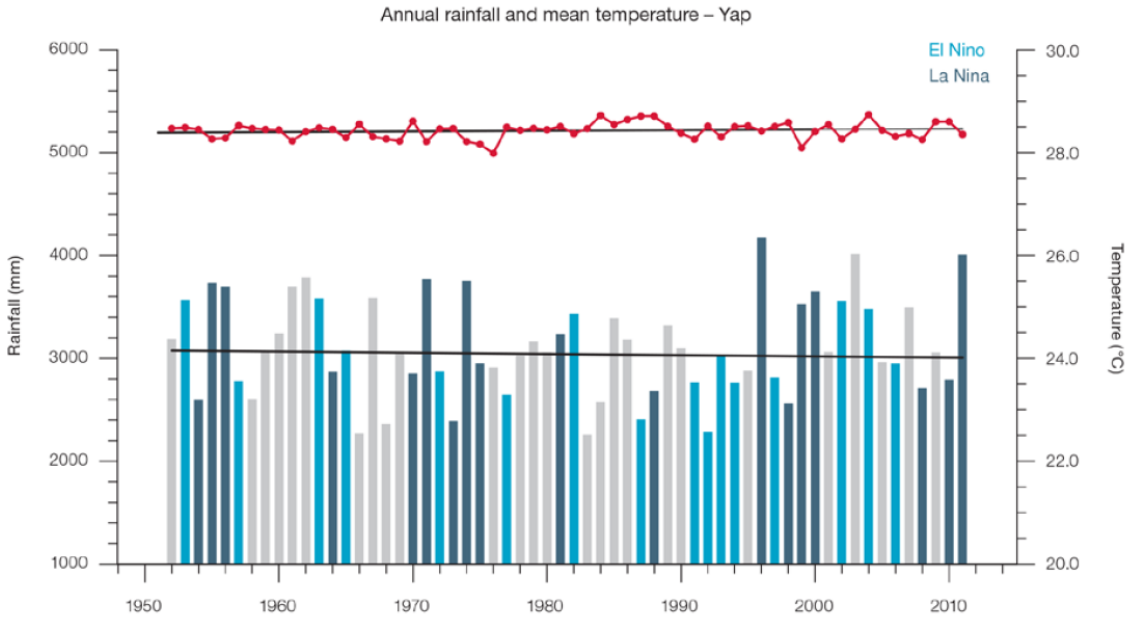


Figure 8: Observed time series of annual average values of mean air temperature (red dots and line) and total rainfall (bars) at Yap. Light blue, dark blue and grey bars denote El Nino, La Nina and neutral years respectively. Solid black trend lines indicate a least squares fit[9].

90. Notable inter-annual variability associated with the ENSO is evident in the observed rainfall records for Yap since 1952, however the total rainfall trends observed are not statistically significant. Thus, there has been little change in rainfall at Yap to date. The long-term average rainfall over the FSM is projected by almost all models to increase, with a greater increase projected in May to October than in November to April rainfall. However, the annual variability over the FSM is still the same or larger than the projected change, even in the highest emission scenario in 2090. Mean rainfall increased markedly in the western states of FSM including Yap between 1979 and 2006, but the 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 caused by global warming.

[9] Pacific-Australia Climate Change Science and Adaptation Planning (PACCSAP) Program 2015 https://www.pacificclimatechangescience.org/wp-content/uploads/2013/06/7_PACCSAP-FSM-11pp_WEB.pdf

[10] Chapter 4 in Climate Variability, Extremes and Change in the Western Tropical Pacific: New Science and Updated Country Reports 2014 https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_Ch4FSM_WEB_140710.pdf

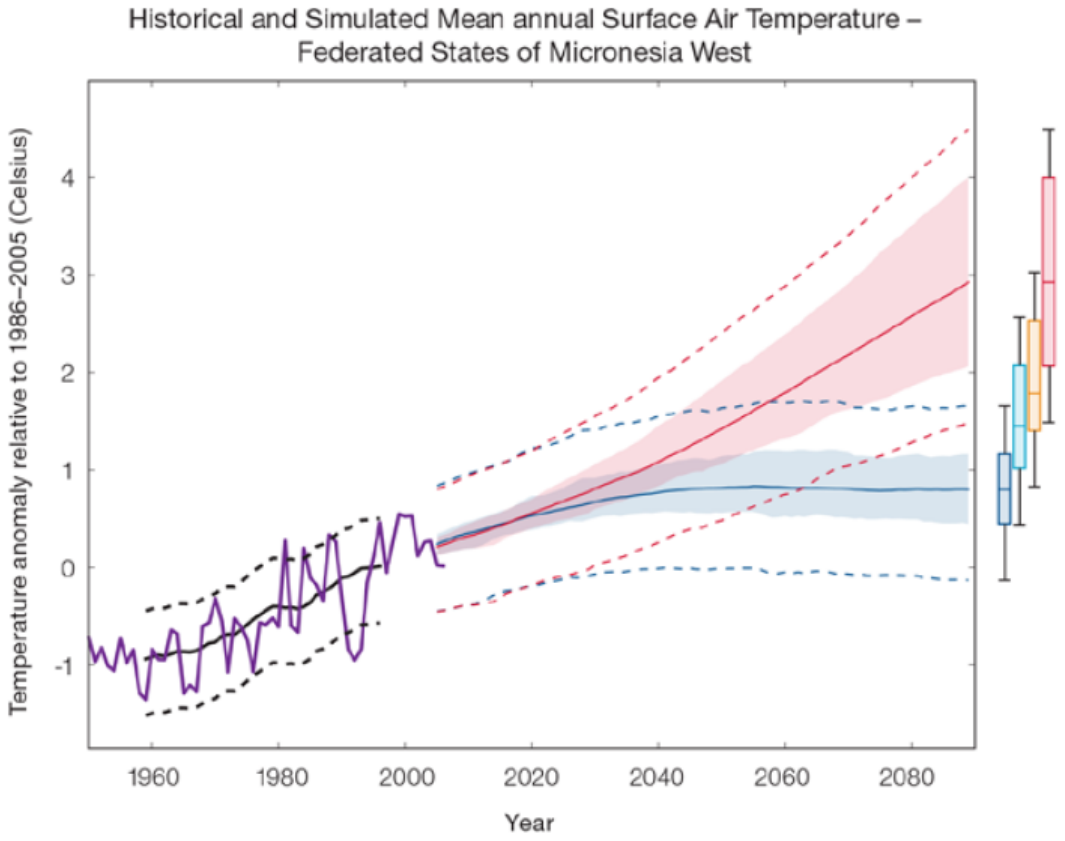


Figure 9: Historical and Simulated Mean annual Surface Air Temperature – Federated States of Micronesia West[11]

91. Extreme temperatures for the western FSM states are projected to increase by 0.8˚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.

92. 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 4). The sea level rise combined with natural yearly changes will accentuate the impact of storm surges and coastal flooding.

[11] Chapter 4 in Climate Variability, Extremes and Change in the Western Tropical Pacific: New Science and Updated Country Reports 2014 https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_Ch4FSM_WEB_140710.pdf

Table 4: Projected changes in the annual mean sea level rise in inches and centimetres for the Federated States of Micronesia. Values represent the 90% of the range of model results and are relative to the period 1986-2005[12].

	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

93. **Water resources [12].** The primary freshwater source on Yap proper is surface water (Figure 10). A large water reservoir on Yap proper was constructed to capture surface water in the stream drainage to the ocean. 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 included in the few streams on the Yap Islands that do not dry up during periods of low rainfall.

94. A proportion of the surface water percolates deeper underground and becomes groundwater, which eventually leaks out 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.

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

[12] Chapter 4 in Climate Variability, Extremes and Change in the Western Tropical Pacific: New Science and Updated Country Reports 2014 https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_Ch4FSM_WEB_140710.pdf

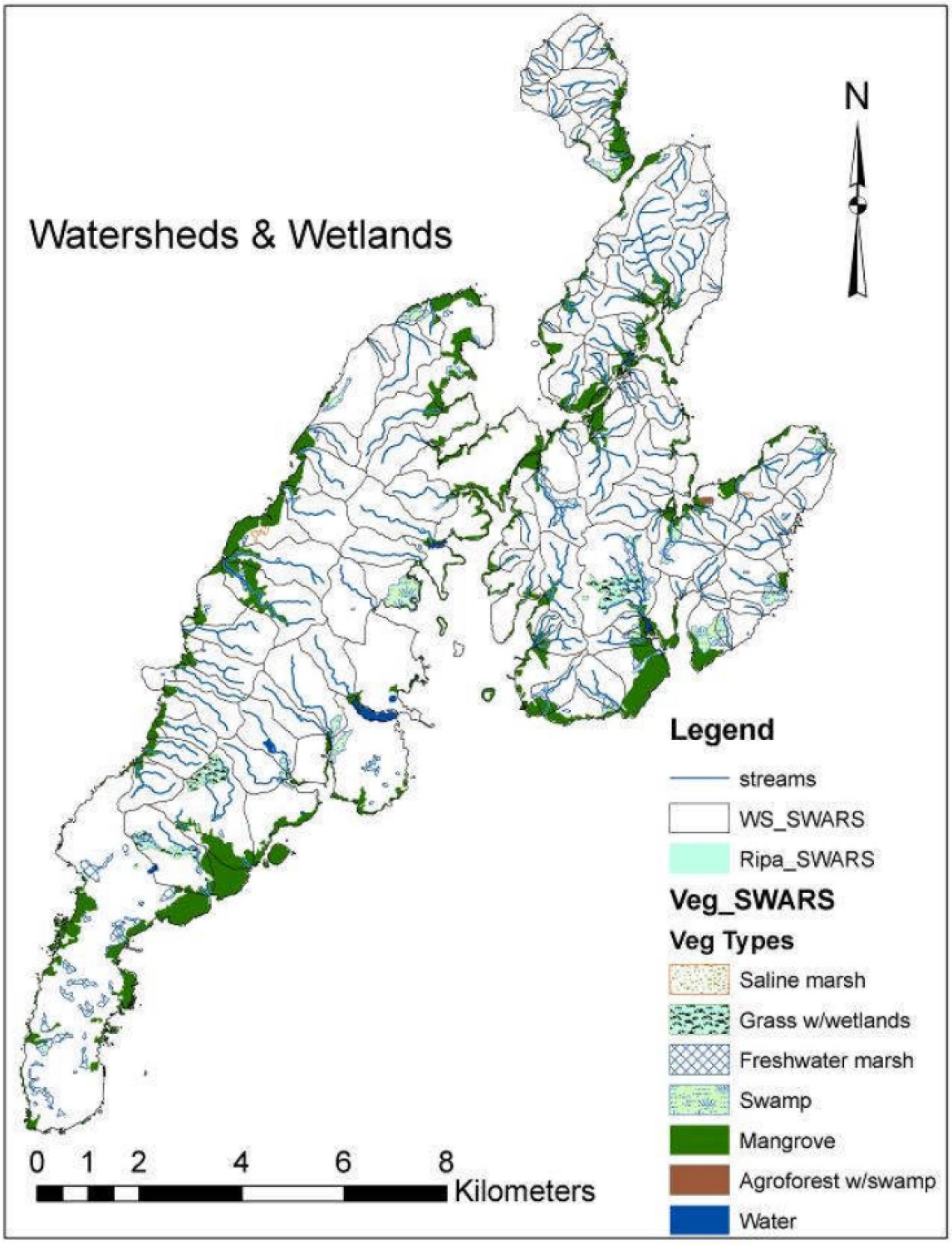


Figure 10 – Watersheds, streams and wetlands of YAP Islands[13]

[13] U.S. Forest Service and the FSM (2010) *Federated States of Micronesia State-Wide Assessment and Resource Strategy 2010–2015+*.

B. Terrestrial Biological Resources

96. **Vegetation/habitat types**. The vegetation of Yap has been greatly modified by mankind; other than mangroves, little native forest is left. 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. All of which have contributed to the destruction of the native vegetation and the development or expansion of savanna areas of degraded soils[14].

97. 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[15]. The islands are thought to have been mostly covered with broadleaf deciduous forests in the past. A vegetation map for mainland Yap is provided in Figure 11, with estimated coverage of key vegetation/habitat types provided in Table 5 (U.S. Forest Service and the FSM 2010[16] based on data from Falanruw et al 1987[14]) Across Yap, the major land class/habitat types are:

- *Forests* (40% of total land area) including upland forest, swamp forest and mangrove forest. The upland forests are of low stature, with no conspicuous stratification. In favourable, sheltered sites, the upland forest is dense with a closed-canopy but becomes more open on exposed slopes. Most upland forest remaining on Yap is secondary growth, containing a mixture of native and cultivated species. Figure 12 shows areas of relatively intact native forest (i.e. forest without secondary inclusions) on mainland Yap based on data from Falanruw et al 1987[14]. Mangrove forests occur in low, sheltered areas around most of Yap's coast.

  Upland forests provide habitat for biodiversity including a number of endemic species. They are also very important for their watershed services. Mangrove forests have multiple values for fisheries habitat, wood production, trapping sediment, and shoreline protection. Mangrove forests significantly buffer the force of waves, including storm surges, and thus protect the coastline from erosion. Coastal forests occurring above high tide mark, especially on the coasts of atoll islets, help to stabilize the coastal dunes and reduce the extent of beach erosion during storm surges

  - *Nonforest* (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.

[14] Falanruw, M.C., C.D. Whitesell, T.G. Cole, C.D. MacLean, A.H. Ambacher. 1987. *Vegetation survey of Yap, Federated States of Micronesia*. USDA, Pacific Southwest Forest and Range Experiment Station, Resource Bulletin PSW-21, Berkeley, CA.

[15] Zirkus, S. (2001) *Yap Islands State, Federated States of Micronesia* WWF unreviewed document

[16] U.S. Forest Service and the FSM (2010) *Federated States of Micronesia State-Wide Assessment and Resource Strategy 2010–2015+*.

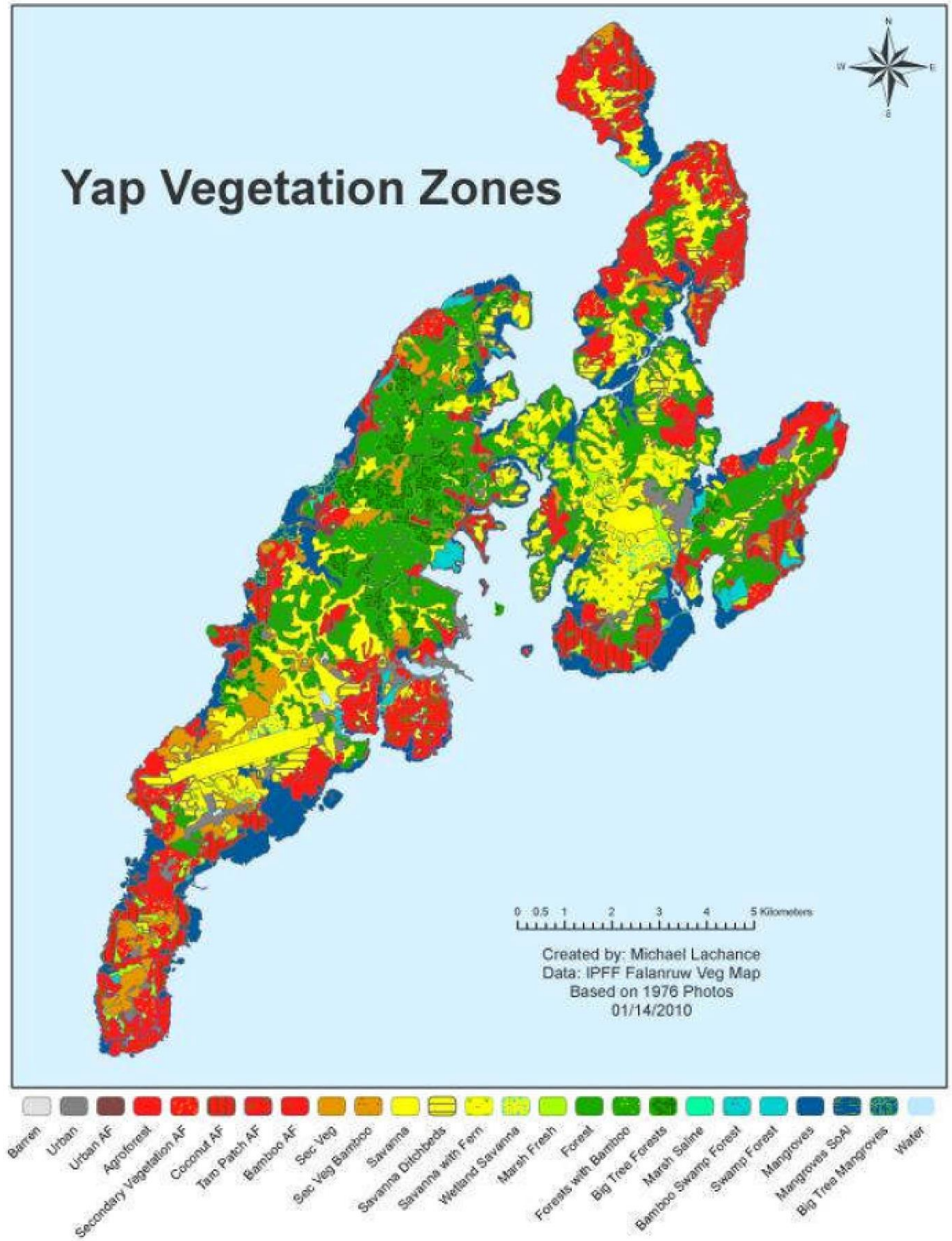


Figure 11: Vegetation map of Yap Islands (source U.S. Forest Service and the FSM 2010[17])

[17] U.S. Forest Service and the FSM (2010) *Federated States of Micronesia State-Wide Assessment and Resource Strategy 2010–2015+*.

Table 5: General vegetation/habitat types of Yap Islands[16]

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**	

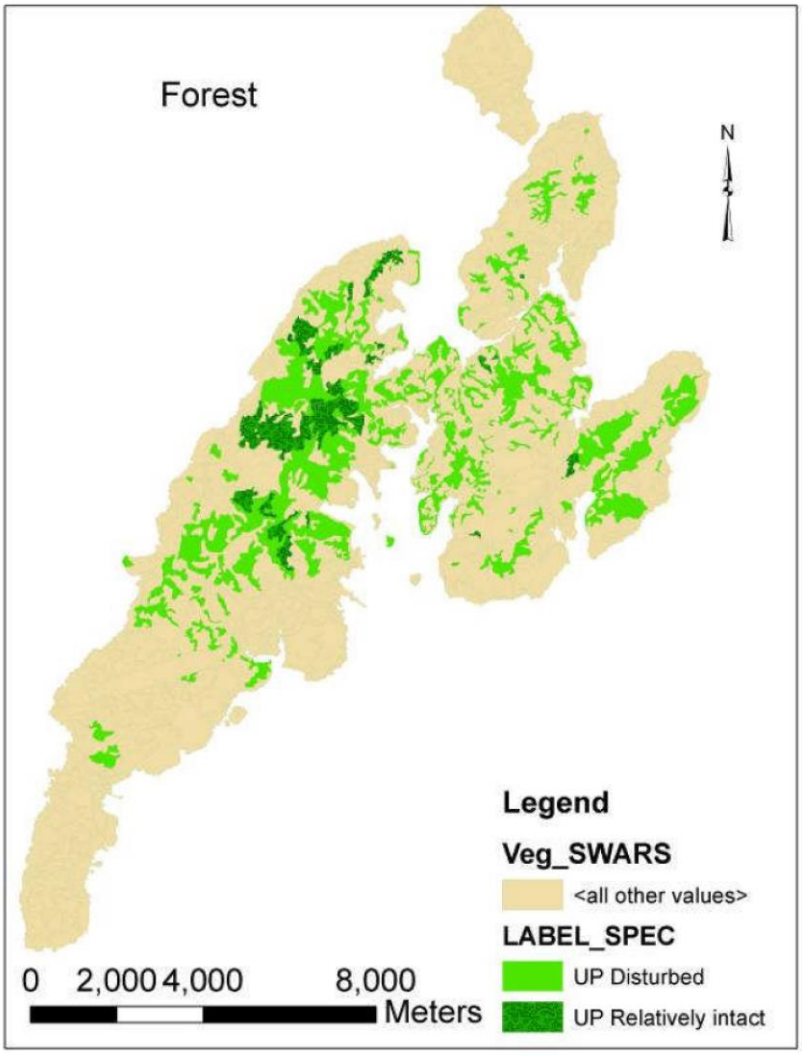


Figure 12: Yap Islands areas of relatively intact native forest (forest without secondary inclusions) based on data from Falanruw et al 1987 (source U.S. Forest Service and the FSM 2010[18])

98. **Flora**. There are over 1239 species of ferns and flowering plants in the FSM. Approximately 782 species are native, including about 145 native species of ferns, 267 native

[18] U.S. Forest Service and the FSM (2010) *Federated States of Micronesia State-Wide Assessment and Resource Strategy 2010–2015+*.

species of monocots, and 370 native species of dicots[19]. Of these, approximately 618 occur in Yap including 376 native species (45 ferns, 144 monocots, and 187 dicots; Table 6).

99. The flora of Yap appears to be an attenuated version of that found on Palau. The upland forests are of low stature, with no conspicuous stratification. The canopy layer is diverse, and common species include *Celtis* sp., *Buchanania engleriana*, *Campnosperma brevipetiolata*, *Trichospermum ikutai*, *Garcinia rumiyo*, *Pentaphalangium volkensii*, *Terminalia catappa*, *Pouteria obovata*, *Pangium edule*, *Aidia cochinchinensis*, and *Eurya japonica*[20]. The shrub layer below includes *Psychotria*, *Crateva*, *Streblus*, *Glochidion*, *Leea*, *Hibiscus*, *Polyscias*, and *Ixora*.

100. Over 457 species of plants, including many food plants have been introduced to the FSM, with 242 found in Yap (Table 6). The percentage of introduced plants varies between the states with introduced species comprising 39% of all plant species in Yap[15]. 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 6: Approximate number (and % of total) of native and introduced flora species in Yap[16]

	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

Table 7: Top ten invasive weed species within the FSM[21]

Invasive Plant Species	**Habitat**	**Pohnpei**	**Chuuk**	**Kosrae**	**Yap**
Coccina grandis		NWS			
Chromolaena odorata Siam weed		WS	WS	WS	WS
Clerodendrum paniculatum Pagoda flower		WS	NWS		
Clerodendrum quadriloculare		WS	WS	WS	WS
Clerodendrum chinense Honolulu rose		NWS	NWS		
Costus speciosus Crepe ginger		WS			
Merremia peltata		NWS	WS	WS	WS
Mimosa diplotricha Giant Sensitive plant		WS			WS
Piper auritum False kava		NWS			
Spathodea campanulata African tulip-tree		WS	NWS	?	NWS
Wedelia trilobata Wedelia		WS	WS	WS	WS

WS – widespread, NWS – not widespread

101. **Rare, regionally significant or protected flora species**. There are four threated (one endangered and three Vulnerable) and one near threatened (NT) flora species associated with Yap (Table 8). Of these species, one species (NT) is not endemic to Yap, but instead a cultivar from the islands of Pohnpei and Chuuk (*Metroxylon amicarum* - Ivory nut palm). All of the threatened species are tree species, with two (*Intsia bijuga* – thorrot, *Pterocarpus indicus* - lach) found in lowland forest, one (*Pericopsis mooniana)* from coastal forest and one (*Cycas micronesica* - faltir) from closed forest.

102. In addition, there are 364 vascular plant species that are considered endemic to Micronesia; most of them are restricted to the Caroline Islands (FSM and Palau) with a large

[19] Falanruw, M. (2002) *Terrestrial Biodiversity of the Federated States Of Micronesia*. Prepared for the FSM National Biodiversity Strategy and Action Plan Project

[20] Zirkus, S. (2001) *Yap Islands State, Federated States of Micronesia* WWF unreviewed document

[21] FSM (2002) FSM National Biodiversity Strategy and Action Plan.

percentage restricted to Palau[22]. The Yap Islands themselves support 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 9). 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[15, 16].

Table 8: Threatened or near threated flora species of Yap[23], [24]

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.

[22] Costion, C. and Lorence, D. (2012). The Endemic Plants of Micronesia: A Geographical Checklist and Commentary. *Micronesica*. **43**. 51-100

[23] Falanruw, M. (2002) *Terrestrial Biodiversity of the Federated States Of Micronesia*. Prepared for the FSM National Biodiversity Strategy and Action Plan Project

[24] IUCN (2018) *International Union for Conservation of Nature's (IUCN) Red List of Threatened Species*. Accessed November 2018.

Table 9: Endemic plant species of Yap[25]

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	
Endemics limited to Yap and FSM			
Selaginella volkensii	Yap and Chuuk	Herb	Genus often occurs along rocky stream banks or moist rocky outcroppings
Sterculia ponapensis	Pohnpei and Yap	Tree	
Endemics limited to Yap and Western Carolines			
Alphitonia carolinensis	Western Carolines	Tree	
Buchanania engleriana	Western Carolines	Tree	
Cherostylis raymundii	Western Carolines	Herb	**Rare**, orchid
Cyclosorus palauensis	Western Carolines	Herb	
Dianella carolinensis	Western Carolines	Herb	Commonly occurs in open savannas or barren volcanic soils
Dienia volkensi	Western Carolines	Herb	orchid
Diplocaulobium elongaticolle	Western Carolines	Epiphyte	Orchid
Epipremnum carolinense	Western Carolines	Herb/epiphyte	
Garcinia rumiyo	Western Carolines	Tree	
Hedyotis divaricata	Western Carolines	Shrub	
Nervilia palawensis	Western Carolines	Herb	Rare, orchid
Oberonia rotunda	Western Carolines	Epiphyte	Orchid
Peristylus setifera	Western Carolines	Herb	**Rare**, orchid
Semecarpus venenosus	Western Carolines	Tree	
Spathoglottis carolinensis	Western Carolines	Herb	Orchid
Spathoglottis micronesiaca	Western Carolines	Herb	Orchid

103. **Fauna**. FSM terrestrial ecosystems support unique avian, mammalian, reptilian and other species, including 119 species of birds (including 31 resident seabirds, 33 migratory

[25] Costion, C. and Lorence, D. (2012). The Endemic Plants of Micronesia: A Geographical Checklist and Commentary. *Micronesica*. **43**. 51-100

shorebirds, 19 migratory land or wetland birds and five vagrant species); 25 mammals (including six endemic species or subspecies of bats); and over 27 species of reptiles (skinks, geckos, snakes) and amphibians (most of them native with at least four endemic)[26]. Studies of reptiles of Micronesia are incomplete, and it is likely that there will be additional records as well as new species[27]. While there has been some work undertaken on the terrestrial invertebrates of the FSM, reports are scattered, and mostly located outside of the FSM[28]. In addition, 40 species of freshwater fish have been recorded in FSM[29].

104. 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[28]. There is one introduced amphibian (cane toad - *Bufo marinus*). 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.

105. **Rare, regionally significant or protected fauna species**. Due to the sparse knowledge of FSM's biodiversity, a list of threatened "species in peril" has not been compiled at National or State levels[28]. Some species present in the FSM are, however, included in the IUCN Red List of threatened species as well as appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the U.S. Endangered Species Act listing of Threatened and Endangered species. The *Endangered Species Act* of the FSM was carried over from the Trust Territory of the Pacific Islands and is still incomplete with no inventory or list of threated FSM species in peril[28].

106. 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 10)[30]. Other birds endemic to FSM also occur in Yap including the Caroline Reed-warbler, *Acrocephalus syrinx*, and Caroline Swiftlet, *Aerodramus inquietus*. Preferred habitats of these species are outlined in Table 10.

107. 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) and, the Micronesian starling *Aplonis opaca* and Micronesian myzomela *Myzomela rubratra*, both of which are of Least Concern (Table 10). Yap may also be visited by 21 IUCN listed migratory bird species (Table 10), including one Critically Endangered species, two Endangered, six Vulnerable and 12 Near Threatened.

108. 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.

109. 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 the four adjacent small main islands of Yap and Marianas flying fox (*Pteropus mariannus*; Endangered) which

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[26] Wortel, O. (2010) *Federated States of Micronesia Fourth National Report on the Convention on Biological Diversity*

[27] Falanruw, M. (2002) *Terrestrial Biodiversity of the Federated States Of Micronesia*. Prepared for the FSM National Biodiversity Strategy and Action Plan Project.

[28] FSM (2002) FSM National Biodiversity Strategy and Action Plan.

[29] Pippard, H (2012). *The current status and distribution of freshwater fishes, land snails and reptiles in the Pacific Islands of Oceania*

[30] Zirkus, S. (2001) *Yap Islands State, Federated States of Micronesia* WWF unreviewed document

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 11).

110. 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 and listed as Vulnerable (Table 12). In addition, there is one restricted range species thought to occur on Ulithi Atoll, in Yap State, the Giant micronesian gecko (*Perochirus scutellatus*).

111. There is one threatened freshwater fish species that may occur in Yap, the Japanese eel (*Anguilla japonica*; listed as Endangered) which has previously been recorded as a vagrant in FSM (Table 13).

112. No threatened invertebrate's species listed on the IUCN Red List are known to occur in Yap.

Table 10: Restricted-range and threatened birds of Yap (source: Birdlife International, IUCN)[31, 32]

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.

[31] BirdLife International (2018) *Micronesia, Federated States of*

[32] IUCN (2018) *International Union for Conservation of Nature's (IUCN) Red List of Threatened Species*. Accessed November 2018.

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.

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.

Table 11: Threatened mammals of Yap (source: IUCN) [33]

Common name	Scientific name	Listing	Category	Comments	Habitat
Marianas flying fox	*Pteropus mariannus*	IUCN	Endangered	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 State Code, Tilte 18 Conservation & Resources, Chp 11 Fruitbats	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.		
Yap flying fox	*Pteropus pelewensis* ssp. *yapensis*	IUCN	Vulnerable	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.
		Yap State Code, Tilte 18 Conservation & Resources, Chp 11 Fruitbats	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.		

[33] IUCN (2018) *International Union for Conservation of Nature's (IUCN) Red List of Threatened Species*. Accessed November 2018.

Table 12: Restricted-range and threatened reptiles of Yap (source: IUCN) [34]

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.

[34] IUCN (2018) *International Union for Conservation of Nature's (IUCN) Red List of Threatened Species*. Accessed November 2018.

Table 13: Threatened fishes of Yap (source: IUCN)[34]

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

113. **Protected and areas of biodiversity significance areas**. Current policy and legislation, both at the State and National level, is inadequate to support the development of a national protected areas network. The nation's decentralized political system will require the development of a unique legal and policy framework, conceivably consisting of a National policy enabling each of the four States in their protected area development[35]. In addition, FSM is not a contracting party to the Ramsar Convention and, as such, there are no internationally protected wetlands associated with FSM.

114. A two-year multi-stakeholder process including all levels of government, the U.S. Forest Service, The Nature Conservancy, university scientists, and local scientists resulted in the identification of 130 Areas of Biodiversity Significance in 2002 throughout the 607 inhabited and uninhabited islands of FSM, of which 23 are strictly terrestrial related, mainly upland native forests [36, 37, 38]. Since 2002, more than five upland forests have been placed under protection, more than 15 new marine protected areas have been established, and the designation of two UNESCO Biosphere Reserves has occurred, all with NGOs and communities central to the process[37]. As of 2014, the current status (% areas protected) was: Yap 10% marine, 0% terrestrial; Kosrae 7%, 8%; Pohnpei 29%, 20%; and Chuuk 2%, 18%[35].

115. Threatened terrestrial habitats of the FSM includes cloud forest, remaining areas of native forest, native freshwater marsh and riverine systems, swamp forest, and critical areas of mangrove forest and uninhabited atoll seabird and turtle rookeries.

116. Of the 130 ABS, 32 were identified in Yap State[38], including five terrestrial, six marine and 21 coastal marine ecosystems (Figure 13). None of the subproject sites are located in an ABS. In Yap, 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 on Yap as it is elsewhere in the Pacific. Figure 14 shows in further detail, areas of Yap Island currently protected, areas of biodiversity significance identified in 2002 and known areas of importance i.e. dive, cultural heritage or fruit bat/flying fox sites.

117. **Subproject localities biological resources**. The installation of subproject 3 (roof top solar at the sports complex) and subproject 1 (BESS at the YSPSC power station) are not anticipated to disturb any terrestrial biological resources.

118. A survey of the proposed site of the ground mounted solar PV array (subproject 4) was undertaken in December 2018. The report documenting the results of the survey is contained in (Annex 1). The survey found that the site was dominated by savannah vegetation with narrow strips of riparian vegetation to the east and west associated with drainage lines. The savannah vegetation was of low diversity with 36 species recorded whilst the riparian vegetation contained a higher diversity with 48 species recorded from a smaller area. No flora species listed on the IUCN Redlist or recorded as endemic to Yap were recorded from the savannah site. A single occurrence of *Pterocarpus indicus* (lach) which is listed as near threated on the IUCN Redlist and one species (*Trichospermum ikutai*) endemic to Yap were recorded from riparian vegetation.

119. The Yap monarch (*Monarcha godeffroyi*), Yap Olive White-eye (*Zosterops oleaginous*) and Yap Plain White-eye (*Zosterops hypolais*), all listed as near threatened on the IUCN Redlist, were observed or heard at the site but were associated with the riparian vegetation.

[35] Takesy, A. (2014) *Action Plan for PoWPA and Target 11*. Report by FSM Department of Resources and Development to the Convention on Biological Diversity.

[36] TNC (2002) *A Blueprint for Conserving the Biodiversity of the Federated States of Micronesia.*

[37] Wortel, O. (2010) *Federated States of Micronesia Fourth National Report on the Convention on Biological Diversity.*

[38] The Yap State Environmental Stewardship Consortium (2004) *Yap State Biodiversity Strategy and Action Plan*.

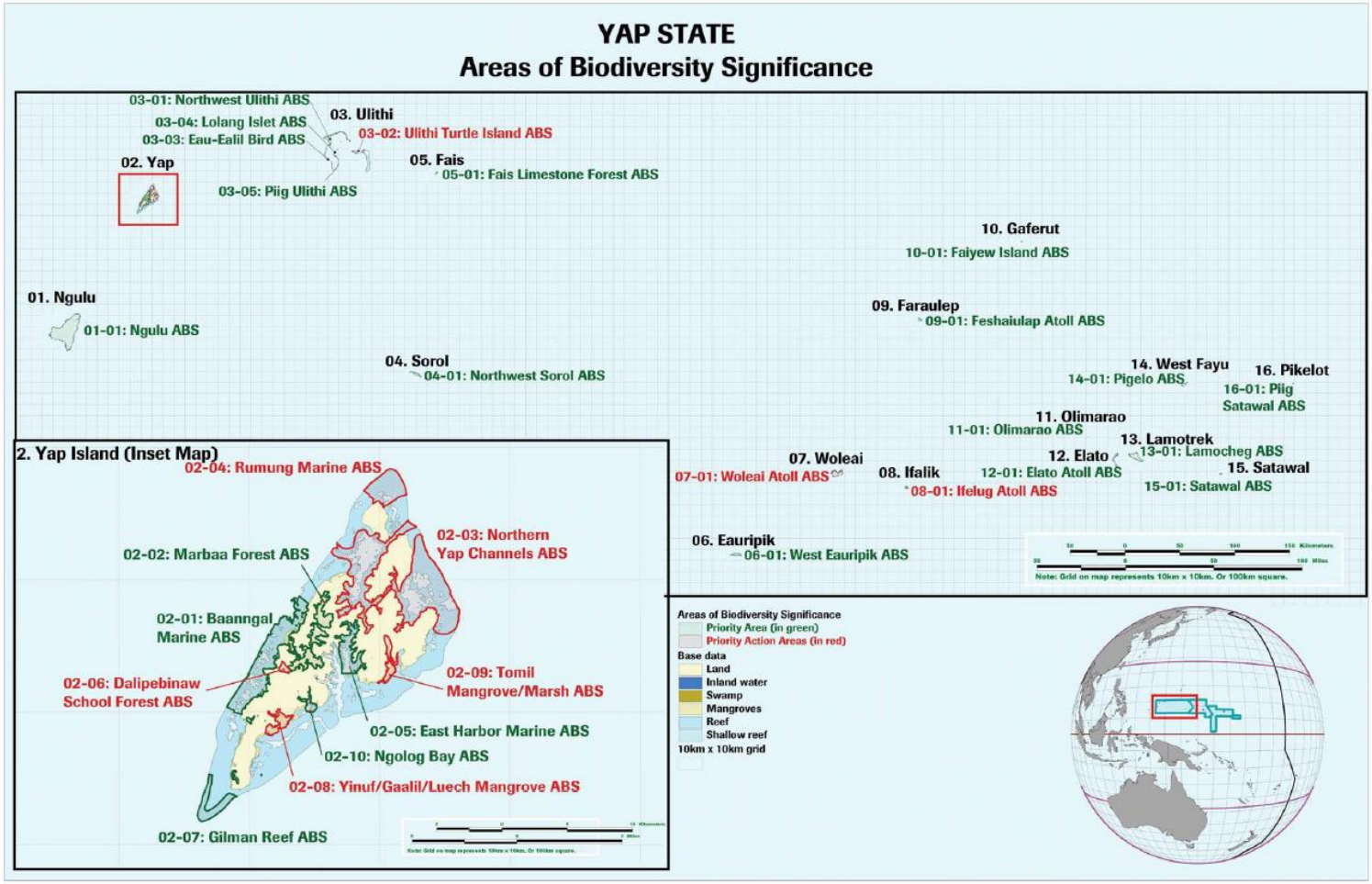

Figure 13: Areas of biodiversity significance in Yap[39]

[39] TNC (2002) *A Blueprint for Conserving the Biodiversity of the Federated States of Micronesia*

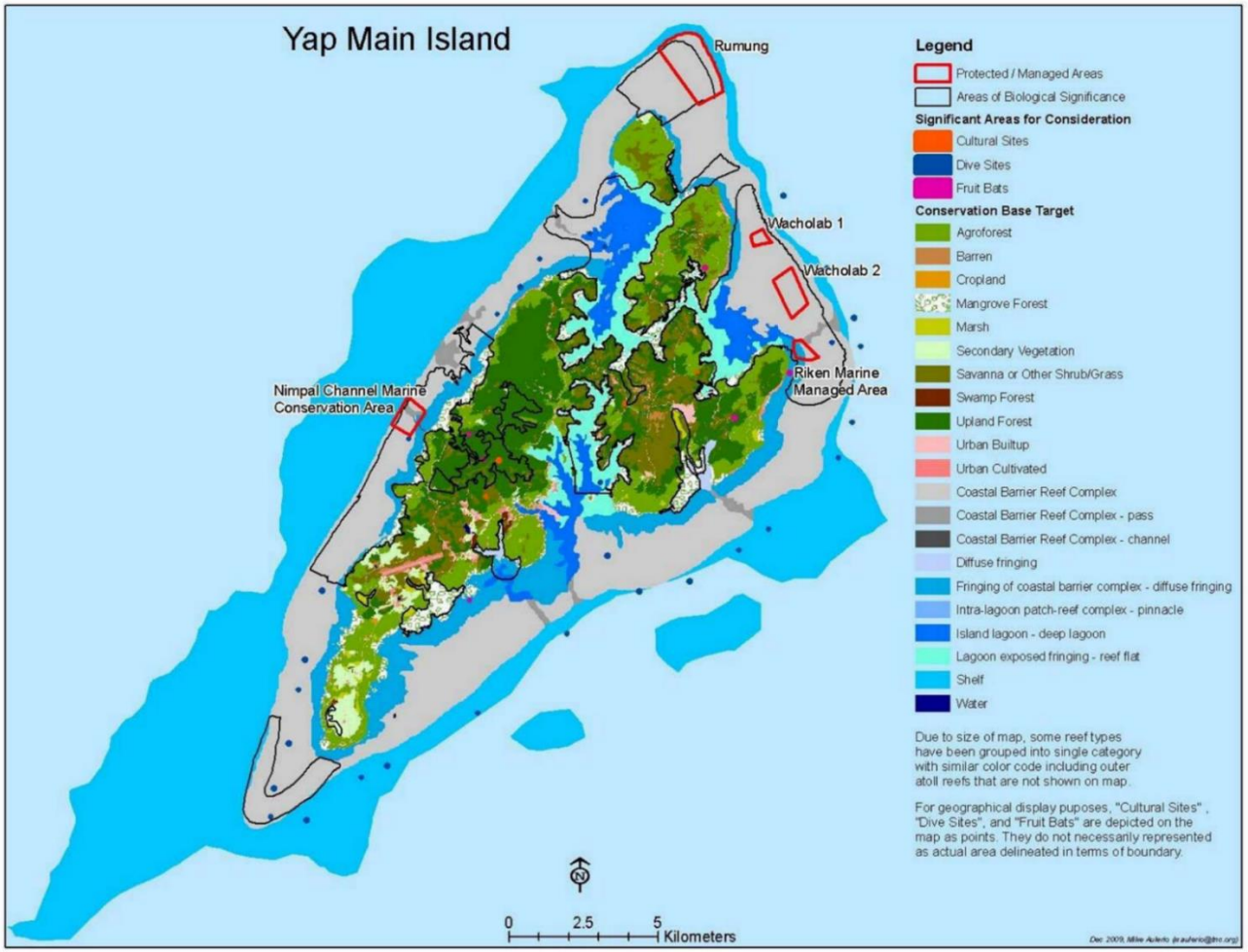

Figure 14: Conservation base map for Yap Island, 2014[40]

[40] Takesy, A. (2014) *Action Plan for PoWPA and Target 11*. Report by FSM Department of Resources and Development to the Convention on Biological Diversity.

C. Socio-economic Resources

120. **Demographics**[41, 42]. FSM's 2010 census record a total population of 102,843, comprising of 52,193 males and 50,650 females (Table 14). This represented a decline in population of 4,178 since the 2000 census, at an average annual growth rate of -0.40%. According to the 2010 census, Yap state had a population of 11,377 (11% of FSM), with 5,741 males and 5,635 females, which represents a population density of 247 people per square mile (Table 14). By comparison, Chuuk state had the highest population (48,654; 47% of FSM) and population density (993 people/sq mile). Yap state recorded the second highest average annual growth rate (0.12%) after Pohnpei state (0.48%), while Chuck and Kosrae both recorded a declining growth rate as a result of a declining economy resulting in population movement interstate (preferably Pohnpei) or to other countries.

Table 14: 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

121. 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

[41] Division of Statistics, Office of SBOC (2010) Summary Analysis of Key Indicators from the FSM 2010 Census of Population and Housing.

[42] Division of Statistics, Office of SBOC (2012) *2010 Census of Population and Housing National and State Basic Tables*.

annual rate of 0.52% and declining in urban areas (-3.84%). The greatest population in Yap Islands is located in Rull municipality (2100) 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%.

122. The average household size in FSM declined from 6.7 persons in 2000 to 6.1 persons in 2010 (Table 14). 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. In Yap state the average household size (4.9) is smaller than the national average, as is the average family size (3.7).

123. FSM's population is predominately Micronesian and is comprised of eight major ethnolinguistic groups and numerous spoken dialects. English is the country's official language of government (although less so at the state or municipal levels), and for secondary and tertiary education. Each state has its own languages, culture, local government, and traditional systems, with Yap State having five official languages: English, Ulithian, Woleaian, Satawalese and Yapese. According to the 2010 census, 75.9 % of FSM's population speaks English, In Yap, 88.3% of the Yap Islands population speaks English and 70.2% speaks Yapese. By comparison, only 73.3% of the Outer Islands population speaks English, with outer island languages dominant (81.5%) and Yapese barely spoken (1.2%).

124. 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.

125. **Education**[43, 44]. 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.

126. 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. The 2010 FSM census also showed that 79% percent 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.

[43] Division of Statistics, Office of SBOC (2010) *Summary Analysis of Key Indicators from the FSM 2010 Census of Population and Housing*.

[44] Division of Statistics, Office of SBOC (2012) *2010 Census of Population and Housing National and State Basic Tables*.

127. **Public health**[45]. The Department of Health Services in each state provides medical and public health services through a hospital, community health centres and dispensaries. 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 oversees health programmes, including health planning, donor coordination, and technical and training assistance. It is also responsible for public health programmes funded by the United States Department of Health and Human Services.

128. 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. 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

129. **Poverty**[46]. Based on a 2008 poverty assessment, 11 percent of the FSM population suffered from food poverty, while 29.9 percent of the population suffered from basic needs poverty. Opportunities for income generation were seen to be limited, especially in rural areas. With the stagnation of real incomes since 2005, accentuated by sharp decreases in gross domestic product (GDP) since 2012, it is expected that poverty will have worsened since 2008.

130. **Economy**. Economic activities consist primarily of subsistence farming and fishing. Primary farm products include black pepper, tropical fruits and vegetables, coconuts, cassava, betel nuts, sweet potatoes, pigs and chickens. The islands have few mineral deposits worth exploiting, except for high-grade phosphate. The potential for a tourist industry exists, but the remote location, lack of adequate facilities and limited air connections hinder development.

131. In 1986 FSM entered into a Compact of Free Association (Compact) with the US. The Compact of Free Association is an agreement between FSM and the United States, which provides for US economic assistance (including eligibility for certain US federal programmes), defence of the FSM, and other benefits in exchange for US defence and certain other operating rights in the FSM. A second Compact agreement, the Amended Compact of Free Association (Amended Compact), came into effect in 2004 and provides $1.8 billion of funding over twenty years, including contributions to a Compact Trust Fund (CTF) intended to replace the direct financial assistance that concludes in 2023.

132. The FSM economy has languished over the last decade and real GDP growth has averaged -0.4 percent[47]. This has resulted in declining living standards and contributed to net outward migration. An ongoing excess of imports over exports sees a continuing deficit in the trading account of the balance of payments. The economy is firmly tied to overseas aid which is significant relative to domestic revenues at the State level and is dominated by funding coming from the Amended Compact.

133. The country has a severe trade deficit. In 2005, total imports were valued at US$ 117.5 million and exports were valued at only US$ 1.3 million (exclusive of long-liner and purse seiner catches). The tourism sector is small. Private remittances are also limited, especially compared with other Pacific island countries.

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[45] World Health Organization (2018) *Country Cooperation Strategy at a Glance – Micronesia (Federated States of).*

[46] FSM Department of Transportation, Communications & Infrastructure (2015) *Federated States of Micronesia Infrastructure Development Plan FY2016-FY2025*

[47] FSM Department of Transportation, Communications & Infrastructure (2015) *Federated States of Micronesia Infrastructure Development Plan FY2016-FY2025*

134. **Livelihoods and income**[48, 49]. 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[50]. 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.

135. 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.

136. 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 15). The annual average income in FSM was estimated to be USD 16,950, with the average annual income in Yap state slightly higher at USD 17,768. However, at a national level, 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.

137. 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 (67% in Yap), with additional income (or its equivalent) gains from a range of other sources (i.e. home production, gifts, imputed rents and in-kind) (Table 16). 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.

138. 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%).

[48] Division of Statistics, Office of SBOC (2010) Summary Analysis of Key Indicators from the FSM 2010 Census of Population and Housing.

[49] Government of FSM (2014) *Household Income and Expenditure Survey 2013/14 Main Analysis Report*.

[50] Division of Statistics, Office of SBOC (2010) Summary Analysis of Key Indicators from the FSM 2010 Census of Population and Housing.

Table 15: Distribution of households by household head characteristics51

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%*

Table 16: Household income by state 2013/14[52]

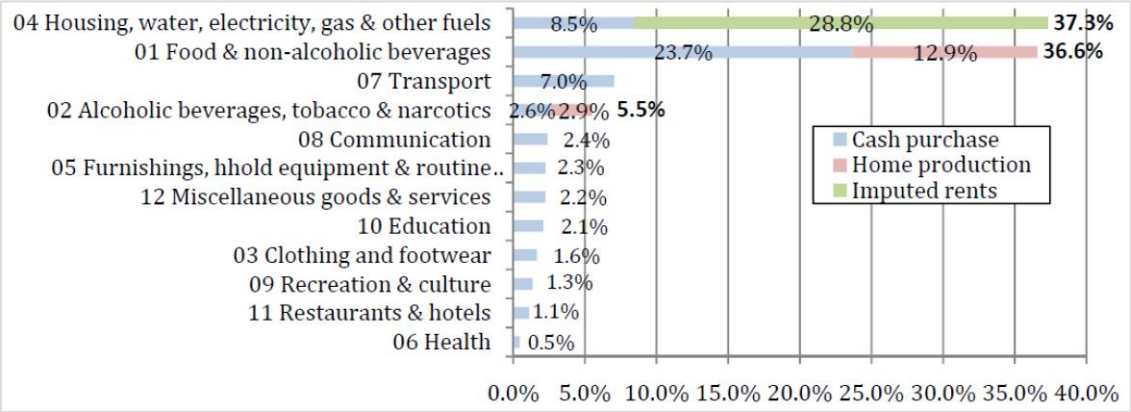
	Total annual household income (USD 000)	Average annual income (excluding imputed rent) (USD)			Income source				
		Total	Male	Female	Cash	Home production	Gifts	Imputed rents	Income in-kind
FSM	282,683	16,950	13,311	12,208	63.1	10.3	3.4	22.8	0.4
Yap State	41,807	17,768	16,103	15,085	67.1	16.7	5.3	10.8	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

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

139. 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%).

140. The majority of consumption expenditure is associated with "housing" (37.3%) especially imputed rents (Figure 15). 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.

[51] Government of FSM (2014) *Household Income and Expenditure Survey 2013/14 Main Analysis Report*.
[52] Government of FSM (2014) *Household Income and Expenditure Survey 2013/14 Main Analysis Report*



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)

Figure 15: Household expenditure 2013/14[53]

Table 17: Household expenditure by state 2013/1454

	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

141. **Employment and unemployment**[55, 56]. According to the 2010 FSM census, the working age population, defined as people aged 15 years and older, accounted for 66,146 people, representing an increase of 2,310 people (3.6 percent) since the last census in 2000. However, the actual labor force comprised of 37,919 people (22,076 males, 15,843 females); representing a national labor force participation rate of 57.3 percent (66% for males, 48% females). Of this group, 31,789 people considered themselves as employed, while 6,130 reporting to be unemployed, revealing an unemployment rate of 16.2 percent for FSM (15% males, 17% females).

142. Yap's labour force (5,181 people) has a 67.3% participation rate and an unemployment rate of 6% (the lowest of all FSM states). Over half of those formally employed, work for government agencies and services (1346 out of 2,254) with 875 people employed in the private sector. A large number of people working in the private sector are employed in wholesale/retail, construction, and transport, storage, and communication.

143. Only 40% of households were employed in paid work, resulting in an average annual income between USD 18,000 – 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 18).

144. 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%) (Table 19). Very few earn a

[53] Government of FSM (2014) *Household Income and Expenditure Survey 2013/14 Main Analysis Report*
[54] Government of FSM (2014) *Household Income and Expenditure Survey 2013/14 Main Analysis Report*
[55] Division of Statistics, Office of SBOC (2010) Summary Analysis of Key Indicators from the FSM 2010 Census of Population and Housing.
[56] Government of FSM (2014) *Household Income and Expenditure Survey 2013/14 Main Analysis Report*

wage or salary in the fishing (1.8%) or agriculture (0.6%) sectors, as income from these sectors is generated from subsistence activities.

Table 18: Occupational status of households 2013/1457

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*

Table 19: Total wage and salary income by industry 2013/1458

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	

145. **Land tenure, ownership and use**[59, 60]. 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. 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[61]. 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

[57] Government of FSM (2014) *Household Income and Expenditure Survey 2013/14 Main Analysis Report*

[58] Government of FSM (2014) *Household Income and Expenditure Survey 2013/14 Main Analysis Report*

[59] ADB (2015) *Understanding Land Issues and Their Impact on Tourism Development: A Political Economy Analysis of Pohnpei, Federated States of Micronesia*.

[60] FSM Department of Transportation, Communications & Infrastructure (2015) *Federated States of Micronesia Infrastructure Development Plan FY2016-FY2025.*

[61] Ryan, B and Les, P. (2018) *Countries and Their Cultures: Culture of Federated States of Micronesia*

their most significant asset and leasing of private lands can be time-consuming due to fractional ownership and uncertain boundaries and titles.

146. 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.

147. In FSM the majority of land is privately owned (68%), with only 32% considered to be public land (Table 20). The amount of public land varies considerably between states, with only 2% of Yap state public land and the rest privately owned.

Table 20: Landownership in FSM62

	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%

148. **Transport**[63]. FSM has 388 km of roads, 184 km sealed and 204 km unsealed. 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 a school bus service between Yap's capital of Colonia and smaller villages is the only significant public bus network in FSM. Road and pedestrian facilities are largely the responsibility of state departments for infrastructure/public works.

149. 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.

150. There are five 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.

151. 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%).

152. **Energy**. Based on those that have access to electric lighting, 72% of Yapese households have access to electricity, with electricity sourced from YSPSC (66%), a generator (1%) and solar panels (6%). On Yap Island, 85% of household source electricity from YSPSC. While Yap State Public Service Corporation (YSPSC) is focused on the main Yap island group, support is also provided to outer island electric power facilities. A high percentage of customers have a metred supply and operation and maintenance costs are largely covered from tariff

[62] Doran, K. (2004) *Private Lands Conservation in the Federated States of Micronesia*. A Report by the Natural Resources Law Center University of Colorado School of Law

[63] FSM Department of Transportation, Communications & Infrastructure (2015) *Federated States of Micronesia Infrastructure Development Plan FY2016-FY2025.*

revenue. Improvements to and/or rehabilitation of generation and distribution assets and major network extensions, as well as the integration of renewable energy sources into the grid, are dependent on external financing.

153. Besides lighting, electricity is used to power common appliances such as televisions, VCRs/DVD players, fridges/freezers and radios. In addition, a small portion (10%) of households, all in Yap Islands, have air conditioners.

Table 21: Appliances owned by Yapese households

	Yap state	% of state HHs	Yap Islands	% of state HHs	% of Yap Island HH	Outer Islands	% of state HHs
# households (HH)	2311		1680			631	
Air conditioners	225	10%	222	10%	13%	3	0%
Fridge/freeze	1234	53%	1128	49%	67%	106	5%
VCR/DVD	1197	52%	1041	45%	62%	156	7%
TV	1012	44%	938	41%	56%	74	3%
Radio	1269	55%	1139	49%	68%	130	6%
Telephone	769	33%	769	33%	46%	0	0%
Mobile phone	1363	59%	1290	56%	77%	73	3%
Computer	315	14%	301	13%	18%	14	1%
Internet	180	8%	179	8%	11%	1	0%

154. **Water supply and sanitation**[64]. Out of the total households in FSM, about two in every five households do not access improved drinking water. According to the 2010 census, 93% of Yapese source their drinking water from a public (11%) or community (43%) water supply or household tank (39%).

155. With regards to sanitation, almost half the households in FSM (43.5%) do not access improved toilet facilities i.e. flushing. In Yap state, 43% of households have flushing toilets with 11% of households (all in Yap Islands) connected to the sewer, with a further 32% connected to a septic. However, 49% of household have no toilet facilities.

156. **Waste management**[65, 66]. The impact of pollution and the need for waste management programs in the past in the FSM were small as most waste products were biodegradable and populations were dispersed. However, recent increases in urbanization and the importation of non-biodegradable materials and chemicals have brought with them ever-increasing pollution problems and the urgent need for correct collection, disposal and management programs for wastes. The current level of pollution from solid and liquid waste in the FSM is increasing particularly in the vicinity of main population centers. It is clear that the generation of wastes will increase both in quantity and type in the future. Increased ship traffic, both domestic and international has greatly increased pollution in the marine environment and directly affects biodiversity within the nation's major ports.

157. There are effective, regulated solid waste management systems in place for the primary state population/activity centers in all states and there is developing private sector involvement in solid waste management services. All primary landfill sites utilize the Fukuoka method and

[64] Division of Statistics, Office of SBOC (2010) Summary Analysis of Key Indicators from the FSM 2010 Census of Population and Housing.

[65] FSM (2002) FSM National Biodiversity Strategy and Action Plan.

[66] FSM Department of Transportation, Communications & Infrastructure (2015) *Federated States of Micronesia Infrastructure Development Plan FY2016-FY2025.*

there is increasing separation of recyclable and hazardous wastes from general refuse. It is noted that current landfill site in Yap Island only has capacity for another few years.

158. **Physical and cultural resources**[67, 68]. 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:

- *Stone fish weirs (aech)*: It is estimated that there may have been 700-800 aech located around coast Yap at one stage, many in the shape of an arrow with some over 200 yards in length and 100 yards wide.
- *Traditional canoes*: Yap Island and the outer islands of Yap are renowned for their canoe building, ocean voyaging and navigation techniques. On Yap Island, the traditional canoe club Waa'gey has been established to continue this knowledge. In the village of Wichilap, there lives one of the last master carvers for Yap Island.
- *Stone money*: Yap is famous for its stone money, being the only place in the world that contains this type of 'currency'. The round limestone disks can vary from a few inches in diameter to over 10 feet, and they were initially carried on rafts and towed by traditional canoe from Palau to Yap, a distance of over 400 miles. The 'value' of the stone money is not in its size but in the associated stories and hardships in acquiring it, particularly during the period when they were all transported by traditional means. In the later 18th century, a westerner named David O'Keefe established a trading station in beche-de-mer and copra, and for 30 years he assisted Yapese in transporting large quantities of stone money from Palau for Yap. It has been estimated that over 30,000 stone money disks are on Yap, located in 200 stone money banks in 134 villages. The stone money can change owners for services rendered, but they generally remain in the same bank.

159. 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.

160. Intangible cultural heritages includes traditional sailing and navigation, Woleai's written language, traditional house construction, other forms of traditional money (e.g. shells, whale teeth), village hierarchy, traditional dances and traditional dress.

161. 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 22).

[67] Jeffery, B. (2016) *University of Guam Archaeology Field School in Yap*.

[68] ICHCAP/UNESCO (2014) *Intangible Cultural Heritage Safeguarding Efforts in the Federal States of Micronesia*. Report prepared in collaboration with the FSM National Archives, Culture, and Historic Preservation Office

Table 22: Heritage sites listed on the US National Register of Historic Places[69]

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.

[69] US Government (2018) *National Register of Historic Places listings in the Federated States of Micronesia*.

162. **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.

163. **Subproject localities physical and cultural resources**. An inspection of the ground mounted solar site (subproject 1) was conducted with representatives of the Yap State HPO and EPA. The site inspection forms the initial analysis of the project for potential impacts on historic or traditional culture by the HPO in accordance with the Yap State Code. The inspection found no historic or traditional cultural values associated with the site (Annex 2).

4. ANTICIPATED IMPACTS AND MITIGATION MEASURES

A. Overview

164. This IEE provides an analysis of the anticipated impacts associated with the subprojects. Environmental safeguard measures will be incorporated into the project as follows:

- Pre-construction phase – the period of time from the preparation of this IEE to the time that the 'notice to proceed' is issued. This IEE and EMP will be included in technical specifications and bidding documents. The successful contractor shall prepare a construction environmental management plan (CEMP) that will be reviewed and approved by the PMU and PIC. The PMU will update the IEE based on the detailed design prepared by the contractor. The contractor will incorporate environmental mitigation measures identified in the IEE and EMP into detailed design.
- Construction phase - the period from the time that the 'notice to proceed' is issued to the contractor to when the 'certificate of completion' is issued. The contractor will complete the project as per the design and technical specifications and implement the measures included in the approved CEMP, IEE any conditions issued by the Yap State EPA. This process will be monitored and documented by the PMU with assistance of the PIC.
- Operation and maintenance phase - the period starting when the 'certificate of completion' has been issued until the end of the agreed lifetime of the project. The YSPSC will be responsible for implementing the measures identified in the operation phase of the EMP.

B. Design and Pre-construction Impacts

165. **Access to land**. Subprojects 1, 2 and 3 are located on land owned by the Yap State Government. The land for the ground mounted solar PV array (subproject 4) is privately owned but will be acquired voluntarily through negotiated lease. A Resettlement Plan (RP) has been prepared and found that the project will not displace anyone physically or economically and no land will be taken involuntarily. No negative land acquisition and resettlement impacts are expected.

166. **Adaptation for climate change**. Sea level is projected to rise over the life of the project which will exacerbate flooding caused by storm surges and tides in low lying areas. The subprojects are located in elevated areas and will not be impacted by increased flooding. Climate change projections also show that rainfall is expected to decrease which will increase the importance of efficient water storage. Although the frequency of typhoons are expected to

decrease their intensity is expected to increase. Solar PV arrays are susceptible to strong winds and the technical specifications will ensure that all subprojects are designed to relevant standards to withstand extreme weather events.

167. In addition, all components procured for the subprojects will be suitable for tropical marine and coastal environments, preferably be preassembled and will be as resistant to corrosion as practicable (e.g. stainless or galvanized steel mounting systems). Components will meet international standards (e.g. IEC 61730 Photovoltaic (PV) module safety qualification).

168. **Pathogens and invasive species**. The installation of the subprojects has the potential to introduce pathogens and invasive species to Yap. The technical specifications will include the requirement for the contractor to obtain appropriate certificates for any material or equipment imported onto Yap for the subprojects.

169. **Unexploded ordinance.** There is potential for unexploded ordinance (UXO) to be disturbed by earth works associated with subproject 4. A survey for UXO will be undertaken and clearance issued for the site prior to any ground disturbing activities.

170. **Asbestos.** There is potential for discovery of asbestos containing material on rooftops (where solar panels will be installed) or used in the construction of new buildings. The subproject will ensure to avoid asbestos use as required by ADB's prohibited investments activities list (ADB SPS Appendix 5).

171. **Visual impacts.** The installation of the subprojects has the potential to impact the visual amenity of the view shed in which they are constructed. There is one residential dwelling located approximately 50 m from the closest point of the subproject 4 which is likely to get partial views of the array. The dominant view shed from this residence is of the ocean and this will not be disturbed by subproject 4. Subproject 4 will also be visible from surrounding elevated land points however, it will be viewed within a landscape of existing industrial infrastructure (e.g. power station, wind turbines) and is not expected to impact visual amenity. Subproject 3 will be visible to users of the sports complex however; it too will be viewed within the context of existing buildings and solar arrays and is not expected to impact visual amenity. The design of the subprojects will minimise visual impacts by:

- Specifying the use of antireflective panels or coatings to ensure reflected light from PV surfaces does not create a nuisance to nearby residents.
- Specifying that cables connecting the solar PV arrays to the existing grid will be buried.

172. **Noise**. The subprojects do not contain any noise generating components that may impact the amenity of nearby residents. The subprojects are anticipated to result in a reduction in the use of existing diesel generators thereby reducing noise emissions from the existing power station.

173. **Local engagement**. The construction of the subprojects is likely to lead to increased employment opportunities for local residents. To ensure opportunities are made available to local contractors a list of relevant local contractors available on Yap will be provided in tender documentation to facilitate the engagement of local contractors by the selected contractor(s).

174. **EMP update, bid documents and national requirements**. The IEE and EMP will be updated as the subprojects are developed. The update will include consideration of potential environmental impacts of changes or modification to the design of the subprojects during detailed design. The IEE and EMP will be incorporated into technical specifications and bidding documents. The IEE and EMP will be submitted to the Yap State EPA with a PEIS and, if required, an EIS prepared to satisfy requirements under the *Yap State Environmental Protection Agency Regulations*.

175. The successful contractor will prepare a CEMP reflecting their approach to the work and construction methodology (detailed with sub-plans and work statements as required) including number of workers to be brought to the site, length of time they will be there,

accommodation and water and food security/supply, emergency management etc. for the period. Prior to the contractor mobilising to each site the CEMP will be approved by the YSPSC.

C. Construction Impacts on Physical Resources

176. **Erosion Control**. Clearing of vegetation and earthworks for the ground mounted solar site has the potential to result in erosion of the site. Erosion may also occur on material stockpiles and open trenches. Erosion can also lead to instability of the project site and surrounds causing damage to vegetation and sedimentation of surrounding environments. The ground mounted solar site is located on Gitam soils. Gitum soils are not described as being susceptible to erosion however, little information on its properties is available. Mitigation measures to prevent erosion will be implemented including:

- Erosion control works and measures will be installed to control surface water runoff and prevent the export of sediments from the site by ensuring;
    - discharge of storm water is to stable preferably vegetated land.
    - erosion control measures closely follow land contours to reduce runoff velocity from exposed soils.
- No surface water runoff will be directed to water courses.
- All land disturbances will be confined to the minimum practicable working area to ensure that the minimum area of land is exposed to erosion for the shortest possible time.
- Existing drainage lines will be protected, and diversion of drainage lines avoided.
- Surface water will be diverted around the construction footprint using structures such as catch drains, silt fences or bunds. Surface water will not be diverted across erosion prone slopes.
- Sediment traps (e.g. silt fences) will be constructed across all drainage lines and erosion controls from site that are likely to receive runoff from exposed or disturbed soils.
- Sediment and erosion control measures will be monitored regularly to ensure their continued correct functioning.
- Cable trenches will remain open for the shortest duration possible to reduce erosion and where possible will not be open during periods of heavy rain or forecast weather events that may inundate the trench.
- Spoil from excavated trenches will be stored on the uphill side of the trench such that any sediment from the spoil is deposited in the trench.
- A shade tolerant low groundcover (e.g. grass) will be established as soon as practicable after site clearance. The species of groundcover used will be selected in consultation with the Yap Agriculture Department and will not shade the PV modules.

177. **Water resources and quality**. The construction of the subprojects has the potential to interfere with local water resources (ground or surface water). Water resources may also be impacted through inappropriate abstraction of ground water for construction, alteration of surface water flow across the subproject site leading to sedimentation of adjacent environments (refer Erosion Control) and pollution of water resources through accidental spillage of hazardous materials (refer Hazardous Materials). Mitigation measures will include:

- Where feasible construction techniques will be specified that minimise the need to alter the topography (e.g. mass concrete blocks for ground mounted solar arrays) and hence surface water drainage on the site.

- Water required for construction (e.g. concrete mixing) will be sourced with the agreement of the Yap EPA.

178. **Use of local materials.** The construction of the subprojects may involve the use of local materials such as fill and aggregate (sand or coralline) and water (refer above). The requirement for fill and aggregate will be dependent on the contractors preferred construction method but may be used to level the ground mounted solar PV site as well as in concrete for solar PV anchors (if not pre-cast-off site). If fill or aggregate is sourced locally there is potential to negatively impact the source site through clearing of vegetation, erosion and sedimentation, noise and over extraction impacting local projects. Mitigation measures will include: If required sources of fill and aggregate will be agreed with the Yap EPA.

179. **Hazards materials**. Hazardous materials will be required for the construction of the subprojects. Hazardous materials (e.g. fuels and oils) will be appropriately managed during construction to prevent pollution of surrounding land and water. Mitigation measures will include:

- Contractor(s) will prepare a hazardous materials management plan that shall, at a minimum, include:
    - The type and quantity of hazardous materials they will be present on site.
    - Safety Data Sheets for all hazardous materials.
    - A spill response plan including training for staff in the use of spill kits.
    - Details of planned transport, storage and disposal of hazardous materials (including compliance with commitments contained within this IEE).
- Hazardous materials storage areas will be located at least 50 m from the marine or aquatic environments.
- The transport of hazardous materials will undertaken by an appropriately qualified, experienced and equipped contractor.
- Hazardous materials will be stored in appropriate containers that are in good condition with adequate labelling.
- Hazardous materials (including fuel and oils) storage will be appropriately bunded.
- Spill kits and containment devices appropriate for the type and volume of hazardous materials on site will be located at the storage area(s), on the site and on vehicles carrying hazardous materials.
- All personnel involved in the handling of hazardous materials will be trained in the handling, emergency procedures and storage requirements for the materials they are handling.

180. **Air quality and dust**. The construction of the subprojects has the potential to generate dust through activities such as earth moving, by the movement of vehicles and machinery and by exposed soil on cleared sites or in soil stockpiles. Exhaust emissions will also be generated from machinery and vehicles. Measures to mitigate impacts to air quality and the generation of dust will include:

- Vehicles and machinery will be maintained in good order.
- Vehicles will not be left idling when not in use.
- Vehicles carrying soil, sand, crushed aggregate or other fine materials to or from the subproject sites will be covered.
- The subproject site, material stockpiles and access roads, including those from the wharf, and material stockpile areas, will be wetted or stabilised if dust is generated.

- Earth moving equipment will be cleaned prior to leaving site to prevent the tracking of soil on nearby roads.

181. **Waste management**. The inappropriate management of waste during construction of the subprojects has the potential to pollute surrounding water and land. Waste management during all phases of the subprojects will seek to reduce, reuse and recycle waste as far as possible and dispose of waste in an appropriate way. There are expected to be few hazardous wastes generated during construction however, there are limited facilities to process hazardous wastes on Yap. Mitigation measures will include:

- Hazardous waste (if generated) will be disposed of in accordance with the manufacturers requirements at a facility licenced to accept the type and quantity of waste (or approved by the Yap EPA). If no such facility exists on Yap hazardous waste will be shipped to an appropriately licenced facility either within FSM or another country.
- Vegetation cleared from the ground mounted solar site will be stockpiled on site and disposed of at the Yap dump or an alternative location agreed with the Yap EPA. Stockpiled vegetation will not be burnt.
- The construction contractor will consult with the Yap EPA to identify opportunities to avoid and reduce the generation of waste and to recycle or re-use waste generated.
- If excess spoil is generated during site preparation it will be stored at an existing stockpile site for re-use.
- Bins for recycling and general rubbish will be provided at the project site and materials laydown area for the disposal of construction wastes.

D. Construction Impacts on Biological Resources

182. **Flora, vegetation, fauna and fauna habitat**. Subprojects 1, 2 and 3 will not disturb vegetation, fauna or fauna habitat. The installation of subproject 4 (ground mounted solar) will result in the loss of up to approximately 1.9 ha of vegetation. A survey of the site found that the site was composed of savannah vegetation bounded by riparian vegetation associated with drainage lines. Although native species were recorded within the savannah vegetation there were no species recorded that are listed on the IUCN Red List or are endemic to Yap. The riparian vegetation will not be disturbed by the subproject.

183. The clearance of vegetation from subproject 4 may also result in the loss of fauna habitat. Of the mammal and reptile species included in the IUCN Red List or the U.S. Endangered Species Act listing of Threatened and Endangered species only the Yap flying fox (*Pteropus pelewensis ssp. yapensis*) and the Micronesia saw-tailed gecko (*Perochirus ateles*), both listed as Vulnerable,are considered to potentially occur at the subproject site. The Yap flying fox is thought to occupy native forest and mangrove habitats however, it was reported by the Yap EPA that there is a flying fox colony near the ground mounted solar site. It may overfly the ground mounted solar site but the savannah vegetation does not provide suitable roosting or foraging habitat and the clearing associated with the ground mounted subproject is unlikely to have a significant impact on this species. The Micronesia saw-tailed gecko occurs in a variety of habitats and suitable habitat may occur at both subproject sites. The relatively small amount of clearing for both subprojects in comparison to the available suitable habitat on Yap is unlikely to have a significant impact on this species.

184. The Yap monarch, Yap plain white-eye and the Yap olive white-eye were seen or heard whilst surveying the subproject 4 site. The clearing of savannah vegetation for the for the establishment of subproject 1 is unlikely to have a significant impact on these species or other bird species listed as threatened and near threatened on the IUCN Redlist including the Yap cicadabird and white-throated ground-dove. The preferred habitat for these species is native forest although the Yap monarch, Yap plain white-eye and the Yap olive white-eye also occur in secondary forest and savannah habitats. The loss of a relatively small area of these

widespread and common habitat types is unlikely to have a noticeable impact on these species.

185. **Vegetation loss**. Vegetation clearance for Subproject 4 (ground mounted solar) is not anticipated to result in the loss of any flora species listed on the IUCN Red List or endemic to Yap. Nor will the clearance result in the significant loss of habitat for any fauna species listed on the IUCN Red List.

186. The loss of vegetation from the Subproject 4 site has the potential to impact the surrounding environment through unauthorised clearing outside the subproject site boundary, clearing additional areas (e.g. to store materials) or by causing damage to surrounding vegetation through erosion or the introduction of invasive species. Mitigation measures will include:

- Ensure vegetation clearance is restricted to within the subproject site boundary and is the minimum practically required for the proposed works, including allowance for shading. The subproject site boundary will be clearly marked on a plan and approved by the PIC and IA prior to the commencement of clearing.
- A representative of the IA will be on site during marking out of the area to be cleared and/or during clearing
- Machinery storage and materials lay down areas will be established in previously disturbed areas to avoid increasing the footprint of the project site.
- As far as is practicable, existing stockpiles of fill material will be used. If new fill material is required it will be sourced from locations approved by the Yap EPA.
- Machinery storage and materials lay down areas will be established in previously disturbed areas to avoid increasing the footprint of the project site.
- As far as is practicable existing stockpiles of fill material will be used. If new fill material is required it will be sourced from locations approved by Yap EPA that do not result in the disturbance of native vegetation.

187. **Pathogens and invasive species**. Invasive species, many recent introductions, are seen as a key threat to biodiversity in Yap. Forty-one terrestrial invasive species are listed on the IUCN Global Invasive Species Database (GISD) as potentially occurring in Yap[70]. Invasive species found on Yap include fauna (e.g. rats, mice, ants, snails) and flora (grasses, herbs, shrubs and climbers). Yap has established an Invasive Species Task Force to help manage the introduction and spread of invasive species on Yap.

188. Over 457 species of plants, including many food plants have been introduced to the FSM, with 242 found in Yap (Table 4). The percentage of introduced plants varies between the states with introduced species comprising 39% of all plant species in Yap15. 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

189. Pathogens and invasive species may be carried on, or in, materials, equipment (including vessels used to transport materials or workers) and any workers brought to Yap for the subprojects. This includes materials, equipment and workers bought from other countries or elsewhere in FSM.

190. Five known invasive species were found at the ground mounted solar site (subproject 4), including the Giant Sensitive Plant (*Mimosa diplotricha*). Invasive species at the site have potential to be spread by the construction of the subproject e.g. through tracking of seeds on vehicles or machinery.

[70] http://www.iucngisd.org – accessed 22/05/2019

191. Mitigation measures to prevent the introduction or spread of invasive species and pathogens will include:

- The bidding documents will specify that the contractor must obtain all required biosecurity and phyto-sanitary clearances (e.g. permits) for any material or equipment imported onto Yap.
- The contractor will comply with all measures stipulated in relevant FSM Acts and regulations obtain all permits and clearances for import of any materials and equipment to be used for the project as required by relevant FSM and State departments.
- As soon as practicable after vegetation clearing, the subproject 4 site will be planted with low growing species (e.g. grass) to help stabilise the site and minimise the spread of weeds (there is a risk of weeds spreading into newly cleared sites at subproject locations). The species to be planted will be selected in consultation with the Yap State Department of Agriculture.
- Weed hygiene measures will be implemented to prevent introduction or spread of invasive species, including cleaning machinery before it enters and leaves the subproject sites.

192. **Threatened and protected species and habitats.** A single record of (*Pterocarpus indicus* (lach), that is listed as near threated on the IUCN Red List, was recorded associated with the riparian vegetation on the site of subproject 4. However, the area of the subproject site containing riparian vegetation will not be disturbed. Of the four flora species listed on the IUCN Red List that are known to occur in Yap none are associated with savannah vegetation. The Yap cicada bird, which is listed as endangered on the IUCN Red List, was not seen or heard at the site but has the potential to occur. The preferred habitat of the Yap cicada bird is native forest although it is found in savanna habitat but at much lower densities. Cicada birds generally inhabit the canopy hence their preference for native forest. Thus, the clearing of a small area of savannah habitat for the establishment of the ground mounted solar development is unlikely to have a significant impact on this species. There is also potential for the sites to provide habitat for two other fauna species; the Yap flying fox and the Micronesia saw-tailed gecko which are both listed as Vulnerable on the IUCN Red List. However, the subproject sites do not provide priority habitat for these species or habitat that is unique on Yap (or in Micronesia). The clearing of these sites is unlikely to have a significant impact on these species.

E. Construction Impacts on Socio-economic Resources

193. **Traditional and cultural heritage**. A site inspection with the Yap State HPO found no traditional or cultural heritage associated with the ground mounted solar site (subproject 4) (Annex 2). There remains potential for the unanticipated discovery of artefacts or graves during the earth works associated with subproject 4. To mitigate the impact to unanticipated discoveries a representative of the Yap HPO will be present on site during all earth works. Should an artefact of grave be found work will cease immediately and the subproject site will be managed in accordance with the Yap HPO's requirements.

194. **Noise and vibration**. The construction of the subprojects will generate noise through the operation of machinery on the subproject sites and movement of vehicles and machinery transporting equipment and materials to sub project sites. Construction noise impacts will be intermittent and are expected to be minor. Mitigation measures will include:

- Wherever possible working hours will be between 8am and 5pm Monday to Friday. Where safety or technical reasons require work to be completed outside of these hours, noise levels will be kept to a minimum and Yap EPA together with nearby residents will be informed.
- Noise generating activities will be carried out in the least sensitive time periods to be determined in consultation with building managers (roof top) and representative

residents' bodies or Yap EPA (ground mount). Wherever possible works will be scheduled to avoid disruption to the normal use of buildings.

- Equipment and plant will be maintained in good order. Noise reduction components (e.g. mufflers) will be inspected prior to the commencement of works to ensure they are fully functional. Noise emissions from construction equipment will not exceed 75 dBA.

195. **Non-local workers**. The subprojects are likely to require foreign contractors and technical specialists for the duration of construction and commissioning. There is potential for conflict between foreign workers and local communities. The size of the non-local workforce is expected to be relatively small, particularly in comparison to the population of Yap. Mitigation measures will include:

- All non-local workers will receive an induction that outlines the social and cultural expectations when working on Yap. Any worker not complying with these expectations will be expelled from Yap and repatriated at the contractor's expense
- A grievance redress mechanism (GRM) has been established for the project (refer Section 8) and will be communicated through the engagement programme and by prominent display of the GRM process at the subproject sites prior to the commencement of onsite works.

196. **Health and safety – workers and community**. The construction of the subprojects will involve health and safety risks to contractors, YSPSC staff and the community. Except by agreement with the YSPSC, the contractor will be responsible for access to the subproject sites during construction. The contractor shall be required to prepare a Health and Safety Management Plan that complies with the IFC's *Environmental, Health, and Safety (EHS) Guidelines General Guidelines: Occupational Health and Safety*[71] and *Environmental, Health, and Safety (EHS) Guidelines – General EHS Guidelines: Community health and safety*[72] that describes the safety measures that will be implemented to protect staff and contractors during construction. The Health and Safety Management Plan will at a minimum:

- Identify responsibilities and authorities within the contractor's staff for adhering to occupational health and safety (OHS) requirements.
- Identify and provide required personal protection equipment (PPE) for staff and sub-contractors (before they start work).
- Child and/or trafficked labor will be strictly prohibited for any activities associated with the project.
- Install fencing on all areas of excavation greater than 1m deep whether temporary or permanent.
- Define appropriate emergency and medical process including evacuation procedures.
- Prepare appropriate work method statements for each construction activity.
- Provide daily hazard identification checklists, risk assessments
- Identify mandatory meeting requirements including toolbox sessions, to ensure all personnel understand the task before commencing work for the day.
- Provide for training for all workers on environmental safety, environmental hygiene prior to the commencement of construction.

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[71] https://www.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES

[72] https://www.ifc.org/wps/wcm/connect/dd673400488559ae83c4d36a6515bb18/3%2BCommunity%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES

- Set procedures for safe handling of toxic materials and other hazardous substances.
- Provide for installation of lights and cautionary signs in hazardous areas.
- Ensure operators of vehicles and equipment are properly licensed and trained.
- Ensure safety and inspection procedures are implemented, setting schedules for regular checking.
- Ensure movements of heavy vehicles is managed so as to minimise impacts to existing traffic and the wider community.
- Provide for the provision of adequate sanitation and potable water for staff and contractors for the duration of construction works.
- Access will be controlled to subproject sites (e.g. through the use of security fencing or restricting access to roof tops) for the duration of construction to prevent public access.
- Children will be prohibited from entering the sites (including worker's accommodation, works area/construction zone) and prohibited from playing on any equipment or machinery.
- All advisory and warning signage will be clear, secured on fences, gates and signboards and be posted in Yapese, the language of the main nationality of workers and repeated in English, if required.

F. Operation Impacts

197. **Waste and hazardous materials**. The operation of the subprojects will generate waste, including hazardous waste (e.g. inverters and batteries will require replacement during the life of the subprojects), which must be appropriately managed to prevent contamination. Mitigation measures will include:

- Inverters and batteries that have been replaced during the operating lifetime of the subprojects will be removed, transported and disposed of by an appropriately experienced and equipped contractor.
- Where possible batteries and inverters will be recycled. If recycling is not possible, they will be disposed of at a facility approved by Yap EPA or, if no facility is available, transported to an appropriately licenced facility elsewhere in FSM or another country.
- Washing of solar PV panels will only be undertaken on an 'as needs' basis to minimise the generation of wastewater. Disposal of wastewater will be agreed with Yap EPA.
- All infrastructure containing hazardous materials (e.g. batteries, transformers) will be inspected regularly to ensure they are functioning correctly, and no hazardous materials are being discharged.

198. **Water resources**. Water will be required for cleaning solar PV modules during operation of the subproject. A source of water will be agreed with Yap EPA prior to the commencement of operation.

199. **Erosion control**. If localised erosion is detected during operation of the subproject effective mitigation measures such as application of mulch, covering with open weave jute matting and reseeding with ground cover, protection with geotextile fabric or localised flow dispersal and diversion structures will be installed.

200. **Employment**. It is expected that existing employees will be retained to operate the new solar power systems. Training will be provided for YSPSC employees in the operation and maintenance of the new infrastructure.

201. **Emergency response**. YSPSC will prepare (or update) an operational emergency response plan. The plan will be included in the training provided to employees and be implemented during the operation of the solar power system.

G. Decommissioning impacts

202. The subproject's solar PV modules are expected to have an economic life of at least 25 years. At this time, it is expected that they will be replaced by new solar PV modules. The removal of the solar PV modules will be contracted to a specialist supplier. The batteries installed in the YSPSC power station are expected to have an economic life of between 10- and 20-years dependent on the battery type selected. All equipment will be removed from the subproject sites (e.g. PV modules, batteries, inverters) and will be reused or recycled where possible. Equipment that cannot be reused or recycled will disposed of at a facility approved by Yap EPA or, if no facility is available, transported to an appropriately licenced facility elsewhere in FSM or another country.

203. The decommissioning contractor will be required to develop a hazardous materials management plan prior to the commencement of any works on site.

204. If the site is not reused it will be replanted with species appropriate to the future land use of the site.

5. ANALYSIS OF ALTERNATIVES

205. Yap is committed to transitioning from an electricity generating system that relies primarily on diesel generation to one that relies on renewable energy generation. This transition is required to enable Yap State to meet its renewable energy generation targets and in turn for FSM to meet its commitments under the National Energy Policy and Paris Accord.

206. The feasibility assessment undertaken for the project concluded that a mix of increased renewable energy and the additional of a BESS at the YSPSC was the most cost-effective way to increase renewable energy penetration within the time and anticipated funding constraints of the project.

207. Higher levels of renewable energy generation has potential to result in issues such as:

- Low fault levels leading to protection coordination issues and reduced stability and recovery from faults.
- Low system inertia leading to a high rate of change of frequency to load disturbances and reduced system stability.

208. Several options to mitigate these issues were considered including the use of flywheel, low load diesel, synchronous condenser and BESS. A BESS was considered the best alternative.

209. Yap has a good wind resource and the addition of additional wind generation was considered and a potential site inspected. Access to the land at the preferred site was not able to be agreed amongst landowners and the option was not considered further.

210. YSPSC identified a preferred solar site located between the existing wind farm and power station and along the route of the existing 13.8 kV distribution line. The site is privately owned but the YSPSC have been able to agree access to the land. The site does not contain any significant ecological values and does not require the construction of an additional transmission line. No other potentially available more suitable land was identified by YSPSC.

211. Given the limited availability of accessible land for ground mounted solar on Yap a floating installation on the water reservoir was considered. Floating solar systems are becoming increasingly popular particularly where limited land is available. The technology is proven, and several suppliers provide turnkey solutions in Europe and Asia. Floating solar has several additional benefits including reducing evaporative water loss from the reservoir and improving system performance by allowing the solar PV modules to run at cooler temperatures. Funding restrictions did not allow for both a floating and ground mounted system and the ground mounted system was preferred in part due to lower potential environmental impacts.

212. The sports complex has been assessed as structurally suitable for the installation of solar PV modules and is located in close proximity to a suitable point of connection to the existing grid. No other potential roof tops were able to meet these attributes.

213. A 'do nothing' option was not considered viable as it does not enable Yap to meet its State commitments and for FSM to meet its national and international commitments.

6. CONSULTATION AND INFORMATION DISCLOSURE

A. Consultation

214. Consultation with National and State stakeholders was undertaken in 2009 and 2010 during the development of the National Energy Policy and State Energy Action Plans. National and State working groups consisting of representatives from Government, State utilities, private sector and NGO's made up the working groups. The State action plans identified the need for further renewable energy but specific projects were not identified.

215. The FSM National Government prepared an Energy Masterplan for FSM, with individual plans for each of the States. The plan was completed in April 2018. As part of the preparation of the National and State plans, consultation was undertaken with Government and Government agencies, representatives of the State Energy Working Group, municipal Governments, representatives of YSPSC and representatives of women's groups.

216. For the current project a range of stakeholders from State and National Government, Government agencies, municipal representatives and landowners were consulted. A list of stakeholders consulted together with minutes of meetings with landowners is provided in ANNEX 3.

217. YSPSC are committed to undertaking public consultation with the wider community. A framework for consultation has been prepared and is provided in ANNEX 4. This IEE will be updated to include the results of public consultation.

B. Information Disclosure

218. All safeguard documents are subject to public disclosure, and therefore will be made available to the public. Following clearance of the IEE by ADB the document will be posted on government and ADB websites as per the Public Communications Policy. Provided it does not contain any commercially sensitive information the approved CEMP will also be disclosed.

7. GRIEVANCE REDRESS MECHANISM

219. A Grievance Redress Mechanism (GRM) is proposed for the project to receive and facilitate the resolution of affected peoples' (AP) concerns, complaints, and grievances about the project's environmental and social safeguards performance. When and where the need arises, this mechanism will be used to address any complaints that may arise during the construction and operation of the project. The grievance mechanism is scaled to the risks and adverse impacts of the project. It addresses AP's concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate and readily accessible to all segments of affected people at no costs and without retribution. The mechanism does not impede access to FSMs judicial or administrative remedies.

220. Since all the proposed project works would be carried out by or under the guidance and authority of YSPSC acting on behalf of the IA, and since all landowners and the great majority of all households, businesses, and other institutions on the island already understand the operations of and deal directly with YSPSC on a regular basis, it would be best to use standard YSPSC channels for receiving and dealing with any project-related grievances relating to land

acquisition and resettlement. Note here that “resettlement” impacts would include any temporary commercial, wage, or other income losses due to project works.

221. In serious cases, people would likely take grievances directly to the GM or perhaps to a relative that happens to hold a senior position in YSPSC, but a project-specific staff member acting as grievance focal point within YSPSC will be designated once project implementation begins employing the following mechanism:

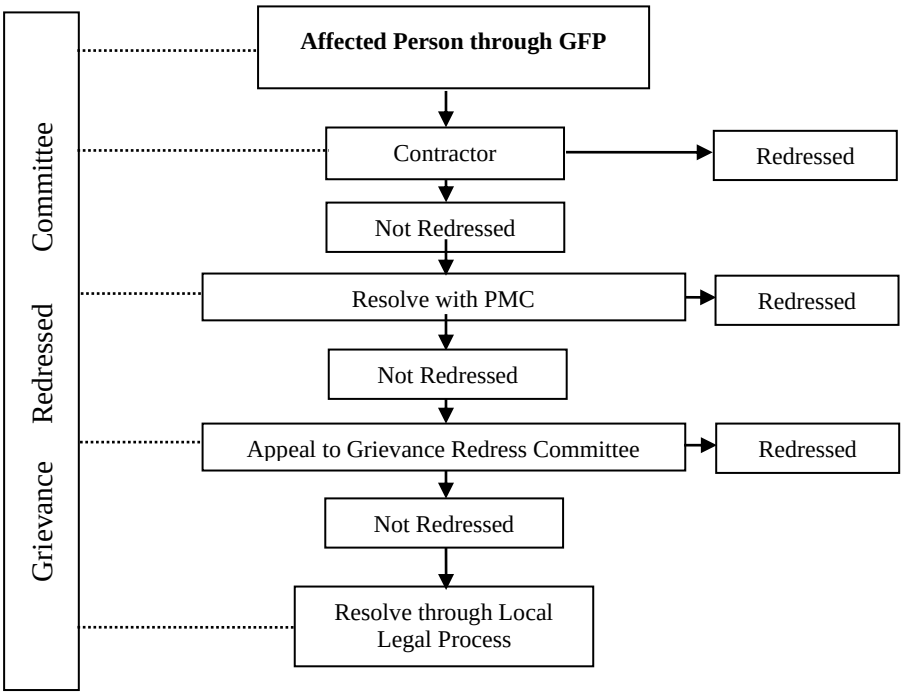
222. Environment complaints will be received through the Grievance Focal Point (GFP), these will be designated personnel from within YSPSC who will be responsible for receiving the environmental complaints. YSPSC will record the complaint in the onsite Environmental Complaints Register (ECR) in the presence of the GFP.

223. The GFP will discuss the complaint with the Contractor and have it resolved. If the Contractor does not resolve the complaint within one week, then the GFP will bring the complaint to the attention of the designated Safeguard Specialist. The Safeguard Specialist will then be responsible for coordinating with the Contractor in resolving the issue.

224. If the Complaint is not resolved within 2 weeks the GFP will present the complaint to the Grievance Redress Committee (GRC). The GRC will be comprised of designated officials from the following organizations: Contractor’s Environment Specialist, IA Safeguard Specialist, GFP, Island Level representative, and a representative from the EA.

225. The GRC will have to resolve the complaint within a period of 2 weeks and the resolved complaint will have to be communicated back to the community. The Contractor will then record the complaint as resolved and closed in the Environmental Complaints Register.

226. In parallel to the ECR placed with the Contractor, each GFP will maintain a record of the complaints received and will follow up on their rapid resolution. The EA through IA will also keep track of the status of all complaints through the Monthly Environmental Monitoring Report submitted by the Contractor to the PMU and will ensure that they are resolved in a timely manner. The following figure shows the Grievance Redress Mechanism.



227. In any case, an appropriate public awareness campaign should precede and carry on through project implementation, and that campaign should include advice on where and how to direct any grievances that might arise.

8. ENVIRONMENTAL MANAGEMENT PLAN

A. Introduction

228. This EMP is intended to cover all phases of the Federated States of Micronesia (FSM) Renewable Energy Development Project: Yap implementation including design, construction, commissioning, operation and decommissioning. The EMP complies with ADBs SPS and includes the following information:

- Implementation arrangements including institutional roles and responsibilities for the EMP throughout all phases of the project.
- Environmental management matrices including:
    - Potential environmental impacts at each stage of the project
    - Proposed mitigation measures to address each potential impact
    - Institutional responsibility for implementing proposed mitigation measures
- Environmental monitoring matrices including:
    - Parameters to be monitored to ensure mitigation measures have been implemented effectively
    - Schedule and frequency of monitoring
    - Responsibility for implementing and supervising monitoring

B. Implementation arrangement and responsibilities

229. The DFA will be the executing agency for the project and R&D will be the implementing agency. The DFA will have overall responsibility for the project whilst R&D will be responsible for day to day implementation and management of the project including the project's compliance with environmental safeguard requirements. The IA will likely delegate the day to day operations to a PMU that will be supported by a PIC, both of which will include a safeguards expert. R&D will be responsible for implementing all environmental safeguards as per the SPS and country safeguard system. A Steering Committee has been established that is responsible for providing Government oversight of the project and reporting to Cabinet. An engineering, procurement and construction (EPC) contractor will be engaged to construct the project. Organisational responsibilities for environmental management are summarised in Table 23.

Table 23: Organisational environmental responsibilities

Project Organizations	Environmental Management Roles and Responsibilities
Executing Agency (FSM Department of Finance (DFA))	• General project oversight • Ensure overall compliance with the project agreements and covenants. Overall delivery of the project and reporting to Government • Ensure the compilation and presentation of all reporting requirements under the project
Implementing Agency (FSM Department of Resources and Development (R&D))	• Submission of environmental documentation to the Yap State EPA as required under the *Yap State Environmental Quality Protection Act* and *Environmental Protection Agency Regulations*. • Responsible for the overall implementation of the project • Ensure compliance with the provisions of the project agreements and government policies and guidelines • Responsible for procurement and services for the project • Issue contract change orders as appropriate
Project steering committee	• Composed of representatives of Kosrae Utilities Authority, YSPSC, DFA and R&D. • Provide Government oversight of project and reporting Cabinet
Project Management Unit (PMU)	• Responsible for oversight of the implementation of the project, under the direction of the IA, to ensure compliance of contractors with contracts, specifications and management plans. • Update the IEE including its EMP, as required • Provide inputs to the bid evaluation in respect of contractor's response to the EMP requirements • Supervise, monitor and report on contractor's implementation of CEMP and all other contractual obligations • Prepare reports and supporting information for the EA, IA and Steering committee as required • Submission of quarterly progress reports and semi-annual monitoring reports • Ensure readiness of all project sites for contractor including surveyed and staked out sites, any required permits in place and secured lease agreements (if required) •
Project implementation committee (PIC)	• Review and approve selected contractor(s) project specific CEMP and other plans as required by the EMP. • Prepare semi-annual safeguards monitoring reports to be submitted to EA and ADB. All safeguards monitoring reports to be disclosed as per ADB policies. • Ensure contractors are aware of any consent conditions and the implications for the implementation of the project. • Assist PMU to supervise, monitor and report on contractor's implementation of CEMP and all other contractual obligations • Enforce contractual requirements • Audit construction phase through environmental inspections and review monitoring reports and data
Yap State Environmental Protection Agency (Yap EPA)	• Ensure compliance with government requirements • Review complicated issues, if any, arising from the project • Participate in environmental monitoring
Engineer, procure and construct contractor (EPC contractor)	• Preparation of the project CEMP and other plans as required prior to the commencement of any on site works. • Submit CEMP to PMU and PIC for review and approval (revising as necessary if required) • Compliance with the EMP

	• Identify materials and equipment sources and arrange necessary permits, consents and compliance certificates • Provide inductions prior to commencement of construction • Provide ongoing training, awareness and “toolbox” sessions for workers. • Implement CEMP • Implement GRM • Monthly project compliance reports on CEMP and GRM implementation. • Implementation of corrective actions as requested by the PMU.
ADB	• Review all feasibility study documentation (incl. IEE) • Prepare documents package for Board review (incl. requirements and TOR in PAM and covenants in grant agreement) • Board approval of project • Undertake regular review missions • Review monitoring reports • Disclose project information as required

C. Mitigation Measures

230. Environmental mitigation measures have been designed to avoid potential impacts where possible and to mitigate impacts that cannot be avoided. Implementation of this EMP and mitigation measures will ensure compliance with obligations under the Federate States of Micronesia Acts and Regulations, principally the *Yap State Environmental Quality Protection Act (YSL 3-73)*. The EMP will also ensure ADB safeguard standards are met.

231. To ensure mitigation measures contained in the EMP are successfully implemented:

- The EMP will be updated based on detailed design together with any conditions of the project approval issued by the Yap EPA.
- The IEE and EMP will be included in bidding documentation.
    - The contractor(s) shall prepare a site-specific construction EMP (CEMP) describing the project and measures that will be implemented to comply with the EMP. It is expected that the contractors CEMP will address specific environmental issues associated with the construction methods they propose and the subproject sites.
    - The contractor(s) will submit its CEMP to the IA (or their delegate) for approval prior to the commencement of any construction (including site preparation, clearing and grubbing activities).
    - The IA will ensure there are sufficient resources to oversee the implementation of the approved CEMP at each project site.
    - The EMP and GRM will be disclosed to the public in accordance with Section 7, Consultations and Information Disclosure.

232. An environmental management and monitoring plan (EMMP) describing the potential impacts and proposed mitigation measures and responsible agency has been prepared in a matrix form and presented in Table 24.

233. The EMMP matrix provides an operational reference and a tool for environmental management during construction activities. It describes in general terms how the contractor will meet the specified contractual, regulatory and statutory requirements. The contractor will provide the detail in its response (the CEMP) which will set out method statements and site-specific plans as required.

234. This project, and all project activities to be financed by ADB and government, will be subject to ADB's Safeguard Policy Statement (2009) (SPS). The project is classified as Category B for environment.

D. Monitoring and reporting

235. **Monitoring**: Environmental monitoring will be carried out through all phases of the project development to ensure that the environmental mitigation measures are effective and that actual environmental impacts accord with predicted impacts and are in compliance with *Yap State Environmental Quality Protection Act (YSL 3-73)* and ADB safeguard standards.

236. The PMU/PIC will ensure appropriate monitoring is undertaken during construction in accordance with project progress.

237. Complaints received will be monitored and resolved in accordance with Grievance Redress Mechanism. If required, addition monitoring inspections will be undertaken.

238. An environmental monitoring plan is presented in Table 24 and outlines the parameters, frequency and responsibility for monitoring.

239. **Reporting**: In consultation with EA and ADB, the IA will establish a system for preparing quarterly reports on safeguards performance monitoring, issues resolution, and corrective action plans. The quarterly report will include a summary of the contractor's monthly reports.

240. The EA will submit environmental monitoring reports on EMP implementation for ADB's review.

241. Contractors will prepare monthly reports which will describe the implementation of the CEMP including any non-compliances and corrective actions. The report will be submitted, reviewed and approved by the IA.

242. Throughout implementation of the project, ADB will monitor the implementation progress and impacts of the Project. Overall, the EMP will be implemented by the IA throughout project implementation. In consultation with the EA and ADB, the IA will establish a system for preparing quarterly reports on safeguards performance monitoring, issues resolution, and corrective action plans.

243. The EMP will be part of the overall project monitoring and supervision and will be implemented by the PMU/PIC with oversight from the IA. Progress on the preparation and implementation of an EMP will be included in the periodic project progress reports. Specific monitoring activities defined in the IEE and EMP will be carried out by the contractor and supervised and monitored by the IA. The EA will submit semi-annual environmental monitoring reports on EMP implementation for ADB's review.

244. In general, the overall extent of monitoring activities, including their scope and periodicity, should be commensurate with the project's risks and impacts. The IA is required to implement safeguard measures and relevant safeguard plans.

Table 24: Environmental Management and Monitoring Plan

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	Institutional responsibility	Parameters	Frequency & verification	Institutional responsibility
Design and pre-construction phase						
Land access	Subproject delays or future legal land challenges.	• Land ownership / lease arrangements validated, and agreements made as set out in the Resettlement Plan (RP). • Resettlement Plan updated during detailed design.	YSPSC, PMU	Verification of land access agreements	Once, visual inspection of agreements	PMU, PIC
Adaptation for climate change	Damage to subproject components due to inappropriate siting or design specification.	• Subprojects will be designed and sited to withstand flooding. • Components will meet international standards (e.g. IEC 61730 Photovoltaic (PV) module safety qualification). The subprojects will be designed to withstand extreme winds (e.g. cyclones) and temperatures.	PMU	Bidding and contract documents (BCD), detailed design	Once, visual inspection of BCD	PMU, PIC
	Premature failure of components	• All components procured for the subprojects will be suitable for tropical marine and coastal environments, preferably be preassembled and will be as resistant to corrosion as practicable (e.g. stainless or galvanized steel mounting systems).	PMU	Selection of appropriate components	Once, visual inspection detailed design	PMU, PIC
Pathogens and invasive species	Introduction of invasive species through importation of equipment, materials and personnel	• The technical specifications will include the requirement for the contractor to obtain appropriate certificates for any material or equipment imported onto Yap for the subprojects.	PMU	BCD, detailed design	Once, visual inspection of BCD	PMU, PIC

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	Institutional responsibility	Parameters	Frequency & verification	Institutional responsibility
UXO	Injury or fatality to worker due to detonation of unexploded ordnance.	• A survey for UXO will be undertaken and clearance issued for the site prior to any ground disturbing activities.	YSPSC under delegation of IA	Verification of clearance documentation.	Once, visual inspection of clearance.	PMU, PIC
Visual impact	The subprojects create an unacceptable visual impact on the existing landscape.	• Specify use of antireflective panels or coatings to ensure reflected light from PV surfaces does not create a nuisance to any nearby residents • Specify that cables connecting the solar PV arrays to the existing grid will be buried	PMU	BCD, detailed design	Once, visual inspection of BCD	PMU
Local contractor engagement	Increased opportunity for local businesses and contractors	• A list of relevant local contractors available on Yap will be provided in tender documentation to facilitate the engagement of local contractors by the selected contractor(s).	PMU	BCD, detailed design	Once, visual inspection of BCD	PMU
Bid and contract documents preparation, tendering and contract award	Failure to identify and mitigate environmental risks, breach of state legal obligations.	• Prepare and submit a PEIS, with IEE accompanying, to the Yap EPA. Prepare EIS if required. • IEE / EMP and conditions of environmental approval included in bidding documents. • Bidding documents include requirement for contractor to prepare CEMP including required sub-plans, number workers and accommodation and food security arrangements. • The contractor is required to prepare a CEMP that at a minimum addresses the commitments	PMU	Bidding documents, Environmental Consent, CEMP.	Once, visual inspection bidding documents, environmental consent, CEMP	PMU, PIC

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	**Institutional responsibility**	**Parameters**	**Frequency & verification**	**Institutional responsibility**
		contained in this IEE and EMP and conditions of state approval. • Approval of CEMP by PMU/PIC prior to mobilisation.				
Construction phase – physical resources						
Erosion and sedimentation control	Erosion of subproject sites and sedimentation of surrounding environment	• Erosion control works and measures will be installed to control surface water runoff and prevent the export of sediments from the site by ensuring; ○ discharge of storm water is to stable preferably vegetated land. ○ erosion control measures closely follow land contours to reduce runoff velocity from exposed soils. • No surface water runoff will be directed to water courses. • All land disturbances will be confined to the minimum practicable working area to ensure that the minimum area of land is exposed to erosion for the shortest possible time. • Existing drainage lines will be protected, and diversion of drainage lines avoided. • Surface water will be diverted around the construction footprint using structures such as catch	Contractor	Erosion on subproject site and sedimentation of adjacent land or water bodies. Site drainage, erosion and runoff controls in place and functioning correctly. Inspection records.	Daily, visual inspection of subproject sites during construction. Monthly, visual inspection of sites for 6 months post construction. Monthly inspection of records during construction	PMU, PIC Contractor

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	Institutional responsibility	Parameters	Frequency & verification	Institutional responsibility
		drains, silt fences or bunds. Surface water will not be diverted across erosion prone slopes. • Sediment traps (e.g. silt fences) will be constructed across all drainage lines and erosion controls from site that are likely to receive runoff from exposed or disturbed soils. • Sediment and erosion control measures will be monitored regularly to ensure their continued correct functioning. • Cable trenches will remain open for the shortest duration possible to reduce erosion and where possible will not be open during periods of heavy rain or forecast weather events that may inundate the trench. • Spoil from excavated trenches will be stored on the uphill side of the trench such that any sediment from the spoil is deposited in the trench. • A shade tolerant low groundcover (e.g. grass) will be established as soon as practicable after site clearance. The species of groundcover used will be selected in consultation with the Yap Agriculture Department and will not shade the PV modules.				
Water resources and quality	Overuse or sedimentation of Yap water resources impacting local fresh	• Where feasible construction techniques will be specified that minimise the need to alter the topography (e.g. mass concrete blocks for ground	Contractor, Yap EPA	Agree water sources, construction techniques	Water source agreed with Yap EPA,	PMU, PIC

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	Institutional responsibility	Parameters	Frequency & verification	Institutional responsibility
	and potable water supplies	mounted solar arrays) and hence surface water drainage on the site. • Water required for construction (e.g. concrete mixing) will be sourced with the agreement of the Yap EPA.			Construction technique agreed with PMU/ PIC	
Use of local materials	Environmental or social impacts to source location of local materials (e.g. fill).	• If required sources of fill and aggregate will be agreed with the Yap EPA.	Contractor, Yap EPA	Agreement of Yap EPA for material sources.	Once	PMU.
Handling hazardous materials	Spill of hazardous material	• The contractor(s) will prepare a hazardous materials management plan that shall, at a minimum, include: ○ The type and quantity of hazardous materials that will be present on site. ○ Safety Data Sheets for all hazardous materials. ○ A spill response plan including training for staff in the use of spill kits. ○ Details of planned transport, storage and disposal of hazardous materials (including compliance with commitments contained within this IEE). • The transport of hazardous materials will be undertaken by an appropriately qualified, experienced and equipped contractor.	Contractor	Hazardous materials management plan in place and implemented.	Once, visual inspection of hazardous materials plan, as required visual inspection of controls and mitigations during construction.	PMU, PIC.

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	**Institutional responsibility**	**Parameters**	**Frequency & verification**	**Institutional responsibility**
		• Hazardous materials storage areas will be located at least 50 m from any marine environment. • Hazardous materials will be stored in appropriate containers that are in good condition with adequate labelling. • Hazardous materials (including fuel and oils) storage will be appropriately bunded (e.g. self-bunded containers or a bund with a minimum of 110% capacity of largest container). • Refuelling will take place in a designated area and drip trays or containment devices will be used when refuelling equipment and machinery. • Spill kits and containment devices appropriate for the type and volume of hazardous materials on site will be located at the storage area(s), on the site and on vehicles carrying hazardous materials. • All personnel involved in the handling of hazardous materials will be trained in the handling, emergency procedures and storage requirements for the materials they are handling.				
Air quality and dust	Creation of dust and air emissions by vehicles	• Vehicles and machinery will be maintained in good order; • Vehicles will not be left idling when not in use; and	Contractor	Dust generated; complaints received via GRM	As required, visual	PMU

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	Institutional responsibility	Parameters	Frequency & verification	Institutional responsibility
		• Vehicles carrying soil, sand, crushed aggregate or other fine materials to or from the subproject sites will be covered.				
	Excessive dust from project sites, stockpiles and access roads	• Subproject sites, material stockpiles and access roads, including those from the port and material stockpile areas, will be wetted or stabilised if dust is generated. • Earth moving equipment will be cleaned prior to leaving site to prevent the tracking of soil on nearby roads.	Contractor	Dust generated, application mitigation measures, inspection records, complaints received via GRM	Daily visual inspection of subproject sites during construction	PMU
Waste management	Inappropriate storage, transport or disposal of waste resulting in contamination	• Hazardous waste (if generated) will be disposed of in accordance with the manufacturers requirements at a facility licenced to accept the type and quantity of waste (or approved by the Yap EPA). If no such facility exists on Yap hazardous waste will be shipped to an appropriately licenced facility either within FSM or another country. • Vegetation cleared from the ground mounted solar site will be stockpiled on site and disposed of at the Yap dump or an alternative location agreed with the Yap EPA. Stockpiled vegetation will not be burnt. • The construction contractor will consult with the Yap EPA to identify opportunities to avoid and reduce the generation of waste and to recycle or re-use waste generated.	Contractor, Yap EPA.	All hazardous waste appropriately managed	Daily visual check of waste disposal bins during construction, monthly check of waste disposal documentation.	PMU

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	**Institutional responsibility**	**Parameters**	**Frequency & verification**	**Institutional responsibility**
		• If excess spoil is generated during site preparation it will be stored at an existing stockpile site for re-use. • Bins for recycling and general rubbish will be provided at the project site and materials laydown area for the disposal of construction wastes.				
Construction phase - biological resources						
Vegetation removal	Over clearing of subproject locations resulting in loss of vegetation.	• Ensure vegetation clearance is restricted to within the subproject site boundary and is the minimum practically required for the proposed works, including allowance for shading. The subproject site boundary will be clearing marked on a plan and approved by the PIC and PMU prior to the commencement of clearing. • A representative of the PMU will be on site during marking out of the area to be cleared and/or during clearing • Machinery storage and materials lay down areas will be established in previously disturbed areas to avoid increasing the footprint of the project site. • As far as is practicable, existing stockpiles of fill material will be used. If new fill material is required it will be sourced from locations approved by the Yap EPA.	PIC, PMU, Contractor.	No vegetation clearance outside subproject site boundary, no stockpiles of vegetation	As required during construction, at least verification of site boundary prior to clearance and verification of clearance during construction.	PMU, PIC

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	**Institutional responsibility**	**Parameters**	**Frequency & verification**	**Institutional responsibility**
		• Machinery storage and materials lay down areas will be established in previously disturbed areas to avoid increasing the footprint of the project site. • As far as is practicable existing stockpiles of fill material will be used. If new fill material is required it will be sourced from locations approved by Yap EPA that do not result in the disturbance of native vegetation.				
Pathogens and invasive species	Introduction and/or spread of pathogens and invasive species to Yap or the subproject island	• The bidding documents will specify that the contractor must obtain all required biosecurity and phyto-sanitary clearances (e.g. permits) for any material or equipment imported onto Yap. • The contractor will comply with all measures stipulated in relevant FSM Acts and regulations obtain all permits and clearances for import of any materials and equipment to be used for the project as required by relevant FSM and State departments. • As soon as practicable after vegetation clearing the subproject 4 site will be planted with low growing species (e.g. grass) to help stabilise the site and minimise the spread of weeds (there is a risk of weeds spreading into newly cleared sites at subproject locations). The species to be planted will be selected in consultation with the Yap State Department of Agriculture.	Contractor	Pathogen and invasive species free status of all materials, equipment and workers.	Visual inspection of phyto-sanitary / quarantine certificate for each shipment	PMU

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	Institutional responsibility	Parameters	Frequency & verification	Institutional responsibility
		• Weed hygiene measures will be implemented to prevent introduction or spread of invasive species, including cleaning machinery before it enters and leaves the subproject sites.				
Construction phase – socio economic impacts						
Traditional and cultural heritage	Unexpected discovery of artefact(s) of traditional or cultural heritage significance	• A representative of the Yap HPO will be present on site during all earth works. Should an artefact of grave be found work will cease immediately and management of the site will be in compliance with the Yap HPO's requirements.	Contractor, Yap HPO	Presence of Yap HPO during all earth works	Confirmation from Yap HPO of presence	PMU
Noise and vibration	Noise and vibration impacts local communities	• Wherever possible working hours will be between 8am and 5pm Monday to Friday. Where safety or technical reasons require work to be completed outside of these hours, noise levels will be kept to a minimum and Yap EPA together with nearby residents will be informed. • Noise generating activities will be carried out in the least sensitive time periods to be determined in consultation with building managers (roof top) and representative residents bodies or Yap EPA (ground mount). Wherever possible works will be scheduled to avoid disruption to the normal use of buildings. • Equipment and plant will be maintained in good order. Noise reduction components (e.g. mufflers) will be inspected prior to the commencement of works to ensure they are fully functional. Noise	Contractor	Work carried out between agreed times, equipment in good order with appropriate noise reduction components	As required, daily visual inspection of all equipment	PMU

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	Institutional responsibility	Parameters	Frequency & verification	Institutional responsibility
		emissions from construction equipment will not exceed 75 dBA.				
Foreign labour	Presence of foreign workers caused conflict, social disruption in community	• All non-local workers will receive an induction that outlines the social and cultural expectations when working on Yap. Any worker not complying with these expectations will be expelled from Yap and repatriated at the contractor's expense • A grievance redress mechanism (GRM) has been established for the project (refer Section 8) and will be communicated through the engagement programme and by prominent display of the GRM process at the subproject sites prior to the commencement of onsite works.	Contractor	Inductions carried out, GRM in place	As required, visual inspection GRM as well as records of induction.	PMU
Health and safety – workers and community	Health and safety of workers and communities inadequate managed leading to injury of fatality.	• The contractor shall prepare a Health and Safety Management Plan that will at a minimum: ○ Identify responsibilities and authorities within the contractor's staff for adhering to occupational health and safety (OHS) requirements. ○ Identify and provide required personal protection equipment (PPE) for staff and sub-contractors (before they start work). ○ Child and/or trafficked labor will be strictly prohibited for any activities associated with the project.	Contractor	Health and Safety Management Plan in place, training completed	As required, visual inspection of Health and Safety Management Plan, health and safety controls, records of training and induction.	PMU, PIC

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	Institutional responsibility	Parameters	Frequency & verification	Institutional responsibility
		○ Install fencing on all areas of excavation greater than 1m deep whether temporary or permanent. ○ Define appropriate emergency and medical process including evacuation procedures. ○ Prepare appropriate work method statements for each construction activity. ○ Provide daily hazard identification checklists, risk assessments ○ Identify mandatory meeting requirements including toolbox sessions, to ensure all personnel understand the task before commencing work for the day. ○ Provide for training for all workers on environmental safety, environmental hygiene prior to the commencement of construction. ○ Set procedures for safe handling of toxic materials and other hazardous substances. ○ Provide for installation of lights and cautionary signs in hazardous areas. ○ Ensure operators of vehicles and equipment are properly licensed and trained. ○ Ensure safety and inspection procedures are implemented, setting schedules for regular checking.				

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	**Institutional responsibility**	**Parameters**	**Frequency & verification**	**Institutional responsibility**
		○ Ensure movements of heavy vehicles is managed so as to minimise impacts to existing traffic and the wider community. ○ Provide for the provision of adequate sanitation and potable water for staff and contractors for the duration of construction works. ○ Access will be controlled to subproject sites (e.g. through the use of security fencing or restricting access to roof tops) for the duration of construction to prevent public access. ○ Children will be prohibited from entering the sites (including worker's accommodation, works area/construction zone) and prohibited from playing on any equipment or machinery. ○ All advisory and warning signage will be clear, secured on fences, gates and signboards and be posted in Yapese, the language of the main nationality of workers and repeated in English, if required.				
Construction activities	Unexpected environmental impacts	• If unanticipated environmental impacts occur during construction phase, the PMU will update the IEE/EMP and the Contractor will update the CEMP. The environmental protection measures will be designed to address the impacts.	Contractor, PMU	Update of IEE / EMP and CEMP as required	As required, visual inspection of updated IEE / EMP and CEMP	PMU, PIC
Operation phase						

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	Institutional responsibility	Parameters	Frequency & verification	Institutional responsibility
Waste and hazardous materials	Inappropriate storage, transport or disposal of waste resulting in contamination	• Inverters and batteries that have been replaced during the operating lifetime of the subprojects will be removed, transported and disposed of by an appropriately experienced and equipped contractor. • Where possible batteries and inverters will be recycled. If recycling is not possible, they will be disposal will be at a facility approved by Yap EPA or, if no facility is available, transported to an appropriately licenced facility elsewhere in FSM or another country. • Washing of solar PV panels will only be undertaken on an 'as needs' basis to minimise the generation of wastewater. Disposal of wastewater will be agreed with Yap EPA. • All infrastructure containing hazardous materials (e.g. batteries, transformers) will be inspected regularly to ensure they are functioning correctly and no hazardous materials are being discharged.	YSPSC	Appropriate disposal of wastes	As required, visual inspection of waste disposal certificates, operation of infrastructure containing hazardous materials	YSPSC
Water resources	Overuse of water impacting fresh and potable water supplies	• A source of water will be agreed with the Yap EPA prior to the commencement of operation.	YSPSC, Yap EPA	Agreed water source	As required, visual inspection of agreement.	YSPSC
Erosion control	Erosion of project sites	• If localised erosion is detected during operation of the project effective mitigation measures such as application of mulch, covering with open weave jute matting and reseeding with ground cover, protection	YSPSC	Effective control of erosion	As required, visual inspection of erosion mitigation	YSPSC

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	Institutional responsibility	Parameters	Frequency & verification	Institutional responsibility
		with geotextile fabric or localised flow dispersal and diversion structures will be installed.				
Employment	Staff unable to operate new power systems	• Training to be provided for YSPSC employees in the operation and maintenance of the new infrastructure and power systems.	YSPSC	Provision of training	As required, evidence of training completed	YSPSC
Emergency Plan	Emergency response	• YSPSC will prepare an operational emergency response plan. The plan will be included in the training provided to employees and be implemented during the operation of the solar power system.	YSPSC	Emergency response plan prepared, and training completed	As required, visual inspection of plan and training records	YSPSC
Decommissioning phase						
Decommissioning of solar PV array and batteries.	Inappropriate disposal of waste	• All equipment will be removed from the subproject sites (e.g. PV modules, batteries, inverters) and will be reused or recycled where possible. • Equipment that cannot be reused or recycled will disposed of at a facility approved by Yap EPA or, if no facility is available, transported to an appropriately licenced outside Yap.	YSPSC	Appropriate disposal of waste	As required, visual inspection of waste disposal during commissioning	YSPSC
Hazardous materials	Release of hazardous materials to the surrounding environment	• The decommissioning contractor will be required to develop a hazardous materials management plan prior to the commencement of any works on the subproject site.	Decommissioning contractor	Decommissioning plan completed	Once, visual inspection of plan prior to decommissioning	YSPSC

Project activity	Potential impact	Management and mitigation		Monitoring		
		Proposed mitigation measure	Institutional responsibility	Parameters	Frequency & verification	Institutional responsibility
Revegetation	Erosion of project sites	• If the subproject site is not reused it will be revegetated with species appropriate to the future land use of the site.	YSPSC	Completion of revegetation	As required, visual inspection of revegetation.	YSPSC

9. CONCLUSIONS

245. In order to the meet the objectives and goals of the FSM National Energy Policy and its own State Energy Action Plan Yap must increase the percentage of energy generated from renewable energy sources. The feasibility assessment undertaken as part of the project has identified four subprojects on Yap that will increase the renewable energy contribution on Yap to approximately 38% in year 1 of operation.

246. Environmental assessments have not identified any significant negative environmental impacts associated with the construction or operation of any of the proposed subprojects. The construction of subproject 4 (ground mounted solar) will include the clearance of up to 1.9 ha of vegetation, including native vegetation, however, the site is already disturbed and does not contain any significant environmental or traditional/cultural heritage values. The operation of the subprojects will not result in the generation of any air or noise emissions and wastes that may be generated (batteries and inverters) can be readily recycled.

247. The subprojects are not expected to have a negative impact on any species listed as threatened on the IUCN Red List. Subproject 4 will disturb savannah vegetation however, of the four flora species listed on the IUCN Red List that are known to occur in Yap none are associated with savannah vegetation and none were recorded during site surveys. The Yap cicada bird, which is listed as endangered on the IUCN Red List, has potential to occur at the site as does the Yap flying fox and the Micronesia saw-tailed gecko which are both listed as Vulnerable on the IUCN Red List. However, the subproject site does not provide priority habitat for these species or habitat that is unique on Yap (or in Micronesia) and the clearing of these sites is unlikely to have a significant impact on these species.

248. The subprojects are not expected to have any negative impacts on local communities, but instead are expected to provide employment opportunities for local contractors.

249. The subprojects will further reduce the use of existing diesel generators for electricity generation on Yap thereby reducing diesel fuel usage by at least 150 thousand gallons in year 1 of operation, avoiding the emission of 1500 tonnes of CO_2e of greenhouse gas and securing electricity supply by reducing reliance on diesel.

250. Provided the mitigation measure outlined in this IEE and EMP are appropriately implemented then the project is not expected to have any widespread, irreversible or significant or long-term environmental impacts. As such, it is considered that a category ‘B’ level of assessment as per the ADB’s SPS is appropriate to the scale and nature of the project.

ANNEX 1: FLORA AND FAUNA SURVEY OF GROUND MOUNTED SOLAR SITE (SUBPROJECT 1)

Yap: FSM Energy Feasibility Projects
Environmental Assessment

Savanna Ground Solar System December 3, 2018 Photograph by Ann Kitalong

June 2019

Publication#060119

Prepared for:

Hydro-Electric Corporation
T/A Entura

Koror Palau 96940

Prepared by:

The Environment, Inc.

Executive Summary

The Pacific Renewable Energy Investment Facility (PREIF) – Federated States of Micronesia (FSM) Component (the project) will assist the Yap to meet the objectives of the FSM National Energy Policy to provide cost effective, safe, reliable and sustainable energy. The Environment, Inc. (TEI) was subcontracted to assist in an Environmental Assessment for the project site that is located Yap, Federated State of Micronesia. A proposed ground mounted solar array will be located between the wind turbines and the power station (9^0 30.5208 138^0 .1072) which is primarily a savanna bounded by riparian forest and homesteads.

It is recommended that a riparian buffer of at least 35 ft or 10 m be established along the eastern boundary. The western boundary has a less developed drainage system that also requires a riparian buffer. This site has been impacted by fires, especially during the recent drought. It is critical to establish fire breaks of at least 3 meters or 15 feet between that extend from the 35 ft or 10 m riparian buffer along the periphery of the site and to remove grasses such as *Pennisetum* that burn quickly and potentially spread the fire. The invasive *Mimosa invisa* is a prickly weed that is a nuisance and should also be removed.

Over 70 species of plants from over 41 Families were found at the site including 59 native plant species including 3 endemic species. A total of 11 introduced species were observed including 4 invasive species The endemic pandanus, *Pandanus yapensis* was common along the stream but does not occur in savannah. Several native orchids were found along this stream. The 48 species of native plants were found along the relatively smaller area of the stream

TEI observed or heard 235 birds representing 13 species and 11 Families. We did record during the evening as some were nocturnal active. The team saw or heard 5 endemic and 1 endemic subspecies of bird including cicada birds, honey eaters, the Yap monarch, and the plain and Yap white eyes. The white tern was common at the savanna as were the two endemic white eyes and several brown noddy were common in the riparian forest at the proposed site. We observed several skinks at each site and the invasive cane toad at the site. We observed over 88 bats (*Pteropus pelewensis* ssp. *yapensis*) at the site. *Pteropus pelewensis* ssp. *yapensis* is assessed as vulnerable on the IUCN Red List.

Table of Contents

Introduction

Background

The site is primarily savanna habitat with a well-developed riparian forest along its eastern and western boundaries, the applicant proposed to install an approximately 1.6MW solar photovoltaic (PV) array at a site located between the power station and the existing wind converter along the 13.8 kV overhead distribution line. Refer to Figure 1. The riparian forest to the east and west of the site will not be disturbed (Gidion Moofal pers. comm. 2018). The total area of the proposed solar PV array is approximately 1.9 ha.

Data source(s):OpenStreetMap: © OpenStreetMap (and) contributors, CC-BY-SA
World Imagery: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Figure: "\\hydrotasmania\consults\Project\ConsultDM\E306xxx\E3065xx\E306525\PS13364\GIS\PS13364_GIS06\PS13364_GIS06 - FSM Feasibility Study.aprx"

Figure 1. Location Map showing proposed ground mounted system

Source: PREIF Yap_IEE Draft Report 2018

Scope

During February 2018, ENTURA requested the services of The Environment, Inc (TEI). to assist in an environmental assessment of a proposed site for a ground based solar panel array. The TEI team accompanied the ENTURA and Yap Team to the site and made some preliminary observations. During December 2018, TEI was requested to conduct an Environmental Assessment for the solar panel array site. Therefore, this assessment is for a ground based solar array.

The environmental assessment included a review of existing information to identify previously recorded flora, fauna and weed and habitat values in the vicinity of the proposed site. A field survey was also carried out within the proposed works areas to verify the potential flora and fauna values identified in the desktop assessment. The flora, fauna and weed assessment included:

1. A review of terrestrial and aquatic flora and fauna data to identify the potential for the occurrence of threatened flora and fauna species

2. Identification of the vegetation communities occurring in the vicinity of the proposed site.

3. A field survey to investigate and verify the potential fauna, flora and weed issues identified in the desktop assessment which included:
   - ground-truthing and mapping of vegetation communities present
   - survey of terrestrial and riparian plants
   - identification of weeds listed on
   - identification and assessment of potential habitat for threatened fauna species.

The results of the desktop assessment and field surveys were used to identify any potential impacts from the proposed project which may require further investigations and/or mitigation strategies to avoid and minimize impacts.

Goals and Objectives of the project

The Goal of the project is to provide sites for solar installations that are environmentally safe for Yap. The Objectives is to successfully complete all national and international requirements to implement this project through the completion of an Environmental Assessment with the following scope of work includes the following deliverables:

a) Information on species abundance and status.
b) An assessment of sensitive habitats and corridors.
c) Sensitive species.
d) Impacts on the site
e) Alternatives
f) Impact and Mitigation measures to safeguard the environment

Methods

A vegetation and fauna habitat surveys were carried out on during February and December 2018. Refer to Table 1 for a summary of the activities. TEI conducted 4 site visits to assess existing physical and biological conditions on site. The TEI team used existing maps of the site provided by ENTURA and Dr. Margie Falanruw. A meandering flora survey was carried out within the proposed works area. A meander search method involves walking over the survey area in a random manner and recording all flora species encountered. The search was stopped when no new flora species were identified following at least 20 minutes of searching since the previous species record. All species of flora encountered during the survey were geo referenced with GARMIN GPS unit.

Nomenclature for flora follows the current of Palau Vascular Plants (Kitalong et al. 2013). Vegetation communities were identified and attributed to Soil and Vegetation Mapping Units (PALARIS 2018).Important fauna habitat components were also recorded during the survey if encountered, including trees potentially suitable for nesting birds and roosting bats. In addition, all fauna species encountered during the survey were recorded, including indirect evidence of fauna presence (e.g. scats, diggings, burrows, shelters). Threatened species locations or habitats, if observed, were recorded.

Table 1. Summary/Timetable of Activities Performed for the EA of the Project

Activity	Dates
Qualitative surveys at the site	February 12, 2018, December 2, 3, and 4, 2018
Interviews and meetings with Entura, YSPPC, Yap EPA, Yap Historical Preservation Office, Yap Visitors Authority, Yap Institute of Natural Science, and community members.	February 12, 2018
Interviews with YSPPC staff, Yap Institute of Natural Resource, Micronesian Challenge Coordinator based in Yap, Bird specialist based in Yap	December 2, 3, and 4, 2018
Write up report on site visit	Dec 11, 12, 13, 14,15 2018 June 24, 2019

1. Walk through the savanna and record all biota observed. Walk along the streams and record the biota observed

2. Measure DBH and estimate height for random sample of large trees within the site

3. Conduct 8-minute counts for birds and an additional 7 minutes for new species or any pigeons or doves.

4. Conduct evening counts of bats starting at dusk until unable to see. (roughly 5:30 to 7pm on three evenings. The team observed the entire horizon.

Limitations

It is likely that not all flora species that occur at the site were identified in the survey because of varying flowering times and seasonality of occurrence. Short- lived annuals, orchids and lilies that may be present at the site may have been missed because they were not able to be identified (they were not flowering) or they were not evident at this time of year. The fauna assessment was limited to a habitat assessment and incidental observations of fauna species, including the ground truthing of potential habitats for significant fauna species that were identified in database searches.

Criteria for determining flora and fauna species of conservation significance

The conservation significance of the flora and fauna within the survey area was assessed according to whether they were listed on the IUCN Red List of threatened species, the appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the U.S. Endangered Species Act listing of Threatened and Endangered species and other publications from FSM. The conservation significance of the native vegetation within the survey area was assessed according to whether the vegetation community was listed on the).

Results

Previous Impacts

Fires spread up to the hill tops at the site (Gidion Moofal pers. comm. 2018). The areas adjacent to the site are farmland.

Physical structures

There are no physical structures at the site. There is a farm and home along the northern boundary and a grassy dirt access road to the south with a home and farm along the northern boundary. The lower portion of the access road intersects with the main road and is in disrepair. Refer to Figure 2.

Figure 2 Access road at the south boundary (left) Home and farmland at northern boundary (right)

Water Quality

There was no available water quality data for the streams at the riparian forest at the proposed site.

Vegetation communities

Terrestrial Species Diversity and Habitats

Plant Species

Over 70 species of plants from over 41 Families were found at the site including 59 native species including 3 endemics and 11 introduced species. Four invasive species were also found at the site. The endemic pandanus, *Pandanus yapensis* was common along the stream at the riparian forest and the endemic *Trichospermum ikutai* was along forest edge (Figure 3). Several native orchids were found along this stream. The greatest botanical diversity of native plant species was found along the relatively smaller area of the stream (48 species) than in the savanna (36 species).

Figure 3 Endemic *Pandanus yapensis* (left) and fruit (center) and the endemic *Trichospermum ikutai*(right)

Tree volume for Savanna and Riparian Forest for Ground Solar System

On December 2, 3 and 4, 2018 the TEI team conducted measured the diameter at breast height (DBh) and estimated the heights of large trees found at the Savana and Riparian Forest. Refer to Figure 4. A total of 31 trees representing 12 species were measured at the proposed site with a total volume of 207 cubic meters. The riparian forest was home to 95% of these trees. (Tables 2). Five trees, representing 3 tree species represented 82% of the total estimated tree volume: 2 *Inocarpus fagifer* (buoy), two *Calophyllum inophyllum* (biyuuch) and one *Pterocarpus indicus* (lach) in the riparian forest. *Pandanus tectorius* represented 5% of the tree volume and was the dominant tree in the savanna. Refer to Figure 4.

Inocarpus fagifer (buoy) *Calophyllum inophyllum* (biyuuch) *Pterocarpus indicus* (lach)

Pandanus tectorius

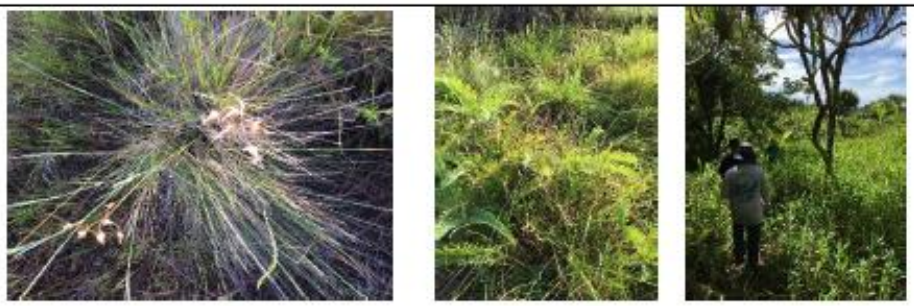
Figure 4. Large trees measured on site

Ground cover

The ground cover within the riparian forest include sedges and orchids and small shrubs. Refer to Figure 5. The ground cover at the savanna site included ferns, sedges, and grasses. Refer to Figure 6. The site was a disturbed site with highly erodible soils in the savanna. However, along the two drainages areas to the east and the west there were more grasses and smaller native herbs as *Hedyotis* spp.

Mapania sedge | *Peristylis* orchid | *Dienia* orchid | *Hedyotis* sp.

Figure 5. Ground cover along the stream in the riparian area.



Fimbristylis sp. | *Dicranpteris* sp. | *Ischaemum* sp.

Figure 6 Ground cover at the savanna habitat

Biodiversity

We observed over 80 species of plants, birds, bats, and reptiles within the project site. (Tables 1-3). The diversity of native species was highest within the riparian forest. The lowest diversity was at the savanna habitat at the site.

Sensitive Habitats

All of Yap's habitats and species within these habitats fall into the broad definition of sensitive coastal areas because of Yap's limited land mass. We prioritize sensitive areas based upon our evaluation of previous disturbance, integrity, biodiversity, representativeness, occurrence elsewhere and value of wildlife corridors. Our general definition of a sensitive habitat is an area that is rare in Yap or home to rare or endangered species. The sensitive areas for this project include the reservoir as a critical source of water for the population and the riparian forest adjacent to the savanna. All habitats need protection as Yap faces the impacts of climate change and climate variability. During severe drought periods the riparian streams dry up and there are uncontrollable fires. The subsequent impact from fire is the opening of areas for invasive plants and animals. Protecting water sources, the upper streams that flow into the riparian forests and grasslands protects coastlines from the predicted increased intensity of storms and floods and sea level rise. Climate change must be considered in all development activities in Yap. The proposed project does include the removal of *Pandanus tectorius* trees in the savanna. However, there is no plan to remove vegetation from the riparian forest.

Vulnerable, Rare, Endangered, Threatened, Sensitive or unique Species

Yap's forests are home to rare, endangered, threatened, sensitive or unique species. Aquatic and terrestrial ecosystems are threatened in Yap as a result of sedimentation from soil erosion, and contamination from waste and reclamation for development. Native plant associations need to be protected. The endemic and rare native plants and birds observed, especially in the riparian forest require protection. *Pterocarpus indicus* is listed as vulnerable on the IUCN Red List and a risk of global extinction (Cushing Falanruw 2015). *Pandanus yapensis* is endemic to Yap and is associated with riparian vegetation found on the site. *Pteropus pelewensis* ssp. *yapensis* is assessed as vulnerable on the IUCN Red List (Wiles et al. 2008).

Weeds

There were invasive species observed on the site. It is important that the Yap Bureau of Agriculture work with the applicant to identify and remove these species from both sites. The *Mimosa invisa* is prickly and painful when touched. The *Pennisetum* grass burns very rapidly and is a fire hazard (Margie Falanruw pers. comm. 2018). Refer to Figure 7. It is important that any fill material for this project be carefully inspected by local agriculture experts to ensure no additional invasive species are present. We also saw the cane toad, *Bufo marinus* that is an unwanted pest.

Figure 7. A field of *Pennisetum* grass at the north boundary of the proposed site

Fauna

Birds and Wildlife

We observed or heard 235 birds representing 13 species and 11 Families. It is possible that the same birds were observed during each survey, especially the more resident birds. We did record during the evening as some were nocturnal active. The team saw or heard 5 endemic and 1 endemic subspecies of bird including cicada birds, honey eaters, the Yap monarch, and the plain and Yap white eyes. We observed 4 native residents,1 winter migrant, 1 introduced, and 1 introduced alien bird species. The white tern was common at the savanna habitat as were the two endemic white eyes and several brown noddy were common in the riparian forest at the proposed site. We observed over 88 bats (*Pteropus pelewensis* ssp. *Yapensis*) flying near or over the site. We observed several skinks. High value habitat components for fauna were identified within the riparian forest. Potential sites or habitat trees were observed around in the riparian forest.

Figure 8 Yap Monarch (left) White tern (center) and Skink (right) in riparian forest

Threatened fauna

The Yap monarch, plain white eye and olive white eye are listed as near threatened on the IUCN Red List and were observed at the sites. *Pteropus pelewensis ssp. yapensis* is assessed as vulnerable on the IUCN Red List (Wiles et al. 2008).

Impact assessment and mitigation measures

Impact Assessment

General physical, biological, health, and social impacts are the following:

1) Magnitude of Impact
2) Loss of Habitat
3) Introduced species

Impact 1 Magnitude of Project

This project is removing vegetation in savanna and partially in forest habitat in order to provide space for a ground solar system in Yap. The impact is significant for the riparian forest area. Ongoing encroachment into the forests and grasslands has already had an impact on this forest system. To reduce impacts the proposed project could be reduced in size to avoid riparian area.

Impact 2 Loss of habitat

The proposed project will directly impact an area of at least 80% the savanna. The project site supports over 84 species of freshwater and terrestrial organisms. It is very important for the applicant to work with the Yap State Public Service Corporation (YSPSC), the contractor for the project, and adjacent landowners to conserve and protect these habitats. TEI supports a design plan that will reduce the impacts to the riparian forest. It is important to ensure that the infrastructure does not reclaim habitat.

Impact 3 Introduced Species

There were invasive species observed on the site. It is important that the Yap Bureau of Agriculture work with the applicant to identify and remove these species from both sites. The *Mimosa invisa* is prickly and painful when touched. The *Pennisetum* grass burns very rapidly and is a fire hazard (Margie Falanruw pers. comm. 2018). It is important that any fill material for this project be carefully inspected by local agriculture experts to ensure no additional invasive species are present. We also saw the cane toad, *Bufo marinus* that is an unwanted pest.

Mitigation Measures for the Project

Below is a list of mitigation and enhancement measures for the project that would require partnerships and collaboration between the National, State and community.

a) minimize size of disturbance to footprint for each site.
b) Establish a riparian buffer of 10 meters at the proposed site to protect the stream and natural drainage
c) Establish a fire break zone of at least 3 meters around the perimeter of the sites to prevent fire outbreaks and spreading
d) Remove invasive species on site, especially *Pennisetum* grass and the prickly *Mimosa invisa* and other invasive species at the proposed site
e) Avoid removal of large trees at the site as they provide coastal protection shade, a wildlife refuge and aesthetic beauty. These are important attributes for tourism throughout Yap.

f) It is further recommended to set aside funds to be used as follows: establish a conservation areas near this project sites for sustainable use of the resources and recreation activities for the community that can include educational signs about the importance of the riparian forest The size of the conservation areas should be 3 times the size of the impacted area left as a conservation area into perpetuity for the people of Yap. Partner with the local forestry, agriculture and fire departments to set up riparian zones, fire breaks and removal of invasive species demonstrating best practices for the community to learn from.

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ANNEX 2: YAP STATE HPO CLEARANCE

Historic Preservation Office

Yap State
Historic Preservation Office
P.O. Box. 714
Colonia, Yap FSM 96943

Tel: (691) 350-4226
Fax: (691) 350-4256
Email: yaphpo@mail.fm

May 17, 2019

Victor Nabeyan
Assistant Manager
Yap State Public Service Corporation
Yap State, FM 96943

Dear Mr. Nabeyan:

The Yap State Historic Preservation Office (YSHPO) along with your and EPA's representatives, Mr. David Procter and Taniela Faletau conducted a reconnaissance survey of the proposed solar farm site up the hill in Mabuu village, Weloy municipality on May 13, 2019 to assess the project's site of any impact the project and its associated activities might pose to any potential cultural/historical resources and other EPA-related issues within its boundaries and immediate surrounding areas.

During the preliminary walk-through of the site, YSHPO did not find any cultural/historical resources visible above the ground. However, it does not mean that there is nothing below the surface of cultural/historic value which might require protection, including human remains.

Your representative stated that a team of UXO experts would assess the site later of any UXO. Further, the clearing of the area would then follow and so YSHPO herein requests that YSPSC informs YSHPO before the UXO and clearing activities start to enable YSHPO staff to be on site. Kindly remember that advance notice is always appreciated as such activities are not emergencies in nature.

Therefore, this letter serves as the initial assessment and findings of the site to be followed later as stated above per requirements of YSL 2-56 and HPA Section 106.

Kamagar,

Francis L. Reg
Officer

Xc: Director, DY&CA
EPA
David Procter
File

ANNEX 3: STAKEHOLDERS CONSULTED

Date	Participants	Rep.	Gender	Location	Purpose	Outcome
6/25/18	Victor Nabeyan Marcellus Robon Gidion Moofal	YSPSC Community YSPSC	Male Male Male	YSPSC BOD Room	Get Feed-back from Community on using the land parcel for PV installation in Dachngar Village	Robon reported that on May 19, 2018 the community held a meeting regarding the Land Parcel in Dachngar village to be used by YSPSC to install PV system. They also visited the proposed site and the majority of the people alluded to "agreeing" for the project to proceed. The people who attended the meeting were: Mr. Robert Ruan … Land Owner Ms. Ursula Gurumow…Land Owner Mr. Yokbay ….Land Owner Ms. Leergal … Community Member Mr. Bandag … Community Member Mr. Marcellus Robon…Community Member Robon also reported that after the community met the land owners has since request for land survey at the Office of Land Resource. Gidion was tasked in this meeting to visit Land Resource Office this afternoon to follow up on the status of the Land Owners request for land survey and report to Victor. It was also agreed that after the land survey is completed that YSPSC will arrange for a community meeting thru Mr. Robon.
7/9/18	Charles Laman Johnny Chieng Gidion Moofal	YSPSC YSPSC YSPSC	Male Male Male	Mabuu' … Proposed Solar Site	Taking GPS points at the foot of the hills	Were able to take several points enlarging the area of the proposed Ground Mount Solar System in Mabuu'. Johnny and Laman to insert the points taken on Google Map and email Victor.
8/6/18	Marcellus Robon Victor Nabeyan Gidion Moofal	Comm. YSPSC YSPSC	Male Male Male	Vic's Office	Robon to update on Land Acquisition	Robon reported that there are dispute over the land boundary but the dispute is only between Ruan and Fanugrang, but Gurumow and Yokbay (Fagalgomaa') don't have any dispute over theirs.

Date	Participants	Rep.	Gender	Location	Purpose	Outcome
						Robon to arrange for the landowners to meet at site and landowners to mark their land boundary and for YSPSC to GPS the marks and compare it to the projected sites. Robon will get back to Gidion on the date of meeting at site with Landowners.
9/5/18	Marcellus Robon Gidion Moofal	Comm. YSPSC	Male Male	Robon's Office at YCA Hardware	Robon to set-up Landowners meeting	Meeting with Landowners at site was taking too long for it to happen and so a decision was made to meet/approach the landowners face to face. This meeting with Robon at Robon's office was for YSPSC requesting to meet with the landowners elsewhere rather than the proposed site at the landowners' choice. Robon agreed and said that he will get back to the landowners and get back to YSPSC with the date, time and location of the meeting.
9/22/18	Marcellus Robon Ruan Robert David Tamanyon Leergal Tinag Victor Nabeyan Gidion Moofal Johnny Chieng Charles Laman	Comm. L. Owner L. Owner L. Owner YSPSC YSPSC YSPSC YSPSC	Male Male Male Female Female Male Male Male	Dachngar Peebay	To notify the community and land owners of the plan to utilize their land for Solar Panel generation facility.	Victor opened the meeting by reporting a little bit about the background of the project. YSPSC was tasked by the government to look into other alternate energy during the fuel crises some years back. YSPSC has begun the process since and up to date has five solar plants on some government buildings as well as three wind turbines on Madadee' hill. The plan is to continue on to the next phase of the project by installing more Solar Plants and Battery Storage. He continued to explain to the group that location chosen for the ground mount Solar Plant is an ideal location because of its proximity to the existing power grid and its proximity to the load demand as well as Power Plant. It is also an ideal area due to the natural

Date	Participants	Rep.	Gender	Location	Purpose	Outcome
						contour of the area and vegetation is mostly grass and practically no big trees. Robon said that part of the area has been surveyed by Land Resource Division but not other part. The land owners understood the explanation except for Tinag who raised concern about using her property. Victor explained that is necessary to have all the land owners flat their property in the mentioned area so that YSPSC can GPS the points and have a better idea of how much land area is available to work with permission of the land owners willing to grant the use of their property. Everyone agreed to have the boundaries be flagged and so the date was set to meet at site on Saturday September 29, 2018 at 2:30pm. YSPSC will provide ride for those that may need transportation if any.
9/29/18	Marcellus Robon Yokbay Leerugal John Gilmatam Pong Ruan Rruw Bandag Gidion Moofal Charles Laman Johnny Chieng	Community L. Owner L. Owner Community Community L. Owner Community Community YSPSC YSPSC YSPSC	Male Male Female Male Male Male Male Male Male Male Male	Dachngar Peebay and then also at Proposed Solar Site	To identify the land owner boundaries, mark and enter points into the GPS	At 2:30pm we met Robon, Yokbay, Leerugal at Dachngar Peebay. After waiting for a few minutes for some who may need ride to the solar sites, no one came and so we left for the site at approximately 2:50pm. When we arrived at the site, there were others at the site but Tinag (who also claim to be a land owner) was not there. Some points were already marked indicating boundary of Leerugal, Tamag and also Yokbay's boundary. During entering these points when Yokbay indicated that he doesn't want his property to be included in the Solar Project. Mr. Yokbay said and he and his children has other plans for the property. After entering these points into the GPS, we proceeded to enter the points marked by Ruan indicating his boundary with Leerugal. These points marking the boundary of Leerugal and

Date	Participants	Rep.	Gender	Location	Purpose	Outcome
						Ruan were marked on this day. We completed entering the points by 5:00pm.

ANNEX 4: PUBLIC CONSULTATION FRAMEWORK

To: Yap State Public Service Corporation (YSPSC)
Re: Stakeholder Consultation Program
Project: ADB Renewable Energy Project

Advice Regarding Stakeholder Consultation Program

Design consultation meeting(s) for the purposes of:

i. Providing public awareness and soliciting stakeholder comments and questions.
ii. Raising and dealing with stakeholder questions and with potential issues including the potential effect of increased renewable energy on YSPSC operations and on consumer electricity tariffs.
iii. Ensuring public safety and convenience during construction.

A public consultation meeting should be scheduled. Consult first with the Council of Pilung as necessary. Advice regarding this meeting and its follow up is as follows:

i. Broadcast the meeting on public radio if possible.
ii. Include in any correspondence a contact name, position, phone number, and email address of the person at YSPSC who is responsible for the consultation program.
iii. Send emails and make phone calls to invite specific stakeholders (including relevant government offices and women's, environmental, and youth groups) that YSPSC believes should attend the meeting.
iv. Prepare a short presentation for the meeting that summarizes the goals of the project, the options considered and why certain options were chosen, what will now be done under the project, what YSPSC sees as potential stakeholder issues, if any, and how the project will deal with the issues and options identified. Issues should include potential safety, any environmental risks and any measures planned to mitigate those risks, and potential effects of the project on YSPSC operations and on the price of electricity to customers. The point here is to anticipate the questions and the issues that stakeholders might raise and to present the information stakeholders need to make informed and constructive comments and questions.
    Note that YSPSC will obtain and follow all relevant permits and all statutory obligations.
    Summarize the project steps and an approximate timeline for their implementation.
    Advise what the next consultation steps will be (e.g., call for public comment on an IEE) and advertise those consultation steps at the appropriate time.
v. Prepare a brief (one page with a photo) handout sheet summarizing the main points to be made at the consultation meeting, email that sheet along with invitations to attend the consultation meeting, post the sheet along with the announcement in public places, and provide that handout sheet to people attending the meeting. The handout sheet should include the YSPSC contact details of the responsible person. The handout should also solicit written, phone, or email comments, questions, or complaints during project planning and implementation. YSPSC should respond in a timely manner to these submissions.
vi. Ask a YSPSC staff member to make a complete record of attendance at the consultation meeting, take detailed minutes of the meeting, and take some photos to record attendance at the meeting. Do the same at any subsequent meetings.
vii. During and after the public consultation meeting, make preliminary arrangements for any follow-up meetings with particular stakeholder groups, as necessary.

INSERT YSPSC LOGO HERE

PUBLIC CONSULTATION ANNOUNCEMENT

With new grant funding coming from the Asian Development Bank (ADB), Yap State Public Service Corporation (YSPSC) will soon be implementing a Renewable Energy Project on Yap. YSPSC will host a public stakeholder consultation to solicit your comments and questions.

EVENT: ADB Renewable Energy Project – Public Consultation
DATE:
TIME:
VENUE:
AGENDA:
1. Project summary – new solar PV and battery storage.
2. Project timeline – 2020 to 2022.
3. Project outcomes.
4. Public comments and questions.

CONTACT: Name and position at YSPSC
Phone number
Email address

We value your input and look forward to your participation.
Thank you.