

Annex 2: Pre-feasibility Study

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This pre-feasibility study has been prepared by E Co. for The Pacific Community (SPC), as a background document for the Green Climate Fund (GCF) Simplified Approval Process (SAP) Funding Proposal titled: *Increasing resilience to the health risks of climate change in the Federated States of Micronesia (FSM)*. This project will focus on delivering adaptation action for FSM's health sector to manage the climate impact on health burdens relating to food-, vector- and water-borne diseases.

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Abbreviations

Acronym	Definition
ADB	Asian Development Bank
AMA	Accreditation Master Agreement
AMD	Advanced Molecular Detection
AWPB	Annual Work Plan and Budget
CCES	Climate Change and Environment Sustainability Programme
CDC	Center for Disease Control and Prevention
CFP	Ciguatera Fish Poisoning
CFU	Climate Finance Unit
CIEWS	Climate-Information Early Warning Systems
COFA	Compact of Free Association
CSO	Civil Society Organization
DAE	Direct Access Entity
DALY	Disability-Adjusted Life Year
DECEM	Department of Environment, Climate Change and Emergency Management
DFA	Department of Finance and Administration
DHSA	Department of Health and Social Affairs
EEZ	Exclusive Economic Zone
ENSO	El Niño-Southern Oscillation
EPA	Environmental Protection Agency
ESHSS	EpiNet State Hospital Surveillance System
EWS	Early Warning System
FAA	Funded Activity Agreement
FBD	Food Borne Diseases
FSM	Federated States of Micronesia
GoFSM	Government of Federates States of Micronesia

Acronym	Definition
GPHL	Guam Public Health Laboratories
HDPE	High Density Poly-Ethylene
HIES	Household Income and Expenditure Survey
HIEWS	Health Information Early Warning System
HNAP	Health National Adaptation Plan
HPHL	Hawaii Public Health Laboratory
INGO	International NGO
ITCZ	Intertropical Convergence Zone
IWRM	Integrated Water Resource Management
JICA	Japan International Cooperation Agency
MCT	Micronesia Conservation Trust
MEL	Monitoring Evaluation Learning
MRO	Micronesia Regional Office
NAP	National Adaptation Plan
NCCHAP	National Climate Change and Health Action
NCD	Non-Communicable Diseases
NPSC	National Project Steering Committee
OECD	Organisation for Economic Co-operation and Development
PACC	Pacific Adaptation for Climate Change
PHD	Public Health Division
PPHSN	Pacific Public Health Surveillance Network
SOP	Standard Operating Procedures
SPC	The Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
STD	Sexually Transmitted Diseases
VBD	Vector Borne Diseases
VCA	Vulnerability and Capacity Assessment

Acronym	Definition
WASH	Water, Sanitation and Hygiene
WBD	Water Borne Diseases

1. Introduction

1.1 Objective of the study

This pre-feasibility study has been developed to support the design of the proposed Green Climate Fund (GCF) project *Increasing resilience to the health risks of climate change in the Federated States of Micronesia*, being developed by the Pacific Community (SPC) through a government-led, coordinated approach with FSM's Department of Health & Social Affairs (FSM Health).

The primary objective of this study is to assess the factors supporting the relevance of the project's proposed interventions for GCF investment, with focus on technical design, cost and benefit analysis, social and environmental impacts, legal and regulatory environments.

The study will analyse the context supporting climate change risks and the health sector in FSM¹, expand on programme activities identified in the approved Concept Note (CN)², and analyse the capacity of national and devolved governments to implement these activities to reach the following outcomes:

- **Outcome 1: Capacity building, policy strengthening and cross-sectoral collaboration to manage climate-related vector-, water- and food-borne diseases are enhanced**
- **Outcome 2: Surveillance of and response to climate-related food-, vector-, and water-borne diseases are established and improved**
- **Outcome 3: Communities have increased resilience to climate-related FBDs, WBDs and VBDs as well as capacity to manage associated health burdens**

This study, further, demonstrates the timely need for GCF investment for managing observed and future climate changes and their impacts on the health sector in FSM.

The GCF, in its Health and Wellbeing Sectoral Guide,³ observes that there are multiple threats to health and wellbeing from climate change. At 1-1.5°C of warming above pre-industrial temperatures, rising temperature increase the frequency and intensity of extreme events, and exacerbate under-nutrition, vector-, food-, and water-borne infections, and occupational and mental health consequences. These impacts can be:

- **direct** - unusual heat and cold, extreme precipitation leading to flood, storm surges, as well as unexpected or severe droughts;
- **ecosystem-mediated** - food-borne, vector-borne and water-borne diseases (FBDs, VBDs and WBDs), or
- **human institution-mediated** - such as, under-nutrition and lack of equitable access to health care.

¹ GCF (x). *Technical Guidelines: Water Security*. Guides. Accessed at:

<https://www.greenclimate.fund/sites/default/files/document/sap-technical-guidelines-water.pdf>

² Concept Note for the project can be accessed here: <https://www.greenclimate.fund/document/increasing-resilience-health-risks-climate-change-federated-states-micronesia>

³ GCF's draft *Health and Wellbeing Sectoral Guide* is currently under consultation process.

To address these threats and continue to deliver service in a changing climate, the GCF establishes that health systems, including healthcare services, need to be climate adaptive, i.e. be prepared for and able to cope with changing climate-related hazards, which is the core rationale of this project being proposed for FSM.

Drawing from the GCF's observations on centralizing adaptation into health systems, this study (developed alongside the Stakeholder Consultations and Engagement Plan) captures how strengthening policies and introducing improved technologies can help build resilience to climate impacts on FBDs, VBDs, and WBDs in FSM. The point of departure of this study builds on the Intergovernmental Panel on Climate Change (IPCC)'s observation that there are research and data lacunae regarding the health consequences of climate change and co-benefit actions, particularly in low-income or climate-vulnerable countries. Climate change is expected to act mainly by exacerbating health issues that exist - such as vectors responsible for VBDs may extend their geographic range to areas that are presently unaffected.⁴ Additionally, emerging climate risks could introduce new conditions and exacerbate existing ones - with spillover impacts on health losses, morbidity and mortality. The study, therefore, demonstrates the importance of installing a robust surveillance system for climate-related FBDs, VBDs, and WBDs through a Health Information Early Warning System (HIEWS) in FSM.

Importantly, the study explicates how the project results, adaptation actions, and health sector interventions will be delivered in a gender-responsive, environment- and socially-responsive manner by drawing from the Environment and Social Management Framework and the Gender Assessment and Action Plan.

1.2 Methodology of the study

Research for this pre-feasibility study was conducted in early 2022. The study was kicked-off by a hybrid virtual and in-person workshop held on 02 November 2021 in Pohnpei, FSM. This workshop, organized by SPC and FSM Health, set the scene by introducing the different stakeholders involved in FSM's health sector.

In November 2021, national stakeholder engagement experts interviewed relevant government departments (in addition to the Dept. of Health and Social Affairs (FSM Health or DHSA), this included: Dept. of Marine Resources, Environmental Health & Sanitation, Dept. of Marine Resources, etc.), as well as key international non-governmental organizations (INGO) and United Nations (UN) actors on the ground such as: SPC, United States Agency for International Development, World Health Organization (WHO). A full list of stakeholders consulted is available as an appendix to the Annex 23: Stakeholder Consultations and Engagement Plan. A second leg of provincial consultations was carried out from in March 2022. Participants and stakeholders were identified using a combination of purposive and snowball sampling during the mission led by FSM Health and the national stakeholder engagement experts, and consulted according to

⁴ Smith, K.R., A. Woodward, D. Campbell-Lendrum, D.D. Chadee, Y. Honda, Q. Liu, J.M. Olwoch, B. Revich, and R. Sauerborn, 2014: Human health: impacts, adaptation, and co-benefits. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 709-754. https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-Chap11_FINAL.pdf

their levels of knowledge, exposure and access on climate change, water infrastructure, and gender as well as socioeconomic issues to prioritize and vet information and data received. These consultations yielded grey literature, recent policies that have been enacted and existing project documents and policy guides from current and closed programmes. The primary literature generated from the stakeholder consultations were reviewed by the international consultants in lieu of in-country missions, which could not be organized due to COVID-19 restrictions.

For the climate change and health linkages technical study, a desktop review of the literature, targeting four databases: PubMed, CINAHL, Scopus, and Web of Science was conducted. These databases are recognized to be the main sources for public health literature inclusive of natural science, social science and policy literature.

Second, grey literature and relevant websites for reports published within the last 7 years on climate change and health in FSM, the Pacific and more broadly, SIDS (referred to here as ‘regional’) was reviewed. This was followed by a prioritization and synthesis of evidence representing a higher-level of evidence from key bodies, in particular the WHO and the IPCC. Key FSM reports, grant applications and other documents and reports provided by partners in relation to this broader project were also reviewed and incorporated.

Third, the authors conducted targeted searches of the literature to fill any evidence gaps identified. In addition to the four academic databases, we also searched Google Scholar and sourced additional evidence from the grey literature and institution websites including: WHO, the Food and Agriculture Organisation of the United Nations, The World Bank, IPCC AR5 and SR1.5 reports, SPC and the Secretariat of the Pacific Regional Environment Programme (SPREP).

The authors searched for local and national data and when this was not available, moved to regional data from the Pacific and other small island developing states (SIDS) - see Table 1 and Figure 1. The global data mostly demonstrate the links between hazards and health outcomes and broader trends that may be pertinent to FSM.

Table 1: Literature review search strategy (Across: AND. Down: OR)

Concept 1	Concept 2	Concept 3: Context
Climate Change	Public Health	PICTs
Climate Variability	Population Health	SIDS
Environmental Change	Global Health	FSM
Environmental Degradation	Climate-sensitive disease	Low lying island states
Global Warming	Vector-borne disease	
Extreme weather*	Food-borne disease	
Disaster	Water-borne disease	
ENSO, La Niña, El Niño	Diarrhoeal disease	

Sea level rise	Infectious disease	
Storm, Hurricane, Typhoon	Communicable disease	
Drought		

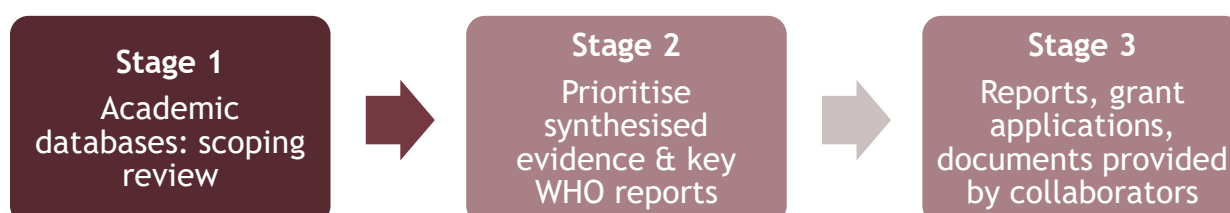


Figure 1: Search strategy (October 2020)

It should be noted that, as with many SIDS, there is a lack of data and information regarding climate change and health in FSM. For example, vector tracking and range analysis is largely undocumented for vast geographic areas. This limited data input has also affected the development of the cost-benefit analysis in areas where quantitative information is missing. Qualitative information has been utilized as well as data from the Pacific region, as a proxy for FSM, where possible.

1.3 Outline of the study

The study is organised in six sections. Section 1 Introduction presents the objective, methodology and the outline of the study. Section 2 provides the overall context of the project including the baseline assessment of the country main geographical and socioeconomic characteristics, the public health analysis, the policy and regulatory landscape of FSM, and the assessment of the relevant baseline projects. Section 3 details the climate rationale providing data about the historical and projected climate trends, the climate risks and impacts under the projections, the public-health specific risks and the respective adaptation needs and barriers. Section 4 is an overview of the project description, including the project targeting, its objective and outcomes, the project's Theory of Change, and lastly its cost reasoning. Section 5 addresses the feasibility assessment including its technical assessment; the environmental, social and gender assessments; the risk analysis and risk mitigation measures; the economic and financial viability of the project interventions; and the sustainability factors and exit strategy. Finally, Section 6 addresses the implementation arrangement of the project including the stakeholder engagement plan, the capacity assessment of the AE and the EEs and the implementation and governance processes.

2. Context Setting

2.1 Baseline Assessment - Situation analysis

2.1.1 Country context

FSM consists of 607 small islands, separated into four States of Yap, Chuuk, Pohnpei and Kosrae, located in the Northern Pacific Ocean, in the region of Micronesia. The islands are spread over a vast region in the Pacific, between 1°S and 14°N latitude, and between 135°E and 166°E longitude. FSM consists of 708.36 km² of land area with a vast exclusive economic zone (EEZ) covering over 2.9 million km². The distance between the eastern-most State (Kosrae) and the western-most State (Yap) is 2,700 km. Much of FSM lies just above the equator, approximately 4,000 km southwest of Hawaii and approximately 3,000 km north of eastern Australia (Figure 2).

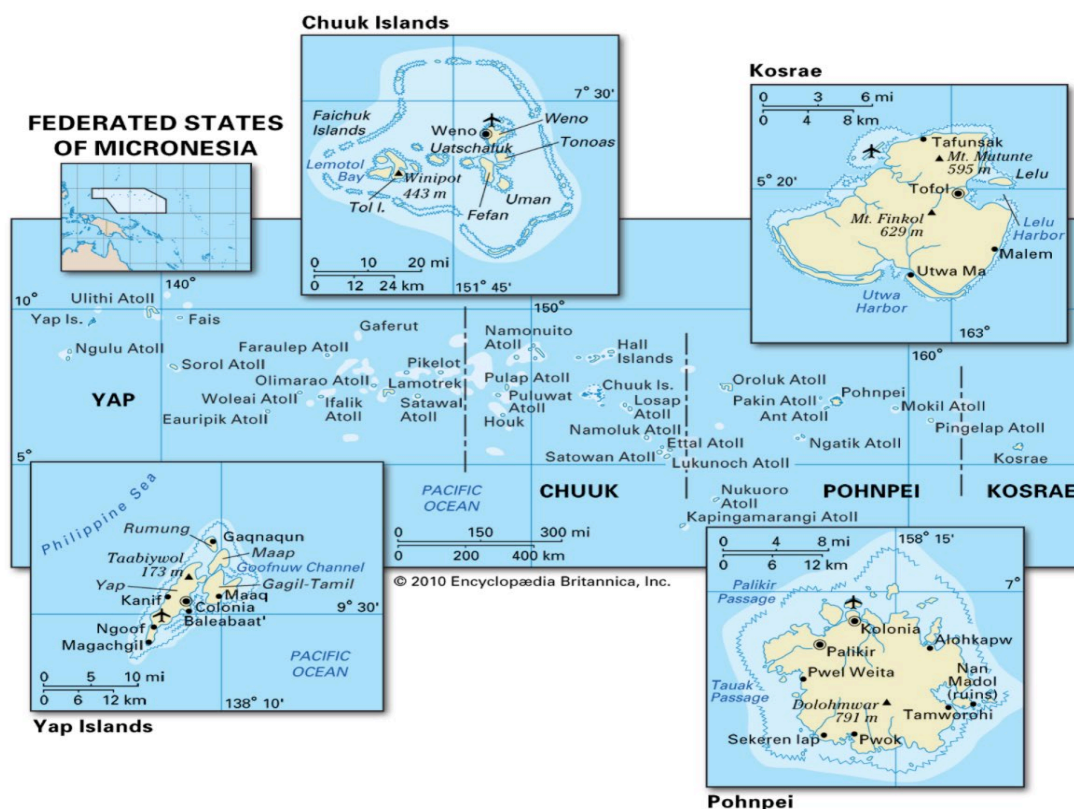


Figure 2: Map of FSM (Encyclopedia Britannica)⁵

The four States have varying amounts of land area. Yap is approximately 119 km² in land area, Chuuk is approximately 126 km², Pohnpei is 342 km² and Kosrae 109 km². Each of the four States is centred on one or more main high, volcanic islands and all the States except Kosrae have inhabited outer-island atolls. Yap is made up of 4 volcanic islands, 7 small islands and 130 atolls (of which 22 are inhabited). Pohnpei is made up of one large volcanic island and 6 inhabited atolls. Chuuk is made up of 7 volcanic island groups within the Chuuk Lagoon and 24 outer-island

⁵ Sourced from the Encyclopedia Britannica.

inhabited atolls.⁶ Many of the islands in FSM are extinct shield volcanoes, with steep and rugged centres that are densely vegetated and eroded. FSM has mangrove-based coastal ecosystems, which grow around the fringes of the different islands. Land elevations range from near sea level to up to approximately 760 m. Other islands are relatively flat, small and swampy, with low-lying, forested atoll islets typically 1-5 m above mean sea level (Table 2).

Table 2: Geographic Characteristics of Islands in FSM⁷

High, Volcanic Islands	Atoll Islands
Remnants of extinct shield volcanoes	Coral rubble and sand deposited on shallow reefs
Large land area relative to length of coastline	Small land area, absolutely and relative to coastline
High and steep slopes, subject to erosion	Low elevation
Mix of shallow and deep, fertile soils	No or minimal (impoverished coral sand) soils
Fringing mangroves, lagoons and barrier reefs	Fringing reef, limited or no mangroves
Perennial and/or ephemeral streams	No or minimal surface water
Large groundwater resource	Shallow freshwater lens
Orographic rainfall, with flash flooding	Convictional rainfall
Relatively abundant natural resources	Narrow natural/economic resource base
Extensive stands of primary and secondary forest	Vegetation predominately herbaceous strand, or strand forest
High biodiversity	Relatively low biodiversity
Relatively high population numbers, concentrated in coastal areas	Relatively low population numbers, but high concentrations
Transport and other infrastructure and services relatively well developed	Poorly developed transport and other infrastructure and services

The World Bank estimates the population of FSM to be 115,021 individuals (2020), collating information from various sources, including SPC's Statistics and Demography Programme. As with many SIDS, a considerable proportion of the population resides within the coastal zone. Close to

⁶ [GCF - Federated State of Micronesia Country Programme](#)

⁷ Adapted from Campbell, J. R. (2006). *Traditional disaster reduction in Pacific Island communities* in GNS Science Report 2006/38.

60% of households in FSM live 180 m from the shoreline: 70% in Yap, 68% in Chuuk, 38% in Pohnpei, and 80% in Kosrae.

A considerable portion of the population also inhabit the outer islands in FSM. In Yap, around 40% (4,006) of the population live on the outer islands; in Chuuk, this figure hovers around 30% (12,502); in Pohnpei, however, the estimate is under 1% (1,407). Kosrae does not have outer islands.

For the period 2000 to 2010, there has been increasing urbanization from 21.8% in 2000 to 22.3% in 2010.⁸ The percentage of urban population varies from 7.4% in Yap to 32.6% in Kosrae, with Pohnpei at 16.8% and Chuuk at 28.5%. Table 3, Table 4, and

Table 5 below provide a breakdown of population in FSM by State disaggregated by gender and municipality. There are 75 municipalities across all four States: 20 in Yap; 40 in Chuuk; 11 in Pohnpei; and, 4 in Kosrae.

Table 3: Population of FSM by State and Gender (2010)

State	Population		
	Male	Female	Total
Yap	5,635	5,742	11,377
Chuuk	24,835	23,819	48,654
Pohnpei	18,371	17,825	36,206
Kosrae	3,352	3,264	6,616
Total	52,193	50,650	102,853

Table 4: Population of Pohnpei, Kosrae, and Yap States by Municipality (2010)

Kosrae			
Municipality	Population	Municipality	Population
Madolenihmw	5,767	Kapingamarangi	350
Kitti	6,470	Nukuoro	210
Sokehs	6,647	Pingilap	258
U	3,192	Mwokil	133
Nett	6,639	Oroluk	10
Kolonia Town	6,074		

⁸ <https://www.fsmstatistics.fm/wp-content/uploads/2020/04/2010-Summary-Analysis-Key-Indicators.pdf>

Total	36,206
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Kosrae			
Municipality	Population	Municipality	Population
Utwé	983	Lelu	2,160
Malem	1,300	Tafunsak	2,173
Total	6,616		

Yap			
Municipality	Population	Municipality	Population
Rumung	58	Ngulu	6
Maap	621	Ulithi	847
Gagil	863	Eauripik	114
Fanif	509	Woleai	1,039
Tamil	1,231	Faraulep	193
Weloy	1,031	Ifalik	578
Dalipebenau	397	Lamotrek	329
Rull	2,095	Satawal	501
Kanifay	314	Elato	105
Gilmaan	252	Fais	294
Total	11,377		

Table 5: Population of Chuuk by Municipality

Chuuk			
Municipality	Population	Municipality	Population
Weno	13,856	Romanum	865
Piis-Penau	388	Fanapanges	672

Fono	376	Wonei	638
Tonowas	3,517	Paata	1,107
Fefen	3,471	Tol	4,579
Siis	349	Polle	1,498
Uman	2,554	Nema	676
Parem	342	Losap	248
Eot	266	Piis-Emwar	258
Udot	1,680	Namoluk	355
Ettal	672	Tamatam	493
Lekinioch	848	Makur	159
Oneop	400	Onou	172
Satowan	692	Onoun	633
Kuttu	323	Unanu	193
Moch	932	Piherarh	227
Ta	273	Nowmin	763
Houk	1,116	Fananu	580
Polowat	745	Ruo	241
Pollap	1,168	Murillo	329
Total	48,654		

2.1.2 Socioeconomic context

Under the 1979 constitution, FSM has three levels of government, and a federated governance structure: national, state, and municipal. The national government exercises only certain powers expressly delegated to it by the Constitution. The four State governments of Yap, Chuuk, Pohnpei and Kosrae are relatively autonomous. Each State has its own governor, judiciary and legislative bodies, along with relevant government departments. States are further divided into 75 municipalities.

As of 2018, FSM had a total GDP of USD 401.9 million (current prices).⁹ The breakdown of GDP by industry sector include the following: agriculture, hunting and forestry (16%), real estate, renting and business activities (13%), education (11%), public administration (11%), wholesale and retail trade (11%), fisheries (9%), transport, storage and communications (6%), health and social work (5%), finance (4%), construction (2%), utilities (2%), hotels and restaurants (2%) and other miscellaneous activities (1%).

GDP per capita in constant prices differs per State, with Yap having the highest (USD 3,468) followed by Pohnpei (USD 3,393), Kosrae (USD 2,344) and Chuuk (USD 1,436). GDP per capita across all of FSM was USD 2,408 in 2018. The unemployment rate as of the last national census (2010) was 9%, although the jobless rate is much higher. The private sector employs the most individuals (7,282) followed by State governments (4,740), public enterprise (854) and federal government agencies (795).¹⁰ In total, municipalities employee 360 individuals.

The minimum wage in FSM is USD 2.65 per for individuals employed within the national government. For State government works, the minimum wage differs per State: USD 2.00 in Pohnpei, USD 1.25 in Chuuk, USD 1.42 in Kosrae and USD 1.60 in Yap. Additionally, Pohnpei State has a separate minimum wage of USD 1.75 for private sector workers. Although incomes have risen by approximately 18.85% between 2004 and 2018, inflation has reduced real wages. Average annual income has decreased from USD 6,627 to USD 4,961.¹¹

In addition to tax revenue, revenue from the sale of tuna fishing licenses for FSM waters and captive insurance, FSM receives economic assistance and other monetary and non-monetary benefits from the United States through the Compact of Free Association (COFA).¹² The first COFA was negotiated in the early 1980s and signed into US law in 1986. In 2003, the Compact was renegotiated, and the amendments were approved by FSM Congress in 2004. The renegotiated Compact will be in effect until 2023 and will ultimately provide USD 1.3 billion in economic assistance to FSM.

The ongoing global pandemic is projected to have consequences for FSM economy over the coming years.¹³ Construction, transportation and communications and the tourism sectors are estimated to shrink for at least the next fiscal year. Overall GDP is expected to decline by approximately 5% over fiscal year 2020 and 2% over fiscal year 2021. The private sector is expected to be the hardest hit, with an estimated private sector GDP reduction of 18.7%

⁹ [FSM Statistics - GDP, GNI & GNDI: FY2007 to FY2018](#)

¹⁰ [FSM Statistics - Labor Market and Participation](#)

¹¹ [FSM. First Voluntary National Review on the 2030 Agenda for Sustainable Development](#)

¹² [FSM. First Voluntary National Review on the 2030 Agenda for Sustainable Development](#)

¹³ [Assessing the Impact of COVID-19 on the Federated States of Micronesia Economy](#)

between 2019 and 2021. The national government announced a USD 15 million pandemic stimulus package to mitigate the negative economic impacts of the pandemic. Additionally, projections are likely to change in the coming months as FSM and other nations around the world enact and retract policies related to travel and economic activity in response to the shifting realities of the pandemic (increased infection rates, development of a vaccine, etc.).

A Household Income and Expenditure Survey (HIES) was conducted by the government in FSM between 2013 and 2014. The HIES found that to meet basic caloric needs in FSM, one requires an average of USD 1.84 per adult per day and meeting all basic needs requires an average of USD 4.34 per adult per day.¹⁴ Throughout FSM, approximately 10% of the population falls below the food poverty line and approximately 41% of the population falls below the total basic needs poverty line. The State of Chuuk has the highest proportion of its population that falls under the food poverty line (16.6%) and the total poverty line (45.5%) compared to the other States, whereas Kosrae does not have any individuals that fall under the food poverty line and approximately 21% of its population falls under the total poverty line. For most of FSM, the poorest individuals and households allocate more than half of their total expenditures on the purchase of food. The HIES study highlighted several additional key findings on the socioeconomic context in FSM:

- The Gini Coefficient at the national level is approximately 38.6%. Each State had a similar coefficient to the national level (Yap - 38.8%; Chuuk - 38.8%; Pohnpei - 37.7%; Kosrae - 37.1%);
- Poverty rates are higher in households with more children;
- There is a strong inverse relationship between the level of education and poverty;
- Female-headed households are poorer than male-headed households in all States; and,
- The poverty rate among workers in the public sector is lower than among workers elsewhere.

2.2 Public Health analysis

2.2.1 Overview and Health Indicators

FSM has seen significant improvements in health indicators in the recent years. Life expectancy at birth has been increasing though still they remain below the expected benchmarks for both males and females. Infant mortality rate has also been decreasing steadily in the last three decades also remaining below the expected benchmarks. Similarly, mortality for children under 5 follows the same pattern¹⁵.

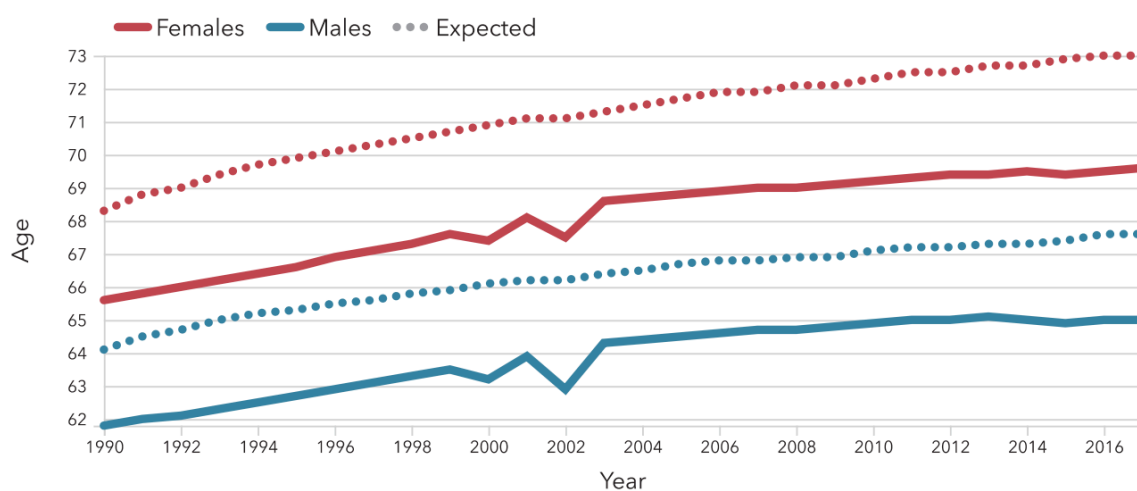
Nevertheless, FSM face significant health challenges. Like other Pacific Island countries and territories, FSM are experiencing the important burden from communicable and non-communicable diseases, but also the significant impact of climate change in health. The most important communicable diseases are Tuberculosis, HIV, and Hansen's disease (leprosy); and the climate-sensitive mosquito-borne illnesses and Leptospirosis. Important non-communicable

¹⁴ [FSM Statistics - Poverty Profile of the Federated States of Micronesia](#)

¹⁵ FSM - Federated States of Micronesia Disaster Management Reference Handbook, 2019.

diseases include ischemic heart disease, diabetes, and stroke. Consumption of imported packaged food, lack of physical activity and use of tobacco products directly contribute to the high prevalence of NCDs and obesity in the country¹⁶.

Certain populations and social groups across the four states suffer disproportionately from these health problems, although there is no data on the geographical distribution of the vulnerable population. Particular attention needs to be paid to all particularly vulnerable members of selected communities so that they are a priority and are not left out during the implementation of activities.



	Expected		Observed	
	1990	2017	1990	2017
Females	68.3	73.0	65.6	69.6
Males	64.1	67.6	61.8	65.0

¹⁶ FSM - Federated States of Micronesia Disaster Management Reference Handbook, 2019.

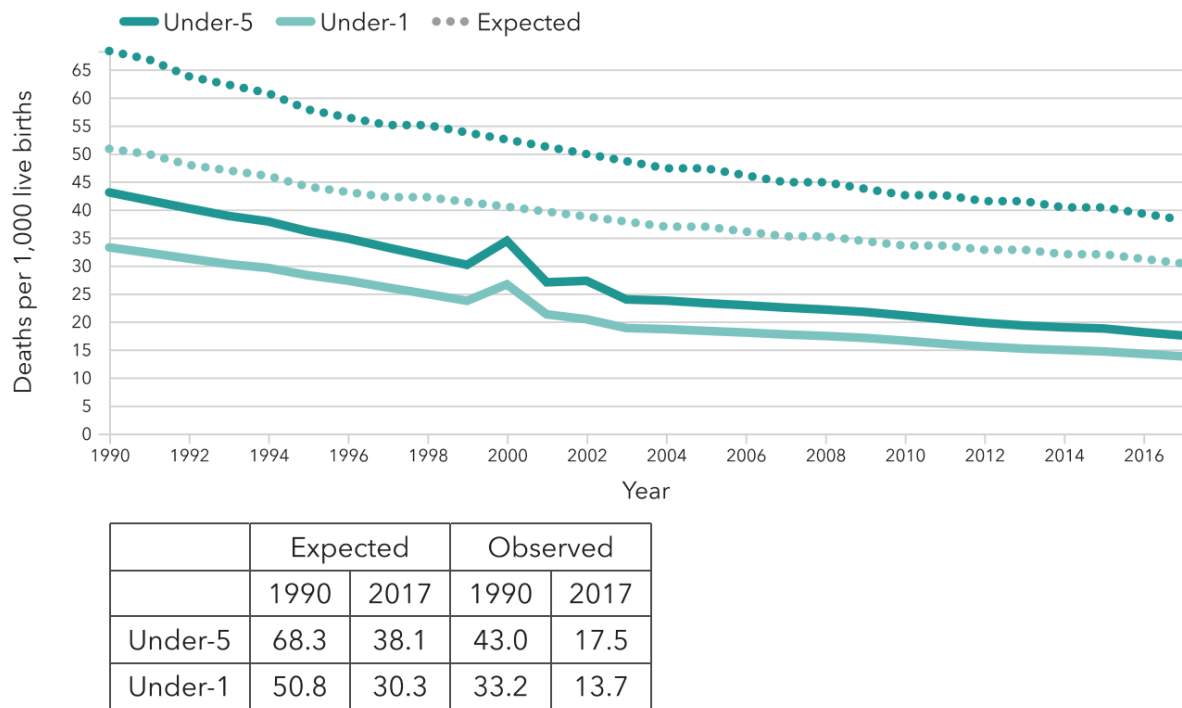


Figure 3: Life expectancy and Child mortality in FSM (Source: Federated States of Micronesia Disaster Management Reference Handbook, 2019)

The most vulnerable communities to the health effects of climate change in FSM include populations at risk of being (or that have already been) displaced; women; those at the extremes of age (children and the elderly); those with pre-existing health problems (co-morbid conditions, the disabled); certain occupations (fishermen, farmers, outdoor workers); the poor and socially disadvantaged; and those that lack access to public information broadcasts and communications. Figure 4 summarizes some key health indicators for FSM.

HEALTHY ISLANDS INDICATORS

Number of skilled health workers* per 10 000 population	38	2009
Per capita total expenditure on health at average exchange rate (US\$)	414.99	2014
Total expenditure on health as a percentage of gross domestic product (%)	13.71	2014
Tuberculosis incidence (per 100 000 population)	124	2015
Life expectancy at birth (both sexes)	69.4	2015
Under-five mortality rate (per 1000 live births)	34.7	2015
Absolute number of maternal deaths	2	2015
Maternal mortality ratio (per 100 000 live births)	100	2015
Adult mortality rate from NCDs at ages 30–69 years (%)	26	2015
Number of suicides	18	2015
Immunization coverage rate for diphtheria-tetanus-pertussis (three doses) (DTP3) (%)	69	2016
Immunization coverage rate for measles-containing vaccine (first dose) (MCV1) (%)	70	2016
Current tobacco smoking among persons 15 years of age and over (%)	NA	
Population using improved drinking-water sources (%)	89	2015
Population using improved sanitation facilities (%)	57.1	2015
Population using improved drinking-water sources (%)	0	2017

NA = not available

*Skilled health workers are defined as physicians, nurses and midwives.

Figure 4: Health Indicators in FSM (Source: WHO - FSM, Country Cooperation Strategy 2018-2022)

2.2.2 Health system structure

In FSM, the delivery of healthcare services is mixed. A great deal of the population relies on a public health care system that is controlled and regulated by the states governments, but there is a limited number of private healthcare providers. The public health care system consists of the overarching, FSM National Department of Health and Social Affairs and the four state governments; Chuuk State Department of Health Services, Kosrae State Department of Health Services, Pohnpei State Department of Health Services and Yap State Department of Health Services.

At the national level, the Division of Health, which part of the Department of Health, Education, and Social Affairs is responsible for health planning, donor coordination, and technical and training assistance.

The role of providing curative, preventing, and public health services lays in the Department of Health Services (DHS) of each state (Yap, Chuuk, Pohnpei, and Kosrae). Nevertheless, most DHSs have structurally weak management systems and minimal capabilities for planning and programming.

The main hospitals, the community health centres, and primary care centres (dispensaries) are under the supervision of the DHSA and are subsidized by the state governments. This does not include the six private health clinics in the country and one private hospital.

Due to the limited capacity of the DHSs the daily operations of dispensaries, especially in the outlying islands, are under the supervision of the mayors of their localities.

2.2.3 Availability of health services

The present health care system in FSM has three levels: the community dispensaries, the state hospitals and referral to hospitals outside of FSM. There is a main public hospital in each of the four states, which primarily covers the population of the urban centres. More remote islands are covered by dispensaries.

Dispensaries are usually staffed by health assistants, who mainly provide diagnosis and treatment of common ailments. Advanced cases are referred to the central hospitals. Lack of public transportation between islands often prevents outer island residents from accessing hospital services.

Table 6: Baseline number of health centres in 4 FSM States (*Source: Association of State & Territorial Dental Director*)¹⁷

States:	Chuuk	Pohnpei	Yap	Kosrae
Hospitals	1	1	1	1
Community Health Centres	3	0	several	3
Dispensaries	several	-	several	-

2.2.4 Water and sanitation system coverage

There are significant differences in water and sewage coverage between and within the four FSM states, lagging behind Chuuk and the outer Yap Islands. Also, apart from distance and density, this is related to the socio-economic status of the population. Water quality and consequent health problems remain a major challenge in the country. Only five of the approximately 70 public or municipal water systems serving the main islands have any type of treatment, and even there, safe water is not consistently guaranteed due to inadequate system maintenance and irregular supplies.

¹⁷ <https://www.astdd.org/territorial-and-jurisdiction-oral-health-programs-federated-states-of-micronesia>

Table 7: Baseline population served by water and wastewater systems in 4 FSM States (Source: *Proceedings of the Pacific Regional Consultation on Water in Small Island Countries - Country Briefing Papers*)

States:	Chuuk	Pohnpei	Yap	Kosrae
Water systems	10000 (18.8%)	3500 (10.4%)	5750 (52.2%)	7633 (100%)
Sewer system	5000 (9.4%)	8000 (23.8%)	4000 (36.3%)	1800
Septic tanks	8300	8500	1000	4500
Pit latrines	45000	20500	6400	1500

2.2.5 Observed burden of disease in FSM

The following is an overview of the overall burden of disease in FSM. The overview goes beyond climate-sensitive diseases, which are discussed in sub-section 3.5, and its scope is to provide the context of burden of disease in FSM.

Overall, Non-Communicable Diseases (NCDs) such as diabetes, cardiovascular diseases and cancers are major health problems. According to WHO the overconsumption of imported packaged food, lack of physical activity and use of tobacco products are main drivers of NDCs and obesity. Moreover, intentional (violence) injury and suicide are important issues in the country, likely driven by factors such as the cultural and economic dislocation, particularly among young adult males. Tuberculosis has a high prevalence, as does leprosy - the latter being among the highest in the Pacific¹⁸.

The subsection utilizes disability-adjusted life year (DALY), which is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death.

In Figure 4, these are represented by blue for non-communicable disease, red for communicable disease and green for injury. Depth of colour represents % change in burden from 1990-2019, with darker colours indicating increased burden over the 30-year period.¹⁹

¹⁸ WHO - FSM, Country Cooperation Strategy 2018-2022.

¹⁹ IHME 2019.

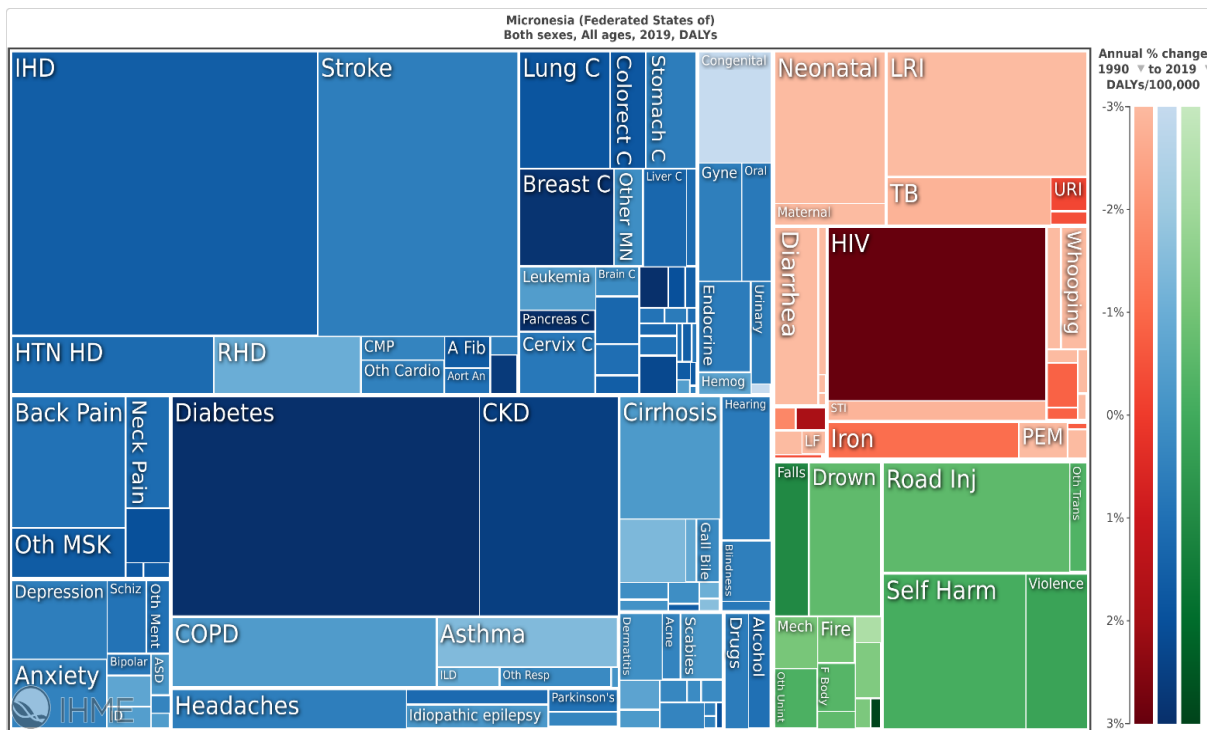
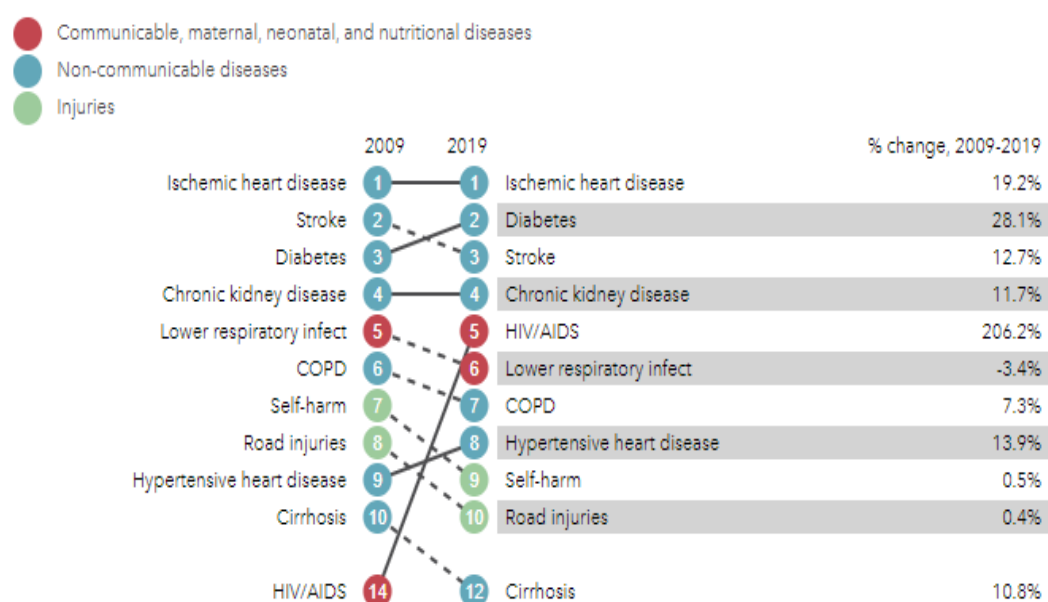


Figure 5: The current burden of disease in FSM (IHME, 2019)

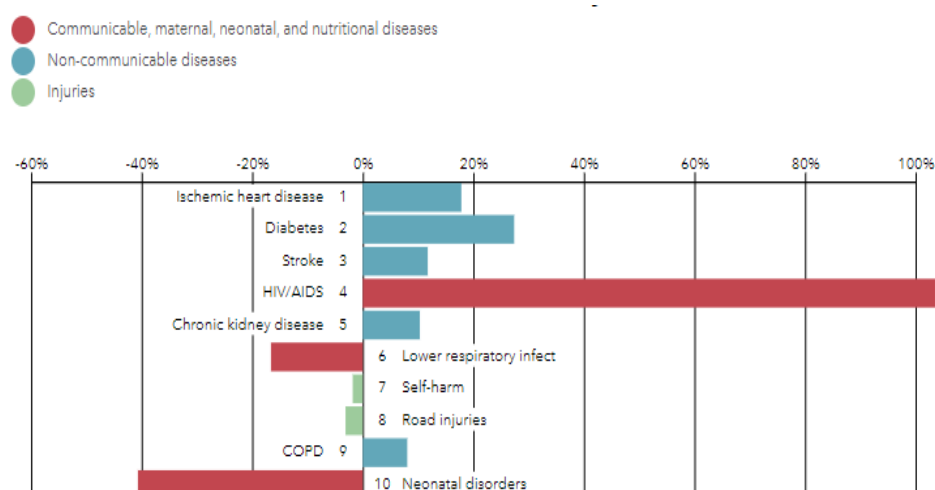
Figure 5 depicts the top 10 causes of deaths in 2009 and 2019 in FSM. The lines between the 2009 and 2019 column show the transition in ranking by cause of death. For example, in 2009, Stroke was the main cause of death and in 2019 it is the third most common cause of death (12.7% decrease). The most significant changes are HIV/AIDS rising by 206.2%, Diabetes rising by 28.1% and ischemic heart disease remaining at the top but rising by 19.2%. Red depicts communicable/maternal/neonatal and nutritional diseases. Blue depicts NCDs (most prominent in the top 10) and green depicts injuries (falling in all both self-harm and road injuries). This provides a useful analysis of how mortality patterns change over time.



Top 10 causes of total number of deaths in 2019 and percent change 2009-2019, all ages combined

Figure 6: Top 10 causes of deaths in FSM 2019 and percentage change since 2009 (IHME, 2019)

Figure 6 shows the top 10 causes of death and disability (measured in disability adjusted life years - DALYs) in FSM over 10 years (from 2009 - 2019) without an age/gender sub-analysis. Unlike Figure 4, morbidity is also taken into account (not just mortality). While NCDs are responsible for most of the burden of disease (Ischaemic Heart disease, diabetes and Stroke), HIV had risen most significantly. Some trends are positive, with declines in the burden from lower respiratory infections, neonatal disorders and injuries.



Top 10 causes of death and disability (DALYs) in 2019 and percent change 2009-2019, all ages combined

Figure 7: Top 10 causes of death and disability (DALYs) in FSM in 2019 and percent change since 2009 (IHME, 2019)

Figure 7 shows trends in the malaria burden of disease in the Western Pacific Region. The blue graph on the left depicts the incidence rate (new cases per 1K population). The red graph on the right depicts the mortality rate (deaths per 1K population). There is a downward trend in the burden of malaria in WPRO over two decades.

Trends in a) malaria case incidence rate (cases per 1000 population at risk), b) mortality rate (deaths per 100 000 population at risk), 2000–2019 and c) malaria cases by country in the WHO Western Pacific Region, 2019 Source: WHO estimates.



Figure 8: Trends in Malaria incidence and deaths in the Western Pacific region (World Malaria Report, 2020)

The heat map (Figure 8) shows how FSM (top row) compares in terms of death and disability with other countries with similar socio-demographic profiles. Hot colours (red - yellow) depict higher ranks (more DALYs) and cool colours (blues) depict lower ranks (fewer DALYs). We can see the main sources of the disease burdens are NCDs in most of these countries (IHD, DM, stroke) however, FSM is doing much better with neonatal disorders than many other countries.

How do causes of death and disability compare to those in other locations?

This table shows the top 10 causes of death and disability (DALYs). It can be used to compare DALYs across locations relative to the group average. Comparison locations were chosen based on socio-demographic indicators.



Age-standardized DALY rate per 100,000, 2019

Figure 9: Top 10 causes of death and disability (DALYs) in FSM (first line) in comparison to countries with similar socio-demographic profiles (IHME, 2019)

2.2.6 Laboratory capacity and communicable diseases surveillance

Public health laboratories provide the services for the detections of diseases and outbreaks, emergency response, environmental monitoring and disease surveillance. FSM has four State

Hospital Laboratories and one national Food Safety Laboratory. Some Community Health Centers can perform simple tests, testing is mostly referred to state hospital laboratories. Communities residing in remote outer islands do not have access to laboratory service but do have access to specific rapid tests.

Most infectious disease testing is not done in the Federated States of Micronesia and is referred to Hawaii Public Health Laboratory (HPHL) or Guam Public Health Laboratories (GPHL), who may also refer specimens further to US CDC laboratories. There is also no laboratory for animal testing in FSM and therefore no laboratory system for zoonotic diseases. Dengue Duo rapid test and blood culture testing are available in all state laboratories. All other testing (with the exception of malaria rapid tests) is available from HPHL.

Communicable disease surveillance is conducted by the Surveillance Team in the Public Health and Healthcare Emergency Preparedness Unit of DHSA and the national EpiNet Team²⁰, who are also responsible for the assessment and response activities.

FSM do not currently have a national communicable diseases surveillance protocol that clarifies how the system operates at the national and state levels, while there are needs for coordination for outbreak investigation and response, post-disaster context, mass gathering events and identification of imported cases of disease.

The communicable disease surveillance system is able to have regular communications between the EpiNet team and the hospital-based clinicians while there is also a weekly communication with the Pacific Public Health Surveillance Network (PPHSN).

The PPHSN is a crucial resource in infectious diseases surveillance and response. The Networks is a voluntary network of countries and organisations across 22 Pacific Island countries and territories. Its goal is to improve public health surveillance and response in the Pacific Islands in a sustainable way. With communicable diseases as its priority, PPHSN provides significant strategic and operational support including, among others, the harmonisation of surveillance data and development of appropriate surveillance systems (with priority given to outbreak surveillance and response) and the provision of training in applied epidemiology and public health surveillance, adapted to regional needs.

2.3 Policy and regulatory landscape

To address climate change vulnerability and impacts on health, the Government of Micronesia has made commitments to improve its response and reverse the increasing prevalence of food-borne, water-borne and vector-borne diseases. FSMs strategic objectives in this area are articulated in relevant legislation, strategies, policies and regulations presented below.

Table 8: Legislation, policies, and plans relating to Public Health in the Federated States of Micronesia

Key Agencies	<ul style="list-style-type: none">• Department of Health and Social Affairs• Department of Finance and Administration
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²⁰ Exposure Prevention Information Network.

Act(s)	Federated States of Micronesia Climate Change Act ²¹(2013) The Climate Change Act mandated key departments and agencies - including the Department of Health and Social Affairs and the Department of Education - to prepare plans and policies on climate change that are consistent with the provisions of the Climate Change Policy by 1 st October 2014.
	Federated States of Micronesia Environmental Protection Act ²²(2015) The Environmental Protection Act states principles and policy of environmental protection in FSM. It also gives definitions including a definition of “public water system” and “primary drinking water regulation”.
Strategies	Federated States of Micronesia Nationally Determined Contribution²³ FSM’s NDC focuses primarily on mitigation, setting out an agenda for the use of renewable energy to achieve the country’s carbon emission reduction targets. Adaptation actions are not included but have been addressed in other strategic documents.
	The Federated States of Micronesia Strategic Development Plan 2004 - 2023²⁴ The Strategic Development Plan 2004 - 2023 identifies nine strategic goals to improve Micronesia’s environment. Among these are: <ul style="list-style-type: none"> - Improve and enhance the human environment (improve waste management (reduce, recycle, reuse) and pollution control). - Manage and protect the nation’s natural environment / protect, conserve, and sustainably manage a full and functional representation of FSM’s marine, freshwater, and terrestrial ecosystems. - Improve environmental awareness and education and increase involvement of citizens of FSM in conserving their country’s natural resources. <p>Whilst the Strategic Development Plan contains a significant amount of context on the health sector, this information is unlikely to reflect the current state of the health sector in Micronesia, given that the plan was drafted pre-2004. When it is developed, the next Strategic Development Plan should provide a detailed update on the state of the health sector in FSM, including information related to the impact of climate change on the prevalence of water-borne and vector-borne diseases.</p>
	Joint State Action Plans for Disaster Risk Management and Climate Change²⁵ JSAPs have been developed by each of Micronesia’s four states. Sector focus of these plans include the environment (coastal ecosystem and biodiversity), water resources and sanitation, agriculture, health, education, infrastructure, transportation, fisheries, social and cultural, and private sector development. The sectors covered in the JSAPs also form the basis of the GCF’s Country Plan for Micronesia.

²¹ Accessed at: <https://fsm-data.sprep.org/resource/federated-states-micronesia-climate-change-act-2013>

²² Accessed at: <https://pacificdata.org/data/dataset/federated-states-of-micronesia-environmental-protection-act-chapter-5-general-provisions2/resource/2f44c1f3-d69d-4ca7-aa18-60c6668fdf41>

²³ Accessed at: <https://fsm-data.sprep.org/resource/federated-states-micronesia-intended-nationally-determined-contribution>

²⁴ Accessed at: <https://fsm-data.sprep.org/resource/strategic-development-plan-2004-2023>

²⁵ Accessed at: <https://fsm-data.sprep.org/index.php/dataset/fsm-states-joint-state-action-plan-jsap-disaster-risk-management-and-climate-change>

	<p>Federated States of Micronesia's Infrastructure Development Plan (2016-2025)²⁶</p> <p>Although it is not purely focused on climate change, the Infrastructure Development Plan is a costed comprehensive and costed infrastructure plan that includes both mitigation and adaptation investments (although the costs of adapting to climate change have not been costed consistently).²⁷</p>
Policies	<p>National Climate Change and Health Action Plan (NCCHAP) (2012)²⁸</p> <p>The NCCHAP represents the health sector's contribution towards climate change adaptation planning in FSM. It identifies the increasing prevalence of food, water, and vector-borne diseases as the most significant climate-sensitive health challenge facing FSM.</p> <p>FSM's climate change health needs and adaptation strategies are highlighted in Section 4. This includes details on VBD, WBD and FBD.</p>
	<p>Nationwide Integrated Disaster Risk Management and Climate Change Policy (2013)²⁹</p> <p>Strategic priorities include Waste Management and Sanitation, and Health and Social Protection.</p>
	<p>Framework National Water and Sanitation Policy (2011)³⁰</p> <p>The Framework National Water and Sanitation Policy sets the rationale for a national water policy and presents an overview of FSM water resources and their management. Moreover, it sets the strategic aspects of the water policy and sets a roadmap for the coordination of water and sanitation service delivery.</p>
Regulations	<p>National Food Safety Act (1992)³¹ - This Act sets out a general framework of rules regarding the safety of food, i.e., any article manufactured, sold or represented to be for human consumption, placed on the market in Micronesia and provides for food safety administration.</p> <p>Kosrae State Code (2014)³²</p> <p>Chapter 12 of Title 12 provides for matters of public health in the State of Kosrae, including the establishment of sanitary standards for commercial premises such as food stores and restaurants, and the control of food for sale to the public. Food offered for public sale shall be subject to inspection by the Department of Health Services. If food is considered to be unsanitary or adulterated, the Department may destroy the food, require its use as animal food, or require it to be labelled to describe its condition.</p> <p>Chuuk State Code (2001)³³</p> <p>Chapter 13 provides for matters of health & sanitation, including: Latrines and toilets; Accumulation of rubbish and refuse; Standards for and inspection of service establishments; Standards for an inspection of food; and Penalties for violations.</p>

²⁶ Accessed at: <https://fsm-data.sprep.org/resource/fsm-infrastructure-development-plan-2016-2025>

²⁷ International Monetary Fund (September 2019), Federated States of Micronesia - Climate Change Policy Assessment

²⁸ FSM Government. (2012). [National Climate Change and Health Action Plan](#).

²⁹ Accessed at: <https://fsm-data.sprep.org/resource/fsm-nation-wide-integrated-disaster-risk-management-and-climate-change-policy-2013>

³⁰ FSM Government. (2011). [Framework National Water and Sanitation Policy for the Federated States of Micronesia](#). FSM Government.

³¹ Accessed at:

http://fsm-law.org/fsm/code/title41/T41_Ch10.htm#:~:text=It%20is%20the%20policy%20of,States%20to%20accomplish%20this%20objective

³² Accessed at: <http://www.fsmlaw.org/kosrae/code/index.htm>

³³ Accessed at: <https://fsmlaw.org/chuuk/code/index.htm>

	<p>Pohnpei State Code (2012)³⁴ Chapter 9 of Title 17 provides for matters of refuse collection and sanitation.</p> <p>Yap State Code (2000)³⁵ Chapter 3 of Title 15 provides for matters related to food and drugs. Chapter 6 of Title 15 provides for matters related to sanitation.</p>
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Table 9: Policy, Strategy and Project Alignment

Policy / Programme	Related Sections	Project Alignment
Sustainable Development Goals	<p>International 2030 Agenda SDG 3: Ensure healthy lives and promote well-being for all at all ages.</p> <p>International 2030 Agenda SDG 6: Ensure access to water and sanitation for all.</p>	The project aligns with SDG3 and 6 through implementation of infrastructure, awareness and training interventions.
Strategic Development Plan 2004 - 2023 ³⁶	<p>Section 8.1.6 (page 392) notes the adverse impacts of climate change and variability on the quality of water supplies, and to the health of the people of FSM - including through increased prevalence of food-borne, water-borne and vector-borne diseases.</p> <p>The need for a contingency plan, at national level and for each state, to deal with potential epidemics, is highlighted.</p> <p>Section 8.2.3 prioritizes the need to “Conduct assessments of climate-related health risks including vector-borne and water-borne diseases and institute relevant early warning and public education programs”.</p>	This project will assist in strengthening through infrastructure interventions, capacity development, awareness and training.

³⁴ Accessed at: <http://www.fsmlaw.org/pohnpei/code/pdf/pohnpei%20state%202012%20code.pdf>

³⁵ Accessed at: <http://fsmlaw.org/yap/code/index.htm>

³⁶ Strategic Development Plan 2004-2023. Accessed at: <https://fsm-data.sprep.org/resource/strategic-development-plan-2004-2023>

<p>Infrastructure Development Plan (2016 - 2025)³⁷</p>	<p>Identifies infrastructure goals across key sectors of the economy including:</p> <p>Water / Wastewater systems - Section 2.3.2 This includes developing water and wastewater infrastructure which contributes to the prevention of water-borne diseases through the provision of potable water supplies.</p> <p>Solid Waste Management - Section 2.3.3 One of the goals is the prevention of adverse effects on the terrestrial and marine environments.</p> <p>Health - Section 2.3.9 Goals include developing infrastructure which is resilient to potential natural disasters and the impacts of climate change.</p>	<p>This project will actively contribute to building the resilience of water and sanitation systems to water-borne diseases.</p>
<p>First Nationally Determined Contribution (2016)³⁸</p>	<p>FSM's NDC focuses mainly on mitigation activities, particularly in energy sector (electricity generation and transport).</p> <p>Recognises the importance of adaptation needs but notes that these are being addressed in the Nationwide Integrated Disaster Risk Management and Climate Change Policy (2013) and Climate Change Act (2014).</p>	<p>FSM's NDC sets adaptation as a priority and recognizes the importance of engaging the country in the formulation and implementation of transformational adaptation investment plans to protect the country against climate change, through various sources of funding including from the UNFCCC financial mechanisms, the Green Climate Fund in.</p>
<p>National Climate Change and Health Action Plan (2012)³⁹</p>	<p>Section 2.2 'Climate-sensitive health risks in FSM' identifies vector-borne, food and water-borne diseases as significant health concerns.</p> <p>Section 4 ranks vector-, food- and water-borne diseases as posing a high risk to FSM.</p>	<p>The focus of this project directly contributes to building FSMs adaptive capacity to food, water and vector-borne diseases, which the NCCHAP identifies as the most climate-sensitive health risks.</p>

³⁷ FSM, Infrastructure Development Plan (2016 -2025) Accessed at: <https://dofa.gov.fm/wp-content/uploads/2018/12/FSM-Infrastructure-Development-Plan-2016-2025.pdf>

³⁸ FSM, Intended Nationally Determined Contribution. Accessed at: <https://fsm-data.sprep.org/resource/federated-states-micronesia-intended-nationally-determined-contribution>

³⁹ FSM, National Climate Change and Health Action Plan (2012).

	<p>Identifies the following needs / gaps:</p> <ul style="list-style-type: none"> - VBD: Integrated vector management; training for local environmental health officers in mosquito surveillance; lack of knowledge/ understanding on the part of public on vector-borne disease; human resources for vector-borne disease control - Water-borne diarrhoeal pathogens: Lack of access to clean drinking water for some members of community (e.g., outside large towns); lack of public understanding re: risks of transmission; improved water infrastructure, safety monitoring; review laboratory diagnostic facilities for water-borne infections; strengthen outbreak response capacity - FBD: Lack of specific data on FBD; improve diagnostic capacity, surveillance and response; lack of public understanding re: routes, risks of transmission; lack of adequate training of food handlers 	
Nationwide Integrated Disaster Risk Management and Climate Change Policy (2013) ⁴⁰	<p>Strategic outcomes include:</p> <ul style="list-style-type: none"> - Secure access to safe and clean water - Reduced occurrence of epidemics and other health hazards - An improvement in the resilience and health status of the population, including special protection measures for vulnerable groups 	<p>This project will make direct contributions to the strategic priority of ‘secure access to safe and clean water’ by supporting the development of WASH (Water, Sanitation and Hygiene) infrastructure in FSM.</p> <p>The aim of the project is to increase FSM’s resilience to food, water and vector borne diseases. It has been designed to ensure the inclusion of vulnerable groups - particularly women. In doing so, it thus contributes to the strategic outcome of improving the resilience and health status of the population, including special protection measures for vulnerable groups.</p>

⁴⁰ Nationwide Climate Change and Disaster Risk Management Policy, Accessed at: <https://fsm-data.sprep.org/dataset/fsm-nationwide-climate-change-and-disaster-risk-management-policy>

Framework National Water and Sanitation Policy (2011)	<p>Vision: to ensure that the people of FSM's right to secure access to safe and clean drinking water is met, and that the use of the Nation's freshwater resources is planned in a manner that maximises the benefits of this scarce and fragile resource for island communities, now and in the future.</p> <p>Goals:</p> <ul style="list-style-type: none"> - To create an environment at the national level, in which collaboration and partnership in addressing water resource and wastewater management issues, between all stakeholders, and at all levels is fostered and encouraged; and - To enhance the mainstreaming of Integrated Water Resource Management and Water Use Efficiency Principles into National and State Development Planning. 	The elements of this project that contribute to the development of WASH infrastructure are closely aligned with the vision of ensuring the right of the citizens of FSM to safe and clean drinking water.
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2.4 Assessment of baseline projects

Under the Compact of Free Association, the United States of America provides over US\$ 110 million in assistance to FSM each year, along with a variety of federal programs and services. Assistance under the Compact Agreement includes grants focused on six sectors: Education; Health; Infrastructure; Public Sector Capacity Building; Private Sector Development; and the environment.⁴¹

The World Health Organisation supports the government in pursuing its national strategic priorities. FSM - WHO Country Cooperation Strategy (2018-2022) has four strategic priorities:

- i) To achieve universal health coverage antimicrobial resistance by building resilient and sustainable health systems to enhance the availability of needs-based health services in the country
- ii) To build IHR (2005) core capacities for proactive preparedness in health emergencies and natural disasters
- iii) To build capacity for NCD prevention and control
- iv) To control communicable diseases.⁴²

Several significant Public Health projects are currently underway in FSM through international donor financing, including from the Asian Development Bank (ADB), the Government of Japan, Secretariat of the Pacific Regional Environment Programme, United Nations Development Programme, and United States Agency for International Development. The table below presents

⁴¹ <https://www.state.gov/countries-areas/micronesia/>

⁴² <https://www.who.int/micronesia/our-work>

relevant projects - under implementation or recently completed - related to health and WASH activities in FSM.

Table 10: Relevant projects under development, implementation or recently completed in FSM with focus on health and WASH.

START / END DATE	PROJECT	IMPLEMENTING AGENCY	FUND	DESCRIPTION
2021 - 2028	Climate change adaptation solutions for Local Authorities in the Federated States of Micronesia ⁴³	SPC	Green Climate Fund	<p>This programme aims to reduce climate vulnerability, lower health risks and increase socioeconomic development for vulnerable communities by improving food and water security, enhancing disaster risk reduction and recovery, and building local adaptive capacity to respond to climate change. This will be achieved by building the capacity of local authorities to deliver climate change adaptation services by enhancing their technical expertise and by creating a sub-grant facility.</p> <p>Synergies There are strong synergies between the two projects as they both seek to lower health risks and increase water security.</p> <p>As SPC is the accredited entity for both projects, coordination will be ensured to avoid any overlap. The programme's trainings will focus on identification and prioritization of adaptation solutions, while trainings for this project will focus on climate-related vector-, water- and food-borne disease management. Moreover, the programme will ensure that sub-grants to be approved by the Facility do not overlap with the work undertaken by other projects, through a rigorous screening process.</p>
2021 - 2026	Climate resilient food security for farming households across the Federated States of Micronesia (FSM) ⁴⁴	Micronesia Conservation Trust	Green Climate Fund	<p>The project is a comprehensive national effort to focus on increasing the resilience of FSM's most vulnerable communities to climate change-induced food insecurity. Planned measures include introducing sustainable agricultural practices and developing climate-resilient agriculture value chains.</p> <p>There is no overlap with this project in terms of objectives and scope and intervention are clearly delineated and different. Both projects complement each other in terms of strengthening</p>

⁴³ <https://www.greenclimate.fund/project/fp169#details>

⁴⁴ <https://www.greenclimate.fund/project/sap020>

START / END DATE	PROJECT	IMPLEMENTIN G AGENCY	FUND	DESCRIPTION
				resilience to climate change working on food security and food safety respectively.
2020 - Ongoing	Chuuk Water Supply and Sanitation Project ⁴⁵	Department of Finance and Administration ; ADB	ADB	<p>The Chuuk Water Supply and Sanitation Project, committed in December 2020, will deliver \$12.8 million to enhance water and sanitation services in the state. It will improve physical sewerage and water supply assets, while helping the public utility strengthen management practices and improve its commercial performance. The project's focus on water and sanitation will create parallel benefits in the health sector by improving community awareness of good sanitation and hygiene practices to prevent disease.</p> <p>Synergies</p> <p>There are clear synergies in terms of focus on developing WASH infrastructure and educating the population on the health benefits of good sanitation and hygiene practices.</p> <p>Nevertheless, the Chuuk Water Supply and Sanitation Project and the current proposal do not overlap as they target different populations and communities. The Chuuk Water Supply and Sanitation Project includes for water resources i) the installation of new water supply connections ii) the construction of water mains, iii) the development of new surface intake, iv) the recommission and development of new wells v) the replacement of meters, while for safe sanitation i) the development of a water wastewater inflow and infiltration management system, ii) the construction of sewage pipes, iii) rehabilitation of pumping stations and grinder stations iv) the connection of households with the sewage system, and v) the provision of desludging facilities.</p>
2018 - Ongoing	Center for Disease Control (CDC)- Advanced Molecular Detection ⁴⁶	Centers for Disease Control and Prevention	United States Congress	CDC's Advanced Molecular Detection (AMD) program builds and integrates laboratory, bioinformatics, and epidemiology technologies across CDC and nationwide. Since 2014, AMD has received support from Congress through a \$30 million per year appropriation to implement these technologies in public health programs. Through investments in AMD technologies, CDC is improving both public health outcomes and preparedness in dozens of areas including foodborne disease,

⁴⁵ [https://www.adb.org/projects/53284-](https://www.adb.org/projects/53284-002/main#:~:text=ADB%20Grant%20of%20$12.8%20Million,the%20Federated%20States%20of%20Micronesia)

[002/main#:~:text=ADB%20Grant%20of%20\\$12.8%20Million,the%20Federated%20States%20of%20Micronesia](https://www.adb.org/projects/53284-002/main#:~:text=ADB%20Grant%20of%20$12.8%20Million,the%20Federated%20States%20of%20Micronesia)

⁴⁶ <https://www.cdc.gov/amd/investments/jurisdictions/micronesia.html>

START / END DATE	PROJECT	IMPLEMENTIN G AGENCY	FUND	DESCRIPTION
				<p>influenza, antibiotic resistance, hepatitis, pneumonia, and meningitis.</p> <p>With funding from the American Rescue Plan Act of 2021, the AMD program has developed a multi-year plan to expand its support to state, local, and territorial public health laboratories with more staff and resources to collect specimens for COVID-19 testing, sequence them to identify and track SARS-CoV-2 variants, and share data, now and future years.</p> <p>Micronesia is part of the Western region. In 2018, the AMD program established seven workforce development regions across the country. Each region has an AMD training lead and a bioinformatics lead. This provides a network of customized AMD support which helps develop skills and provides training assistance to public health labs across the country.</p> <p>Through the Western region's training resources, Micronesia receives lab support on data analysis and how to interface with IT departments. They also receive both pathogen-specific training and cross-cutting instruction to help staff develop the critical skills necessary to extract, analyze, and interpret sequencing data.</p> <p>Synergies The current project creates significant synergies with the CDC Advanced Molecular Detection project. The CDC project increases the interoperability of FSM clinical laboratories. Nevertheless, the CDC Advanced Molecular Detection project focus is wider and not focusing on climate sensitive diseases. Therefore, while synergies can be developed no overlaps are identified between the two projects.</p>
2014 / 2015	Bringing Safe Drinking Water to Micronesia - Tackling water issues faced by	Ichigo Holdings; Japan International Cooperation Agency (JICA)	JICA	<p>JICA funded a feasibility study for Ichigo Holdings Co to introduce mobile drinking water production systems using desalination. Feasibility study was implemented between November 2014 and October 2015. It focused on the islands in Chuuk State, which have the largest population in the country.</p> <p>Synergies While there is a strong alignment with aspects of the project that focus on the development of WASH infrastructure, the scope of the project is clearly different from the current SAP. The JICA project has</p>

START / END DATE	PROJECT	IMPLEMENTIN G AGENCY	FUND	DESCRIPTION
	Pacific Island countries ⁴⁷			been utilizing a reverse osmosis membrane technology that has significant limitations in terms of providing a long-term sustainable solution for FSM setting.
2008 - 2014	Pacific Integrated Water Resource Management Programme (IWRM) ⁴⁸	SPC	Global Environment Facility (GEF); European Union	<p>With a total estimated budget of over USD 80 million (from a range of co-financers on the regional and national level), the programme supported the implementation of the Pacific Regional Action Plan on Sustainable Water Management that aims to improve the assessment and monitoring of water resources, reduce water pollution, improve access to technologies, strengthen institutional agreements, and leverage additional financial resources in supporting IWRM. The programme has been developed by Pacific island countries and SPC through the Pacific Water Partnership and consisted of two main projects:</p> <ul style="list-style-type: none"> • The “Pacific IWRM National Planning Programme” (2008-2010), funded by the European Union, focused on strengthening governance structures (coordinating national water committees) and frameworks (policy, legislation, action plans) to mainstream IWRM and water use efficiency into national planning processes; and • The “Sustainable Integrated Water Resources and Wastewater Management Project in Pacific Island Countries” (Pacific IWRM Project for short) (2008-2013) funded by the GEF and implemented in collaboration with the United Nations Environment and Development Programmes (UNEP and UNDP). It focused on practically demonstrating and developing IWRM best practice to address national priority water issues. <p>Synergies There are clear synergies with WASH elements of this project. In particular, the SPC project has developed the framework for the National Water and Sanitation Policy (see sub-section 2-3) and established a National Water Task Force. While the project was expected to develop a national policy</p>

⁴⁷ <https://www.mofa.go.jp/policy/oda/white/2016/html/takumi/takumi03.html>

⁴⁸ <http://www.pacificwater.org/pages.cfm/water-governance/integrated-water-resource-management/pacific-iwr-programme/>

START / END DATE	PROJECT	IMPLEMENTING AGENCY	FUND	DESCRIPTION
				<p>on water and sanitation, the target has not been achieved.</p> <p>Nevertheless, the current project will build on the strengthened national coordination in the WASH sector.</p>
2014 - Ongoing	Pacific Adaptation for Climate Change (PACC) Project ⁴⁹	UNDP; SPREP	GEF	<p>Working in 14 Pacific Island countries, PACC is demonstrating best-practice adaptation in three key climate-sensitive areas: coastal zone management, food security and food production, and water resources management.</p> <ul style="list-style-type: none"> • Fiji, Palau, Papua New Guinea and the Solomon Islands focus on Food Production and Food Security; • Cook Islands, FSM, Samoa and Vanuatu are developing Coastal Management capacity; • and Nauru, Niue, Republic of Marshall Islands, Tokelau, Tonga and Tuvalu are looking to strengthen their Water Resource Management. <p>The PACC Programme is a partnership between several key regional agencies and national agencies and communities in 14 Pacific Island countries. It is funded by the GEF's Special Climate Change Fund and the Australian Government, with UNDP as its implementing agency and SPREP as implementing partner. The Project is supported by the United Nations Institute for Training and Research C3D+programme.</p> <p>Synergies</p> <p>The food security and food production, and water resources management elements of the PACC project are well aligned with this project. It should be noted though that PACC's focus in FSM has been on coastal management capacity. Moreover, the PACC project clearly focuses on food security and production, while the current project focuses on food safety.</p>
2018- 2021	Practical Solutions for Reducing Community Vulnerability to Climate	Micronesia Conservation Trust (MCT)	Adaptation Fund	The project aims to ensure that all four State Governments and the National Government in the FSM have the mechanisms in place to develop and successfully implement a robust nearshore fisheries management and nationwide protected areas network inclusive of proper enforcement and

⁴⁹ <https://www.adaptation-undp.org/projects/bf-pacc>

START / END DATE	PROJECT	IMPLEMENTIN G AGENCY	FUND	DESCRIPTION
	Change in the Federated States of Micronesia			<p>sustainable finance mechanisms. The project also seeks to provide communities with the resources and support needed to implement successful eco-based adaptation actions to protect their marine ecosystems and increase resilience to climate change impacts.</p> <p>The project objectives were to</p> <ul style="list-style-type: none"> • Objective 1. Improve Protected area management including near-shore marine ecosystems • Objective 2. Capacity building and enforcement of regulations for protected areas and near-shore fisheries • Objective 3. Community-level adaptive capacity to climate change • Objective 4. Improve Knowledge Management for Protected Areas and Eco-based Solutions <p>Synergies Even though the MCT AF project supports the resilience of states to climate change, there are no apparent synergies or overlaps between the two projects</p>
2017-ongoing	Enhancing the climate change resilience of vulnerable island communities in the Federated States of Micronesia (FSM) ⁵⁰	Secretariat of the Pacific Regional Environment Programme (SPREP)	Adaptation Fund	<p>The project aims at reducing the vulnerability of the selected communities to risks of water shortage and increase adaptive capacity of communities living in Woleai, Eauripik, Satawan, Lukunor, Kapingamarangi, Nukuoro, Utwe, Malem to drought and flood-related climate and disaster risks.</p> <p>The objectives of the project are:</p> <ul style="list-style-type: none"> • Prepare the necessary institutional and regulatory frameworks, policies, guidance and tools to help deliver a climate resilient FSM. • Strengthen water and livelihood security measures to help 6 outer atoll islands adapt to impacts of climate change related to water, health and sanitation. • Provide communities with climate resilient infrastructure to help relocate from high-risk coastal inundation sites. • Capture and share the local knowledge produced on climate change adaptation and accelerate the understanding about the

⁵⁰ <https://www.adaptation-fund.org/project/enhancing-climate-change-resilience-vulnerable-island-communities-federated-states-micronesia/>

START / END DATE	PROJECT	IMPLEMENTING AGENCY	FUND	DESCRIPTION
				<p>kinds of interventions that work in island environments in FSM.</p> <p>Synergies While the overall scope of the projects is different there are clear synergies concerning Output 2.2. Water Harvesting and Storage System repaired and installed in 6 atoll islands and Output 2.3: Assessment of viable sanitation measures for outer islands in Yap, Chuuk and Pohnpei.</p> <p>Through these activities the project will engage in WASH infrastructure development and is delivering awareness training for communities in selected outer islands.</p> <p>The current project is ensuring through the communities and beneficiaries selection criteria, that there will be now overlap between the beneficiaries of the two projects. In particular, outer islands supported by other project are excluded from the selection process. Moreover, the project will ensure that lessons learnt and awareness raising material will be incorporated in the activities of component 3.</p> <p>The current project will also build on other interventions that SPREP project is implementing and most crucially the National Policy for Water and Sanitation.</p> <p>It should also be noted that the scaling up and replication scope of the SPREP project has different scope and does not have any overlap with climate proofing the public health sector.</p>
Submitted in February 2022	FSM's National Adaptation Plan proposal	SPREP	GCF	<p>The National Adaptation Plan (NAP) proposal has been submitted to GCF in February 2022 and is expected to be approved in the near future. The proposal identifies the need to engage multilateral climate finance sources through the formulation and implementation of transformational adaptation investments to increase climate resilience across the country.</p> <p>Synergies Complementarities with the NAP proposal concern the processes and procedures of the VCAs. The project will provide significant inputs for the development of the NAP concerning the</p>

START / END DATE	PROJECT	IMPLEMENTIN G AGENCY	FUND	DESCRIPTION
				vulnerabilities of public health and the public health system to climate change.

3. Climate Rationale

3.1 Summary: observed and projected climate change

Temperature, annual precipitation, and sea-level rise are projected to increase in FSM by 2090. Tropical cyclones and droughts are significantly impacted by ENSO (El Niño-Southern Oscillation) events, for which changes remain uncertain. However, there is medium confidence that cyclones and droughts will decrease with climate change. A summary of the climate change observations from 1950 and projections for RCP4.5 emissions scenario using CMIP5 models for the Federated States of Micronesia is provided below, before each category is discussed in detail.

- Temperature - positive seasonal and annual trends have been observed of 0.18 °C per decade in Pohnpei. Projections show that further warming of 1.5°C is expected by 2090.
- Precipitation - shows a significant decreasing trend in May-October rainfall, decreasing by 56.6mm per decade in Pohnpei. ENSO has a significant impact on interannual variability. Total annual rainfall is projected to increase by 6% by 2090, increasing in frequency and intensity.
- Extreme Events
 - Extreme Temperature - there has been an increase of 7.86 warm days per decade, and 5.12 warm nights per decade. The frequency of extremely hot days is projected to rise.
 - Extreme rainfall - Very Wet Day rainfall has been following a decreasing trend of 66.66mm per decade at Pohnpei and an increasing trend of 5.55mm per decade in Yap. The frequency and intensity of extreme rainfall events is projected to increase.
 - Drought - ENSO has a significant impact on FSM's climate. The country typically experiences drought during El Niño years. There is medium confidence that drought frequency will decrease.
 - Tropical Cyclones - the region is one of the most active cyclone regions in the world, with FSM experiencing on average of 71 cyclones per decade. Projections show that, with medium confidence, the frequency of tropical cyclones globally is likely to decrease by 6%-35% by 2100.
- Sea level - Sea levels have risen 10mm per year against 1993 levels, compared to 3mm per year globally. During La Niña years, sea levels are elevated. By 2090, 46-47cm of sea level rise is projected under RCP4.5 emissions scenario, relative to 1986-2005.

3.2 Historical climate trends

The historical climate trends are based on data from 23 local meteorological stations. The overview of the presented data is based on the Pacific-Australia Climate Change Science and Adaptation Planning Program⁵¹. Rainfall data for Pohnpei are available from 1949 and Yap from 1951. Air temperature data are available from 1950 for Pohnpei and 1951 for Yap.

3.2.1 Temperature

Seasonal air temperatures in FSM are influenced by sea-surface temperatures, and there is only 1.5°C difference between the average hottest and coolest months, with little seasonal variation⁵². Positive trends for seasonal and annual mean air temperatures in Pohnpei and Yap for the period 1950-2009 have been observed.

Trends in average mean temperatures since 1950 have shown a positive annual change of 0.15°C per decade in Pohnpei (Figure 10). Maximum annual air temperatures have also shown a positive trend of 0.18 °C per decade in Pohnpei, which is consistent with global trends (Figure 12). Positive minimum air trends of 0.09 °C per decade have been recorded, although these trends are not as great as for maximum air temperatures.

In Yap, changes in observed annual mean temperatures have been insignificant (Figure 11). Maximum annual temperatures have shown a change of 0.23 °C per decade whilst minimum annual temperatures have declined by 0.20 °C per decade resulting in no significant changes of mean temperatures. These trends are not consistent with global trends but can be partially explained by a lack of available data in Yap.

⁵¹ Pacific-Australia Climate Change Science and Adaptation Planning Program; Available at:

https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_WEB_140710.pdf. The PACCSAPP uses the Pacific Climate Change Data Portal Data www.bom.gov.au/climate/pccsp/

⁵² Second National Communication to the UNFCCC. Federated States of Micronesia. <https://www.fsmstatistics.fm/wp-content/uploads/2019/10/2-2nd-National-Communication-to-the-UNFCCC.pdf>

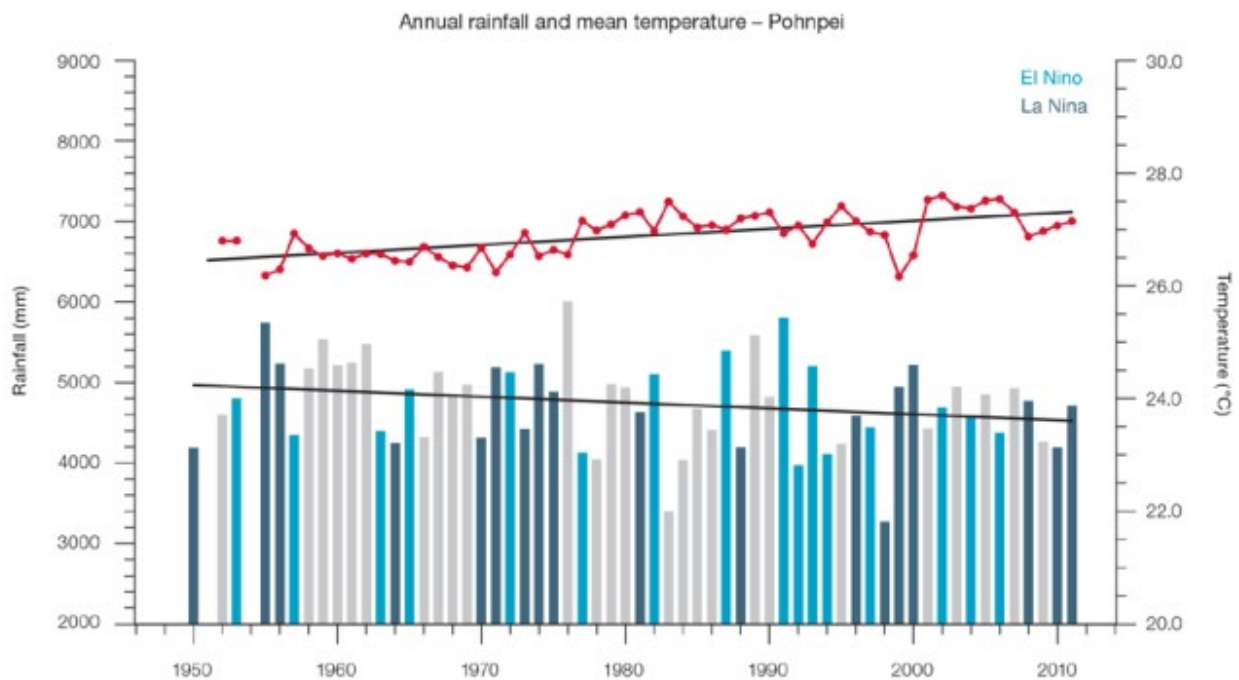


Figure 10: Observed time series of annual average values of mean air temperature (red dots) and total rainfall (bars) - Pohnpei. Light blue bars - El Niño, dark blue bars - La Niña, grey bars - neutral years⁵³.

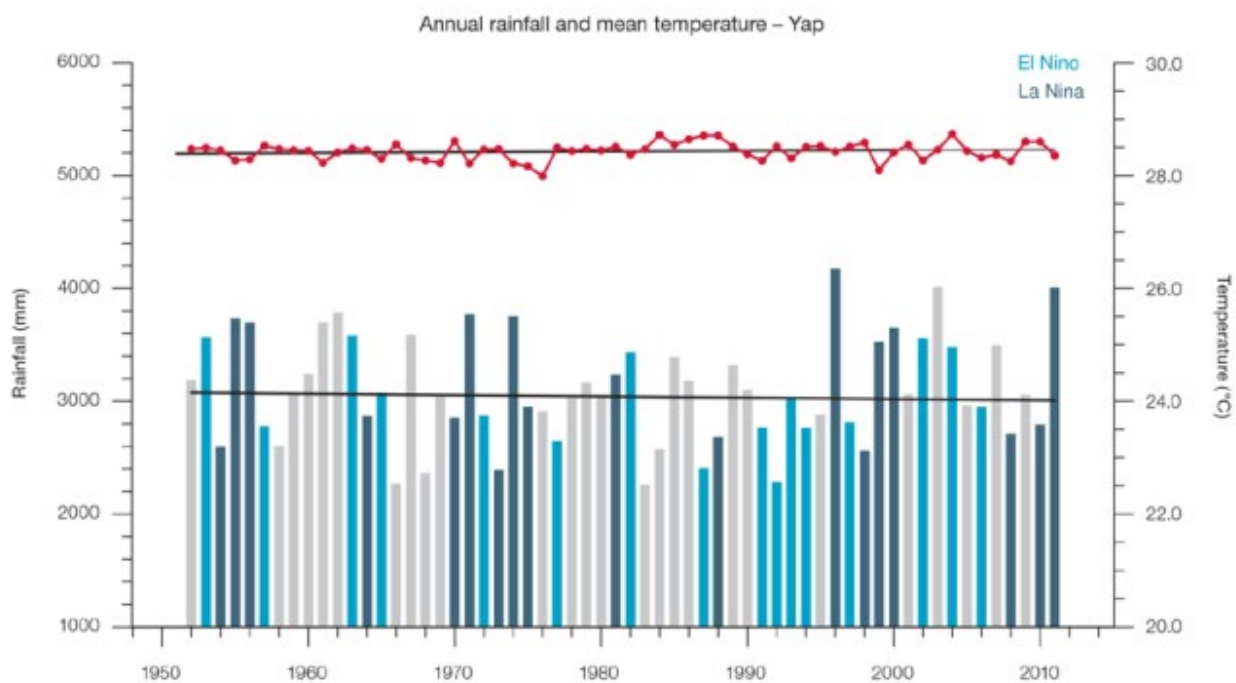


Figure 11: Observed time series of annual average values of mean air temperature (red dots) and total rainfall (bars) - Yap. Light blue bars - El Niño, dark blue bars - La Niña, grey bars - neutral years.

⁵³ Pacific-Australia Climate Change Science and Adaptation Planning Program; Available at: https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_WEB_140710.pdf. The PACCSAPP uses the Pacific Climate Change Data Portal Data www.bom.gov.au/climate/pccsp/

Pohnpei	Tmax °F/10yrs [°C/10yrs] 1951–2011	Tmin °F/10yrs [°C/10yrs] 1951–2011	Tmean °F/10yrs [°C/10yrs]	Total Rain inches/10yrs [mm/10yrs] 1950–2011
Annual	+0.32 (+0.19, +0.46) [+0.18] (+0.10, +0.26)]	+0.16 (-0.02, +0.35) [+0.09] (-0.01, +0.20)]	+0.27 (+0.12, +0.38) [+0.15] (+0.07, +0.21)]	-2.26 (-5.32, +0.61) [-57.3] (-135.1, +15.5)]
Nov–Apr	+0.31 (+0.17, +0.48) [+0.17] (+0.09, +0.27)]	+0.25 (+0.03, +0.42) [+0.14] (+0.02, +0.23)]	+0.29 (+0.11, +0.44) [+0.16] (+0.06, +0.25)]	-1.80 (-4.60, +1.64) [-45.8] (-116.7, +41.8)]
May–Oct	+0.32 (+0.16, +0.46) [+0.18] (+0.09, +0.26)]	+0.19 (+0.03, +0.37) [+0.11] (+0.02, +0.21)]	+0.27 (+0.13, +0.39) [+0.15] (+0.07, +0.22)]	-2.23 (-4.52, -0.12) [-56.6] (-114.9, -3.1)]

Yap	Tmax °F/10yrs [°C/10yrs] 1951–2011	Tmin °F/10yrs [°C/10yrs] 1951–2011	Tmean °F/10yrs [°C/10yrs]	Total Rain inches/10yrs [mm/10yrs] 1952–2011
Annual	+0.41 (+0.36, +0.48) [+0.23] (+0.20, +0.26)]	-0.36 (-0.43, -0.27) [-0.20] (-0.24, -0.15)]	+0.03 (-0.02, +0.07) [+0.01] (-0.01, +0.04)]	0.00 (-2.85, +3.22) [-0.1] (-72.5, +81.8)]
Nov–Apr	+0.39 (+0.34, +0.44) [+0.22] (+0.19, +0.25)]	-0.27 (-0.37, -0.18) [-0.15] (-0.21, -0.10)]	+0.04 (-0.02, +0.11) [+0.02] (-0.01, +0.06)]	+0.86 (-2.87, +1.44) [-21.9] (-72.8, +36.6)]
May–Oct	+0.44 (+0.37, +0.51) [+0.24] (+0.20, +0.28)]	-0.40 (-0.48, -0.33) [-0.22] (-0.27, +0.18)]	+0.01 (-0.04, +0.05) [0.00] (-0.02, +0.03)]	+0.93 (-1.27, +3.10) [+23.6] (-32.1, +78.8)]

Figure 12: Annual and half-year trends in air temperature and rainfall at Pohnpei and Yap. 5% confidence levels are shown in boldface.

3.2.2 Precipitation

As shown in Figure 10 and Figure 11, interannual variability is observed for rainfall records since 1950, as associated with ENSO. Rainfall in Pohnpei shows a significant decreasing trend in May–October rainfall, decreasing by 56.6mm per decade. The wet season occurs from May to October when the Intertropical Convergence Zone (ITCZ) is strongest and further north⁵⁴. The decreasing trend in rainfall might be due to either the shift in the mean location of the ITCZ away from Pohnpei, a change in the intensity of rainfall associated with the ITCZ, or a combination of both.

⁵⁴ <https://www.fsmstatistics.fm/wp-content/uploads/2019/10/2-2nd-National-Communication-to-the-UNFCCC.pdf>

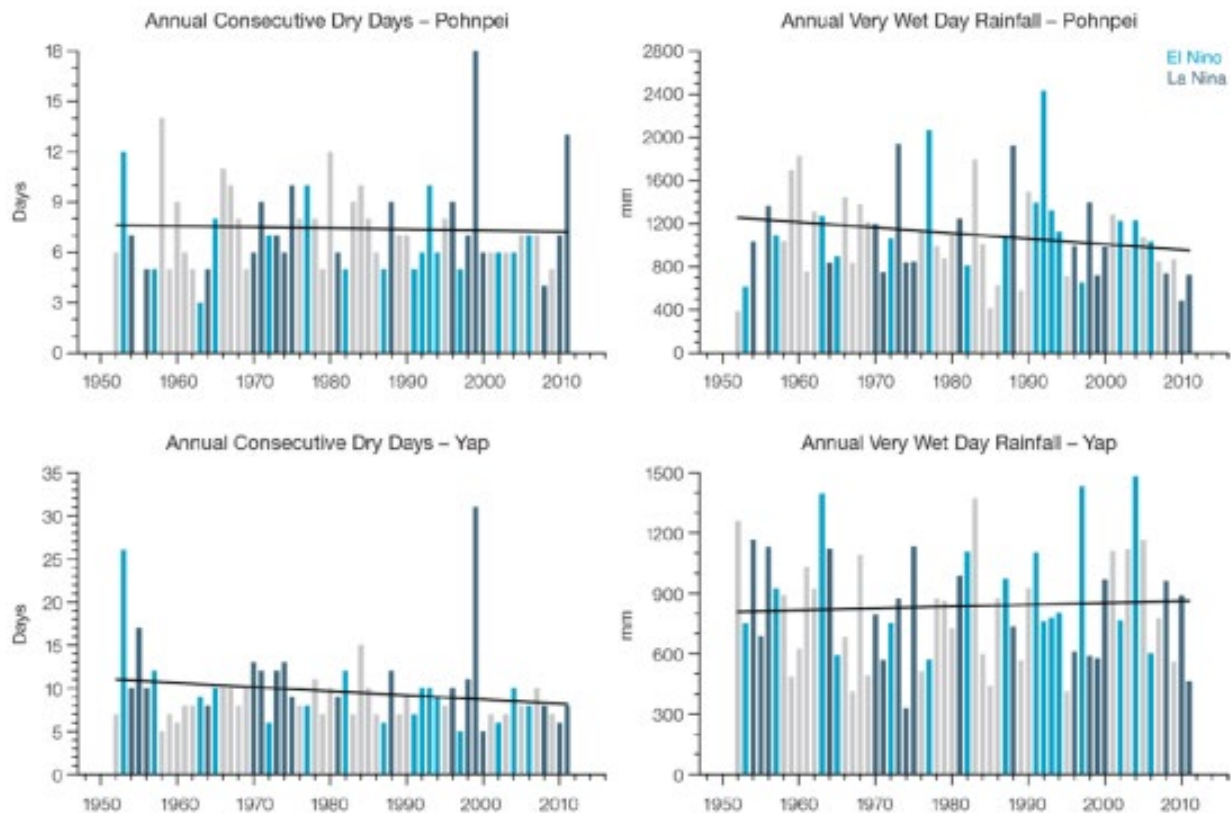


Figure 13: Observed time series of Consecutive Dry Days and Very Wet Day Rainfall in Pohnpei and Yap⁵⁵.

3.2.3 Extremes Events

Extreme Temperatures

At the extremes, statistically significant warming trends have been observed in Pohnpei. Since 1952, there has been an increase of 7.86 warm days per decade, and 5.12 warm nights per decade (Figure 14). Cool days and nights have decreased by 3.98 and 2.73 respectively. Yap has also observed opposite extreme trends to Pohnpei, which can be partially explained by inconsistent data.

Extreme Rainfall

Very Wet Day rainfall (amount of rain in a year where daily rainfall is greater than the 95th percentile for the reference period 1971–2000) at Pohnpei has been following a decreasing trend of 66.66mm per decade (Figure 14). In Yap, there has been a decreasing trend of Consecutive Dry Days 0.37 days per decade. The remaining annual, half-year and extreme daily rainfall trends show little change at both sites.

⁵⁵ Pacific-Australia Climate Change Science and Adaptation Planning Program; Available at:

https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_WEB_140710.pdf. The PACCSAPP uses the Pacific Climate Change Data Portal Data www.bom.gov.au/climate/pccsp/

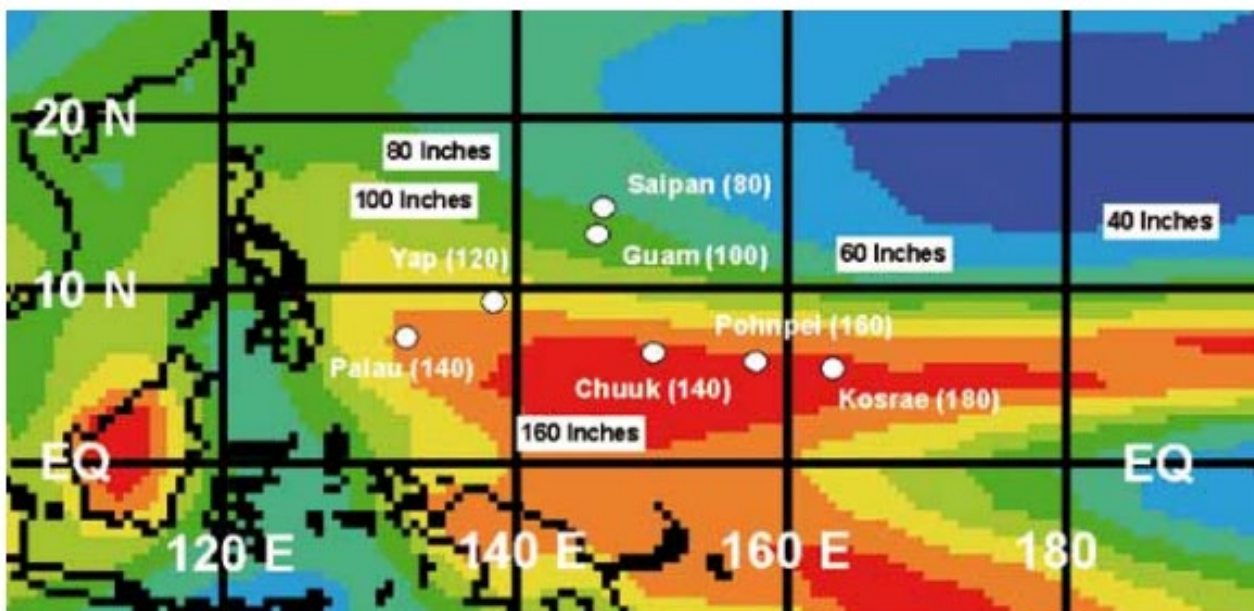
		Pohnpei	Yap
TEMPERATURE		1952–2011	1952–2011
Warm Days (days/decade)		7.86 (+3.65, 11.70)	12.23 (+4.60, +19.80)
Warm Nights (days/decade)		5.12 (+1.22, +9.05)	-16.68 (-21.57, -10.24)
Cool Days (days/decade)		-3.98 (-5.53, -2.52)	-8.50 (-13.66, -2.67)
Cool Nights (days/decade)		-2.73 (-8.21, +3.68)	+8.70 (+3.71, +14.90)
RAINFALL			
Rain Days ≥ 1 mm	(days/decade)	-0.21 (-2.79, +2.48)	-1.01 (-4.20, +1.82)
Very Wet Day rainfall	(inches/decade)	-2.63 (-5.15, -0.12)	+0.22 (-1.39, +1.97)
	(mm/decade)	-66.88 (-130.81, -3.05)	+5.55 (-35.30, +49.95)
Consecutive Dry Days (days/decade)		0.00 (-0.43, +0.20)	-0.37 (-0.77, 0.00)
Max 1-day rainfall	(inches/decade)	-0.015 (-0.29, 0.27)	-0.04 (-0.30, +0.21)
	(mm/decade)	-0.38 (-7.29, +6.84)	-0.88 (-7.62, +5.41)

Figure 14: Annual trends in air temperature and rainfall extremes at Pohnpei and Yap.

Droughts

Micronesia has a zone of maximum annual rainfall from 4-8° N across the region (Figure 15). Due to the mid-Pacific subtropical high-pressure area and accompanying trade winds, rainfall drops further northward, and the dry season becomes more prolonged.

ENSO has a significant impact on FSM's climate. The country typically experiences drought during El Niño years, due to the persistence of a high-pressure weather zone over the Western Tropical Pacific, blocking low-pressure, rain-bearing masses. As shown in Figure 16, extremely dry years in Pohnpei occur during El Niño years. A major El Niño event occurred in 1997, resulting in the driest year on record in Pohnpei⁵⁶.

Figure 15: Mean annual rainfall in Micronesia⁵⁷.

⁵⁶ <https://www.fsmstatistics.fm/wp-content/uploads/2019/10/2-2nd-National-Communiation-to-the-UNFCCC.pdf>

⁵⁷ <https://www.fsmstatistics.fm/wp-content/uploads/2019/10/2-2nd-National-Communiation-to-the-UNFCCC.pdf>

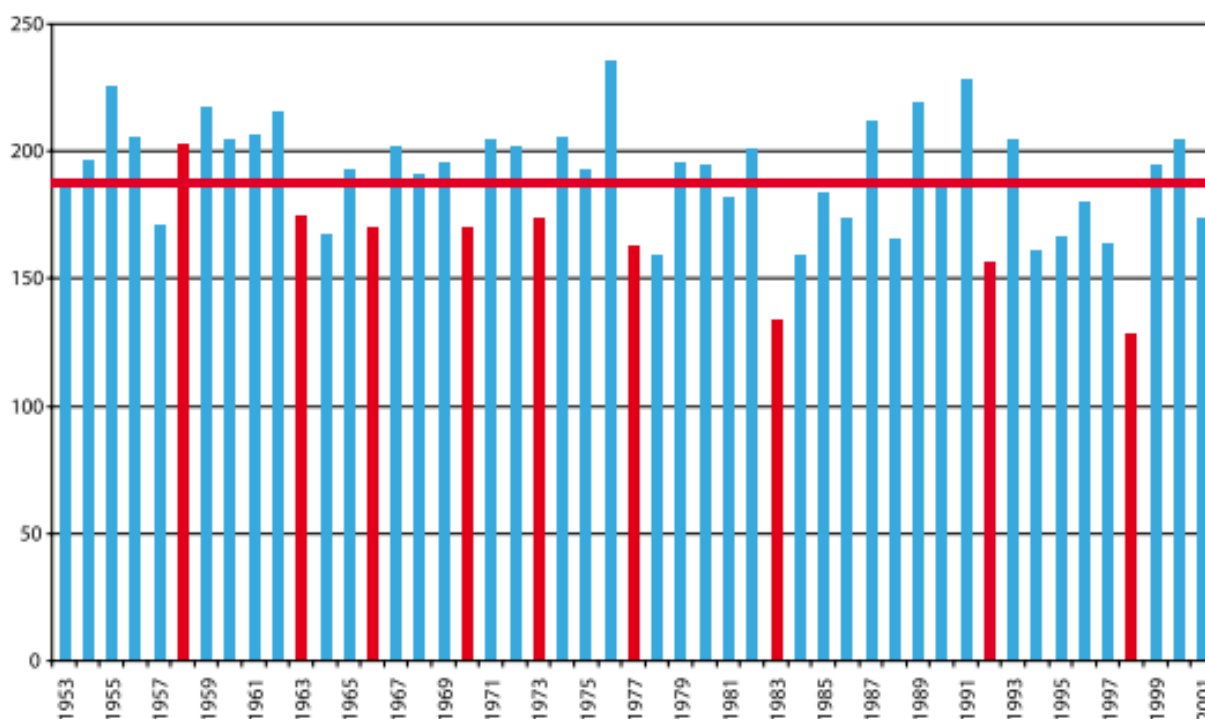


Figure 16: Time series of annual rainfall at the Pohnpei Weather Service Observatory (WSO). El Niño years are depicted by the red bars⁵⁸.

Tropical Cyclones

The western North Pacific is the most active cyclone basin in the world⁵⁹. Cyclones typically form in central and eastern Micronesia and track north-west. 28 tropical storms occur annually, compared to ten for the North Atlantic Basin. Unlike the North Atlantic Basin, these tropical cyclones can occur at any time of the year, which is typical of the North Pacific basin. The main tropical cyclone season affects FSM between June and November. Between 1977 and 2011, 248 cyclones were recorded, with an average of 71 cyclones per decade⁶⁰.

The ENSO cycle significantly effects the distribution and formation of cyclones in the region. Interannual variability ranges from zero in 1999 to 12 in 1979 and 1987 (Figure 17). During La Niña, higher numbers of tropical storms occur in the region. However, ENSO events affect the formation region of the storms, more than the numbers⁶¹. During El Niño, the formation retracts eastward and there is an increased risk of a typhoon for Pohnpei. After an El Niño year, the formation region retracts west. Tropical cyclones are more frequent in El Niño years (88 cyclones per decade). Neutral season average is somewhat lower (84 cyclones per decade),

⁵⁸ <https://www.fsmstatistics.fm/wp-content/uploads/2019/10/2-2nd-National-Communion-to-the-UNFCCC.pdf>

⁵⁹ <https://www.fsmstatistics.fm/wp-content/uploads/2019/10/2-2nd-National-Communion-to-the-UNFCCC.pdf>

⁶⁰ Pacific-Australia Climate Change Science and Adaptation Planning Program; Available at:

https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_WEB_140710.pdf. The PACCSAPP uses the Pacific Climate Change Data Portal Data www.bom.gov.au/climate/pccsp/

⁶¹ <https://www.fsmstatistics.fm/wp-content/uploads/2019/10/2-2nd-National-Communion-to-the-UNFCCC.pdf>

while during La Niña years cyclones are much less frequent (38 per decade)⁶². Typhoons and monsoons can also affect the rainfall during El Niño events, resulting in very wet years. During La Niña and neutral years, precipitation is near or slightly above normal.

Between 1981 and 2011 17% of the cyclones became Category 3 (typhoon) or stronger events with FSM's exclusive economic zone (EEZ). On Pohnpei, the risk of a typhoon is one year in 10 for El Niño years, and approximately one year in 50 for La Niña or neutral years. The last typhoon on Pohnpei was Typhoon Lola in 1986, an El Niño year⁶³.

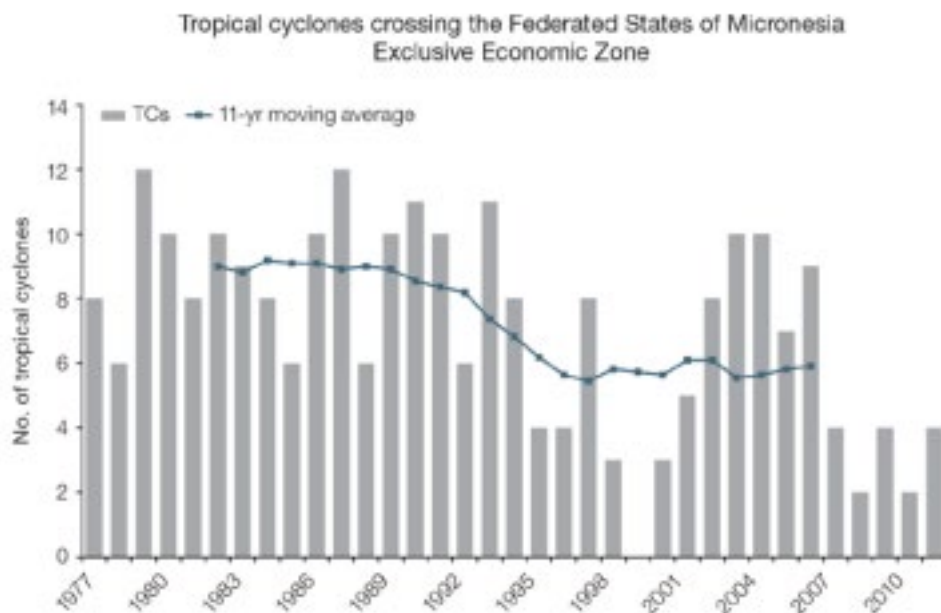


Figure 17: Observed number of tropical cyclones per season.

3.2.4 Sea Level Rise

FSM has experienced some of the highest rates of sea-level rise in the world. Sea levels have risen 10mm per year against 1993 levels, compared to 3mm per year globally (Figure 18). The attribution of this sea level rise to climate change, as opposed to climate variability and natural oscillations such as ENSO, is still being researched.

During El Niño, the mean sea level drops across FSM, whereas during La Niña, the sea level is elevated compared to normal levels. Mean sea levels have been recorded at 0.745m at the Pohnpei Sea frame tide gauge between 2002-2010, with a maximum of 1.758m in 2007 and a minimum of 0.005m in 2002 (El Niño year)⁶⁴. Longer-term sea level data between 1974-2006 shows the sea level falling 0.3m in the 1997 El Niño year, compared to its long term-term average. During the La Niña years of 1998-2001, the sea level rose 0.3m above its average. This

⁶² Pacific-Australia Climate Change Science and Adaptation Planning Program; Available at:

https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_WEB_140710.pdf. The PACCSAPP uses the Pacific Climate Change Data Portal Data www.bom.gov.au/climate/pccsp/

⁶³ <https://www.fsmstatistics.fm/wp-content/uploads/2019/10/2-2nd-National-Communication-to-the-UNFCCC.pdf>

⁶⁴ <https://www.fsmstatistics.fm/wp-content/uploads/2019/10/2-2nd-National-Communication-to-the-UNFCCC.pdf>

difference of 0.6m between ENSO events is substantial compared with daily astronomical tidal changes of 1.22m.

During high tides, maximum high-water levels are most likely in April-July and November-January. Seasonal sea levels in combination with La Niña conditions have led to the highest ten recorded water levels on record.

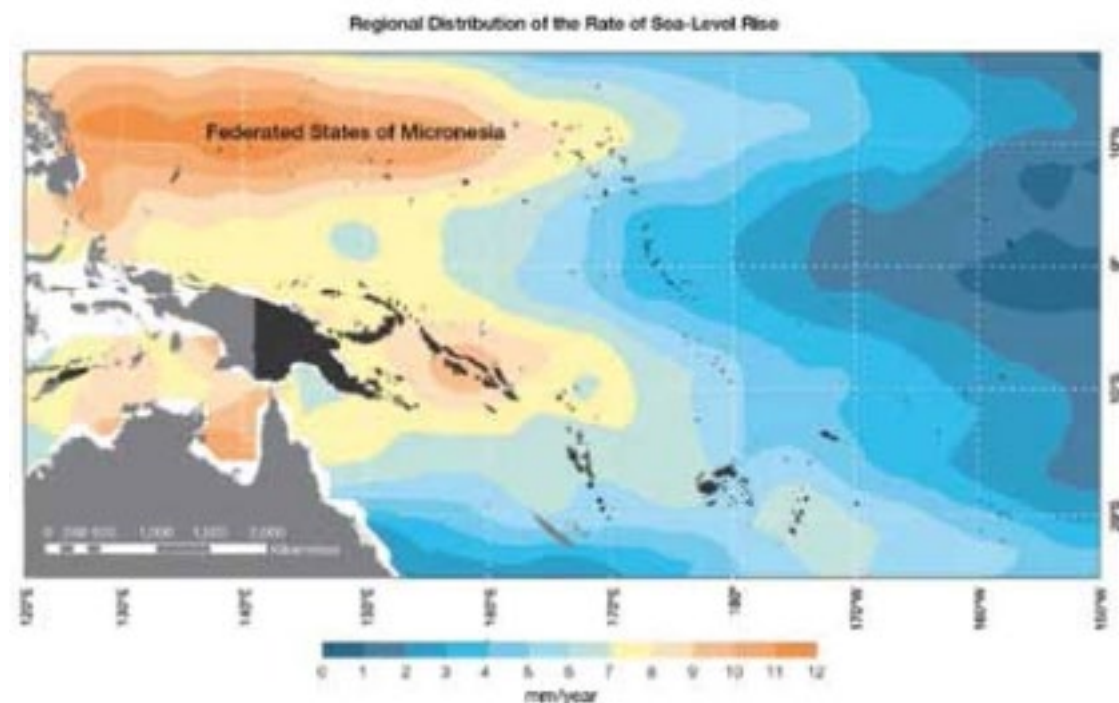


Figure 18: Rates of sea-level change between 1993-2010 from satellite altimeters⁶⁵

3.3 Projected climate trends

Coupled Model Intercomparison Project (Phase 5) (CMIP5) climate models are used to simulate climate projections for the Federated States of Micronesia region. Projections are shown using the RCP 4.5 emissions scenario, with a baseline reference period of 1986-2005. A summary of the projected changes in the annual and seasonal mean climate for the Western and Eastern FSM under RCP 4.5 are shown in Table 10 and Table 11.

Projections show that further warming and an increase in long-term average rainfall are expected. There is very high confidence of an increase in mean and extremely high temperatures and sea levels. There is high confidence that mean annual rainfall, including frequency and intensity will increase. There is medium confidence that drought frequency will decrease.

⁶⁵ <https://www.fsmstatistics.fm/wp-content/uploads/2019/10/2-2nd-National-Communication-to-the-UNFCCC.pdf>

Table 11: Projected changes in the annual and seasonal mean climate for Eastern FSM under RCP 4.5 scenario.

Variable	Season	2030	2050	2070	2090	Confidence
Surface air temperature (°C)	Annual	0.7(0.5-1)	1.1 (0.8-1.4)	1.4 (1-1.9)	1.5 (1-2.1)	High
Maximum temperature (°C)	1-in-20 year event	0.6 (0.2-0.9)	0.9 (0.5-1.4)	1.2 (0.7-1.6)	1.3 (0.9-2.1)	Medium
Minimum temperature (°C)	1-in-20 year event	0.7 (0.4-0.9)	1 (0.7-1.3)	1.3 (0.9-1.8)	1.4 (1-1.8)	Medium
Total rainfall (%)	Annual	3 (-5-12)	5 (-1-12)	7 (1-20)	6 (-2-13)	Medium
Total rainfall (%)	Nov-Apr	1 (-12-15)	3 (-4-13)	5 (-5-16)	2 (-8-12)	Medium
Total rainfall (%)	May-Oct	4 (-3-10)	7 (1-14)	9 (-1-18)	9 (2-17)	Medium
Mean sea level (cm)	Annual	12 (8-17)	22 (14-31)	35 (22-49)	48 (30-68)	Medium

Projected changes in the annual and seasonal mean climate for Eastern FSM under RCP 4.5 scenario. Projected changes are given for four 20-year periods centred on 2030, 2050, 2070 and 2090, relative to a 20-year period centered on 1995. Values represent the multi-model mean change, with the 5-95% range of uncertainty in brackets. Confidence in the magnitude of change is expressed as high, medium or low⁶⁶.

Table 12: Projected changes in the annual and seasonal mean climate for Western FSM under RCP 4.5 scenario

Variable	Season	2030	2050	2070	2090	Confidence
Surface air temperature (°C)	Annual	0.7(0.5-1)	1.1 (0.8-1.4)	1.3 (1-1.8)	1.5 (1-2.1)	High

⁶⁶ Pacific-Australia Climate Change Science and Adaptation Planning Program; Available at: https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_WEB_140710.pdf. The PACCSAPP uses the Pacific Climate Change Data Portal Data www.bom.gov.au/climate/pccsp/

Maximum temperature (°C)	1-in-20 year event	0.7 (0.3-0.9)	1 (0.5-1.3)	1.3 (0.8-1.6)	1.3 (0.8-2)	Medium
Minimum temperature (°C)	1-in-20 year event	0.7 (0.3-0.8)	1 (0.7-1.2)	1.2 (0.8-1.7)	1.4 (1-1.7)	Medium
Total rainfall (%)	Annual	3 (-4-8)	4 (-3-12)	6 (3-13)	4 (-4-10)	Medium
Total rainfall (%)	Nov-Apr	2(-7-11)	3 (-9-12)	5 (-7-27)	3 (-8-13)	Medium
Total rainfall (%)	May-Oct	3 (0-9)	5 (-2-13)	7 (-1-14)	6 (-1-13)	Medium
Mean sea level (cm)	Annual	12 (8-17)	22 (14-31)	35 (22-49)	48 (30-68)	Medium

Projected changes are given for four 20-year periods centred on 2030, 2050, 2070 and 2090, relative to a 20-year period centred on 1995. Values represent the multi-model mean change, with the 5-95% range of uncertainty in brackets. Confidence in the magnitude of change is expressed as high, medium or low⁶⁷.

3.3.1 Temperature

Figure 19 shows the temperature anomaly from the base period 1986-2005 for observations (GISS data) and for the CMIP5 models under different emission scenarios. Under the RCP4.5 emissions scenario, warming of 0.7°C is projected by 2030, relative to 1995. By 2090, this warming is projected to increase by 1.5°C in both the Eastern and Western regions of FSM, with high confidence. Interannual variability will result in some cooler and warmer years and decades, however, on average the projections show more warm years and decades in a warmer climate.

⁶⁷ Pacific-Australia Climate Change Science and Adaptation Planning Program; Available at: https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_WEB_140710.pdf. The PACCSAPP uses the Pacific Climate Change Data Portal Data www.bom.gov.au/climate/pccsp/

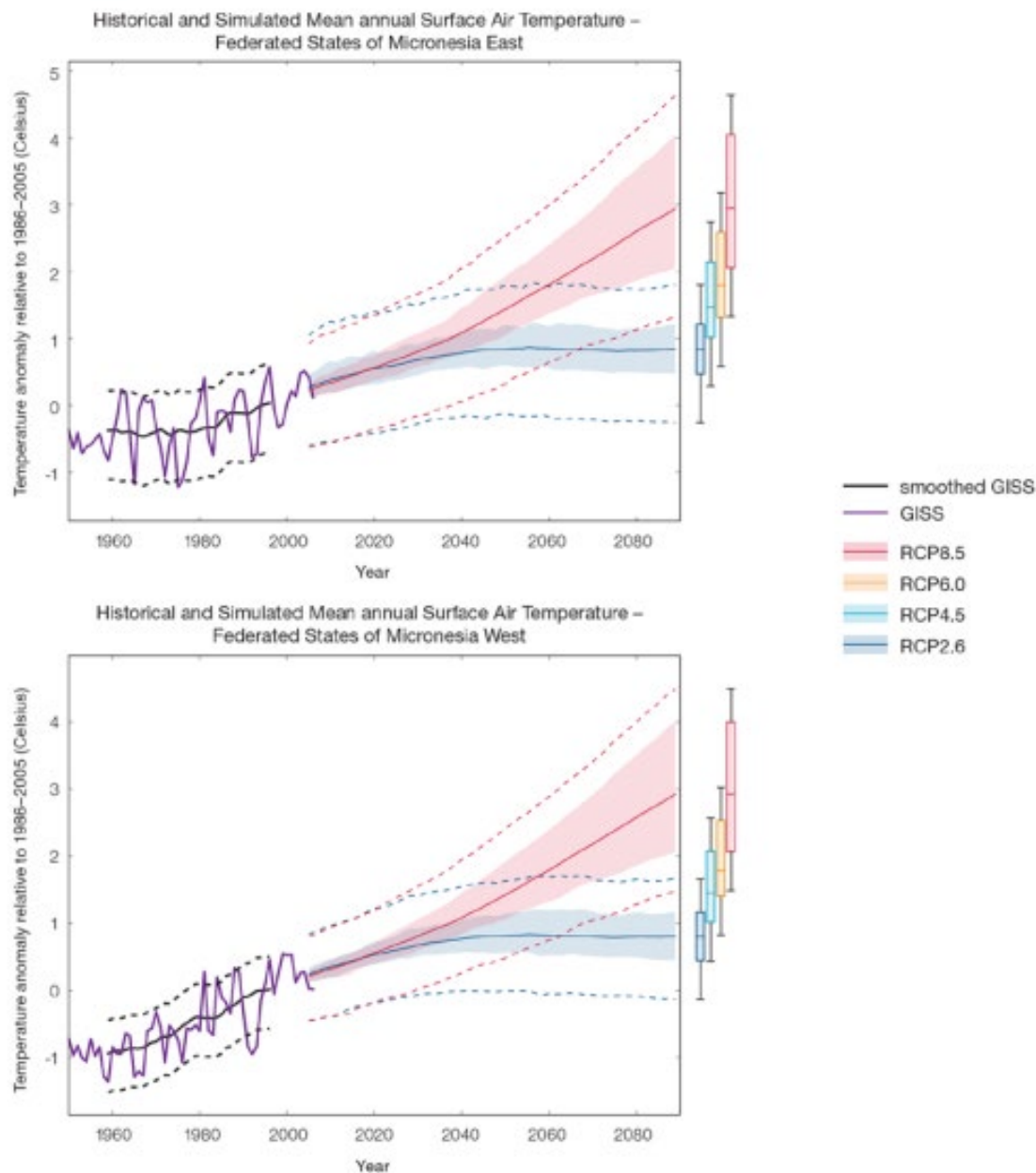


Figure 19: Historical and simulated surface air temperatures for the region surrounding eastern and western FSM⁶⁸.

3.3.2 Precipitation

As shown in Table 10 and Table 11 long-term average rainfall is projected to increase, with a greater increase in May–October than November–April rainfall. Mean rainfall increased

⁶⁸ Pacific-Australia Climate Change Science and Adaptation Planning Program; Available at: https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_WEB_140710.pdf. The PACCSAPP uses the Pacific Climate Change Data Portal Data www.bom.gov.au/climate/pccsp/

significantly between 1979-2006 in western FSM, but due to a high level of natural variability in the region, this rate of increase is not projected to continue. Wet and dry years and decades are still likely due to this variability. In the short-term, the effects on climate change on average rainfall may not be obvious, although the long-term average projects a wetter climate by 2090.

Figure 20 shows the anomaly from the base period 1986-2005 in rainfall from observations (GPCP data) and for the CMIP5 models under different emissions scenarios. Due to internal variability, depicted by the dotted lines, future rainfall could be above or below the projected long-term averages.

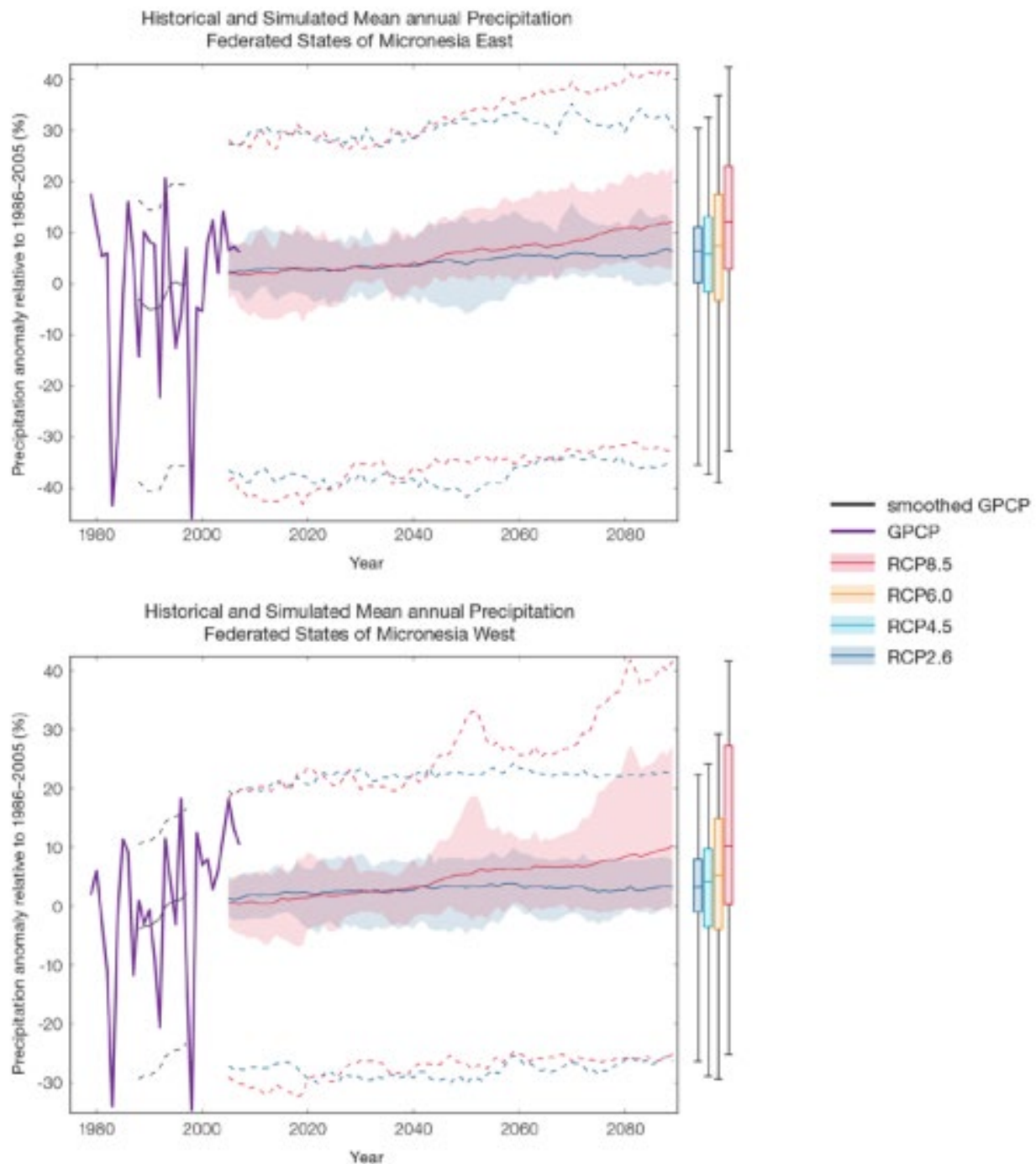


Figure 20: Historical and simulated average rainfall time series for the eastern and western FSM⁶⁹.

3.3.3 Extreme Events

Extreme Temperature

Based on analysis of daily temperature CMIP5 models, temperatures on extremely hot days are projected to increase by approximately the same amount as average temperature⁷⁰. The frequency of these hot days is also expected to increase.

For the eastern FSM the temperature of the 1-in-20-year hot day is projected to increase by 0.6°C by 2030 under RCP4.5. By 2090 the projected increase is for 1.3°C under RCP 4.5 (Table 6).

For the western FSM, the temperature of the 1-in-20-year hot day is projected to increase by 0.7°C by 2030 under RCP4.5. By 2090 the projected increase is for 1.3°C under RCP 4.5 (Table 7).

There is very high confidence that the temperature of extremely hot days and extremely cool days will increase because this is physically consistent with rising greenhouse gas concentrations and is consistent with observed changes in extreme temperatures globally.

Extreme Rainfall

Based on the analysis of daily rainfall data from CMIP5 models, the frequency and intensity of extreme rainfall events is projected to increase (Table 12). There is high confidence that these events will increase because a warmer atmosphere can hold more moisture, so there is a greater potential for rainfall. Increases in extreme rainfall in the Pacific are also projected across all available climate models.

Considering a range of emissions scenarios from RCP2.6 to RCP8.5, the current 1-in-20-year daily rainfall amount is projected to increase by 11-15mm by 2030 and 20-38mm by 2090 in eastern FSM (Table 12). In western FSM, the current 1-in-20-year daily rainfall amount is projected to increase by 14-18mm by 2030 and 19-47mm by 2090.

Table 13: Projected increase in current 1-in-20-year daily rainfall amount by 2030 and 2090 for RCP2.6 and RCP8.5 emissions scenarios⁷¹.

⁶⁹ Pacific-Australia Climate Change Science and Adaptation Planning Program; Available at: https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_WEB_140710.pdf. The PACCSAPP uses the Pacific Climate Change Data Portal Data www.bom.gov.au/climate/pccsp/

⁷⁰ Pacific-Australia Climate Change Science and Adaptation Planning Program; Available at: https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_WEB_140710.pdf. The PACCSAPP uses the Pacific Climate Change Data Portal Data www.bom.gov.au/climate/pccsp/

⁷¹ Pacific-Australia Climate Change Science and Adaptation Planning Program; Available at: https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_WEB_140710.pdf. The PACCSAPP uses the Pacific Climate Change Data Portal Data www.bom.gov.au/climate/pccsp/

Variable	Season	2030	2090
Daily rainfall - eastern FSM	1-in-20-year event	+11mm (RCP2.6) +15mm (RCP8.5)	+20mm (RCP2.6) +38mm (RCP8.5)
Daily rainfall - eastern FSM	1-in-20-year event	+14mm (RCP2.6) +18mm (RCP8.5)	+19mm (RCP2.6) +47mm (RCP8.5)

Droughts

Drought projections are described in terms of drought, frequency, and duration. Across both FSM states, the overall time spent in drought is expected to decrease under all emissions scenarios⁷². This is consistent with an overall increase in rainfall for FSM. Under higher emissions scenarios (RCP8.5), the frequency of drought is projected to decrease across all categories, whereas for very low emissions (RCP2.6), the frequency of severe droughts decreases slightly, whilst all other categories of droughts remain the same. The duration of droughts is projected to stay the same across all emissions scenarios.

The effects of climate change on ENSO conditions and drought remains uncertain. An increase in ambient temperatures associated with climate change and an increase in the magnitude of El Niño conditions may lead to more severe droughts in the future. This is supported by an ADB Report (2005) which states that during an ENSO event, FSM suffers drought conditions during the winter and spring months⁷³.

With a severe El Niño episode, drought can begin as early as late autumn and extend into the following summer. The stronger the El Niño, the longer lasting the drought conditions are likely to be. Whether an El Niño event is “typical” or stronger than usual, Yap, being in the western part of FSM, tends to be affected occasionally earlier and, in most cases, more harshly than the eastern state of Pohnpei, as observed by the ADB⁷⁴. The strongest El Niño events (Super El Niño events) could double in the future due to climate change.⁷⁵ Using 20 climate models to examine possible changes in El Niño over the next 100 years, El Niño events could occur roughly every 10 years instead of every 20 years.

⁷² Pacific-Australia Climate Change Science and Adaptation Planning Program; Available at: https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_WEB_140710.pdf. The PACCSAPP uses the Pacific Climate Change Data Portal Data www.bom.gov.au/climate/pccsp/

⁷³ Asian Development Bank, 2005. Climate Proofing - A risk-based approach to adaptation. Available at: <https://www.adb.org/sites/default/files/publication/28796/climate-proofing.pdf>

⁷⁴ Asian Development Bank, 2005. Climate Proofing - A risk-based approach to adaptation. Available at: <https://www.adb.org/sites/default/files/publication/28796/climate-proofing.pdf>

⁷⁵ (Cai et al., 2014. Increasing frequency of extreme El Niño events due to greenhouse warming. Nature Climate Change, 4, 111-116. Available at: <https://www.nature.com/articles/nclimate2100>

Tropical Cyclones

Tropical cyclones, also known as typhoons or hurricanes, are among the most destructive weather phenomena. They are intense circular storms that originate over warm tropical oceans and have maximum sustained wind speeds exceeding 119 km per hour and heavy rains⁷⁶. However, the greatest damage to life, health and property is not from the wind, but from secondary events such as storm surges, flooding, landslides, and tornadoes.

Projections show that, with medium confidence, the frequency of tropical cyclones globally is likely to decrease by 6%-35% by 2100, but with an increase in maximum wind speed of 2%-11%, and an increase in rainfall of 20%⁷⁷. Whilst confidence levels are lower for the north basin, half of Global Climate Model projections suggest a decrease in the formation of cyclones between 20-50%.

3.3.4 Sea level rise

There is high confidence that sea levels will continue to rise over the century, with 7-18cm projected by 2030 for RCP4.5 (Figure 21 - a). There will be periods of higher and lower sea levels due to interannual variability of 26cm⁷⁸. By 2090, 46-47cm of sea level rise is projected under RCP4.5 emissions scenario, relative to 1986-2005 (Figure 21 - b).

With a long-term trend of sea-level rise, extreme sea-level events are most likely to occur with a combination of extreme tides and La Niña conditions. However, the long-term sea level rise due to global warming is estimated to be of a smaller magnitude compared to the ENSO induced changes in sea level of 0.61m over the course of a year or two⁷⁹.

⁷⁶ World Health Organisation - Tropical Cyclones. Available at: https://www.who.int/health-topics/tropical-cyclones#tab=tab_1

⁷⁷ Pacific-Australia Climate Change Science and Adaptation Planning Program; Available at: https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_WEB_140710.pdf. The PACCSAPP uses the Pacific Climate Change Data Portal Data www.bom.gov.au/climate/pccsp/

⁷⁸ Pacific-Australia Climate Change Science and Adaptation Planning Program; Available at: https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_WEB_140710.pdf. The PACCSAPP uses the Pacific Climate Change Data Portal Data www.bom.gov.au/climate/pccsp/

⁷⁹ <https://www.fsmstatistics.fm/wp-content/uploads/2019/10/2-2nd-National-Communication-to-the-UNFCCC.pdf>

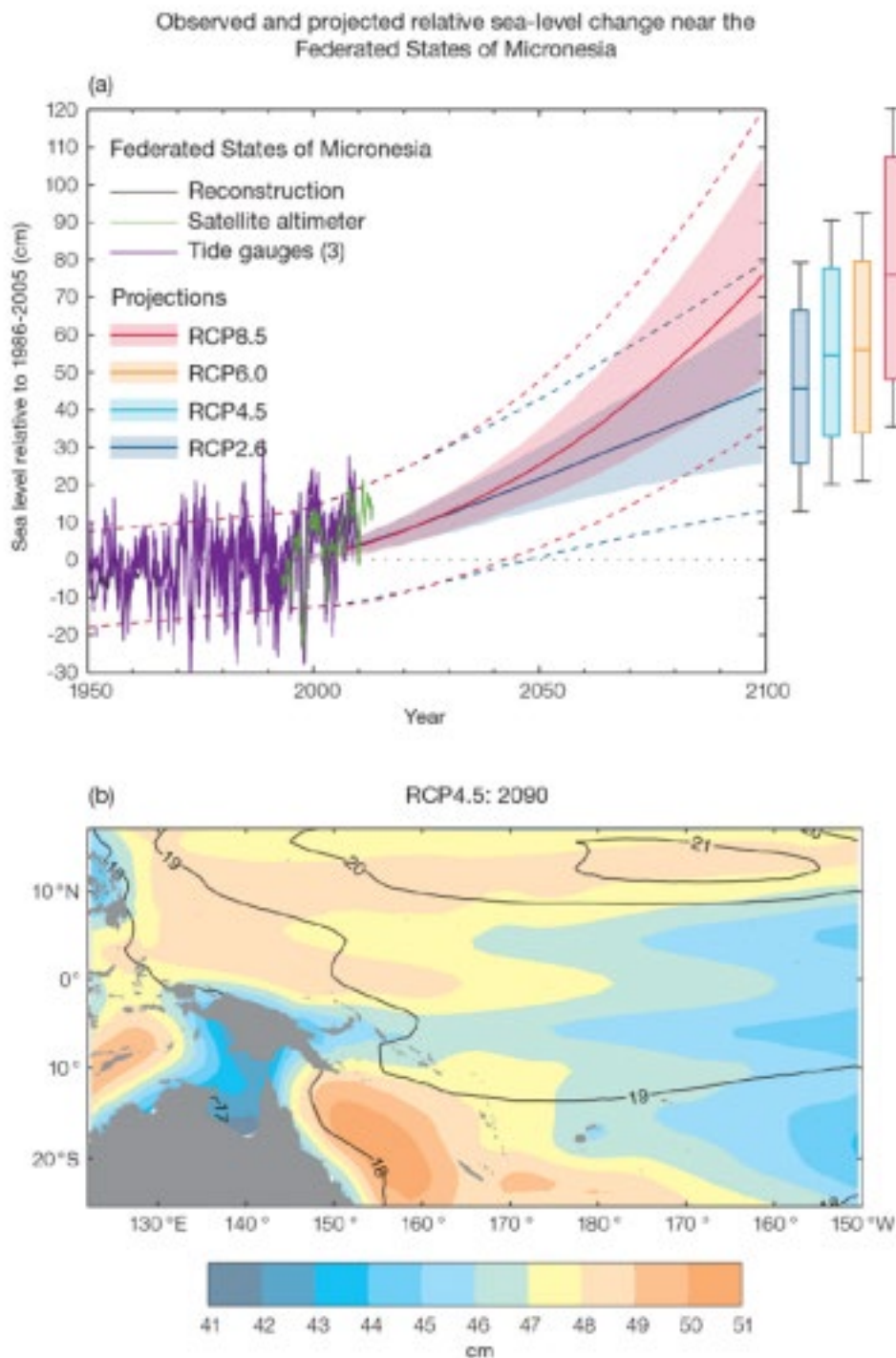


Figure 21: (a) Observed tide-gauge records of sea-levels since 1950 and mean projections for RCP4.5 to 2100 (in light blue). Dashed lines show interannual variability. (b) Projected sea level rise under RCP4.5 emissions scenario for 2081-2100 relative to 1986-2005.

3.4 Climate risk and impacts under projections

Pacific Island Countries and Territories (PICTs) are vulnerable to the health impacts of climate change due to physical geography, isolation, frequent exposure to extreme weather and climate

events, small population numbers and limited resources.⁸⁰ The risk of climate-related health impacts depends on the population and settings and is the result of interactions between hazard, exposure and vulnerability.⁸¹ These health impacts include: changing patterns of communicable disease; traumatic injuries and deaths from extreme weather events; mental health issues (from loss of land, livelihoods and population displacement, and extreme weather/disasters); compromised food and water security (leading to malnutrition, water-borne diseases, etc.); and heat-related illnesses, according to the WHO. Such impacts will be disproportionately felt by vulnerable population groups including the very poor, young children, the elderly, people with disabilities, people with pre-existing illnesses (e.g., NCDs) and people with certain occupations (e.g., farmers, fishermen and outdoor workers).⁸²

Sudden-onset climate hazards (such as tropical cyclones and typhoons) and slow-onset climate hazards (such as sea level rise) combine with demographic, socio-economic, environmental and other factors to manifest in several exposure pathways from hazard to health outcomes.⁸³ Health impacts can be direct, such as injury or death from storm surges. Health impacts can also be indirect, through disruption of ecological systems through increased pathogen loads in food and water in hotter and/or more humid conditions and altered geographic ranges and biting habits of disease-carrying insects.⁸⁴

Exposure pathways between climate hazards and health outcomes (see Figure 3) include changes to many environmental and social determinants of health such as water quality and quantity, vector ecology, and social factors to result in several adverse health outcomes including diarrheal disease, food poisoning, vector-borne and zoonotic diseases. These adverse health outcomes are not solely due to climate change but rather they are amplified by climate change effects, constituting a transversal threat to global public health. There is broad consensus that most health consequences of climate change will be negative. Climate change threatens to reverse the significant public health and development gains made over the past fifty years.⁸⁵ Yet, given the health co-benefits of mitigation activities, climate change also presents a significant global public health opportunity.⁸⁶

Figure 23 is a more detailed but non-exhaustive overview of impact chains between climate change drivers and human health.

⁸⁰ WHO, 2015b.

⁸¹ Field et al., 2014.

⁸² WHO 2017.

⁸³ Haines & Ebi, 2019.

⁸⁴ McIver et al., 2015.

⁸⁵ Berrang-Ford et al., 2021, Watts et al., 2015.

⁸⁶ Watts, 2017.

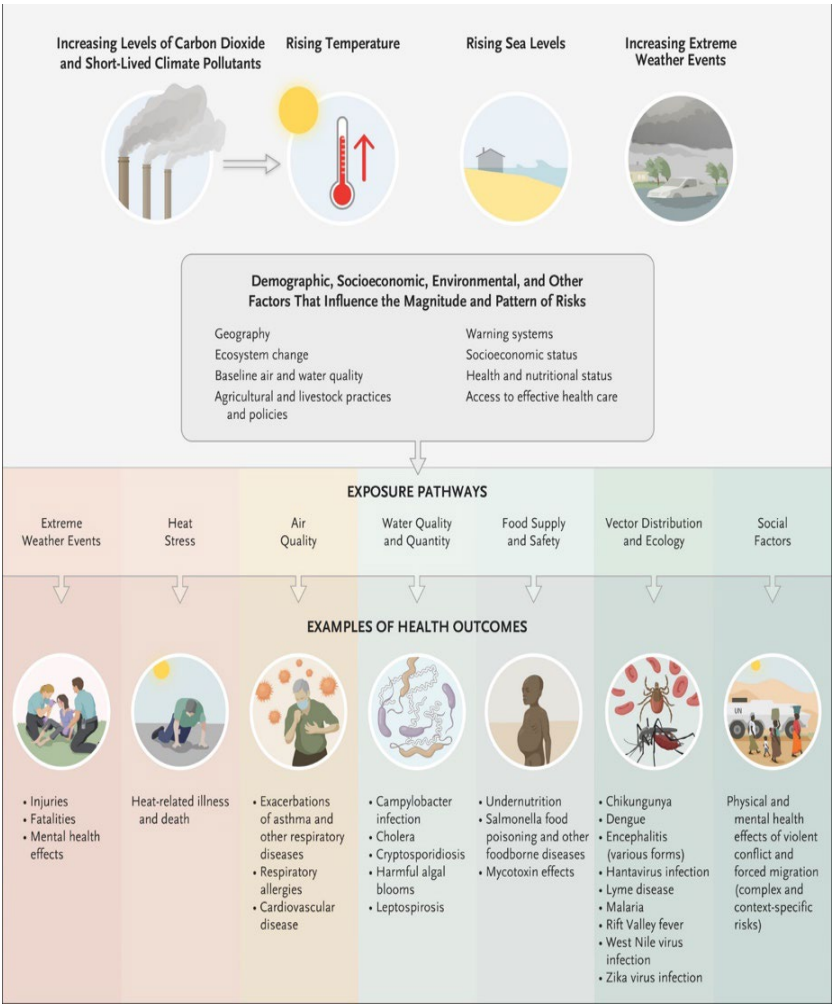


Figure 22: Climate change and health exposure pathways (Haines & Ebi, 2019)

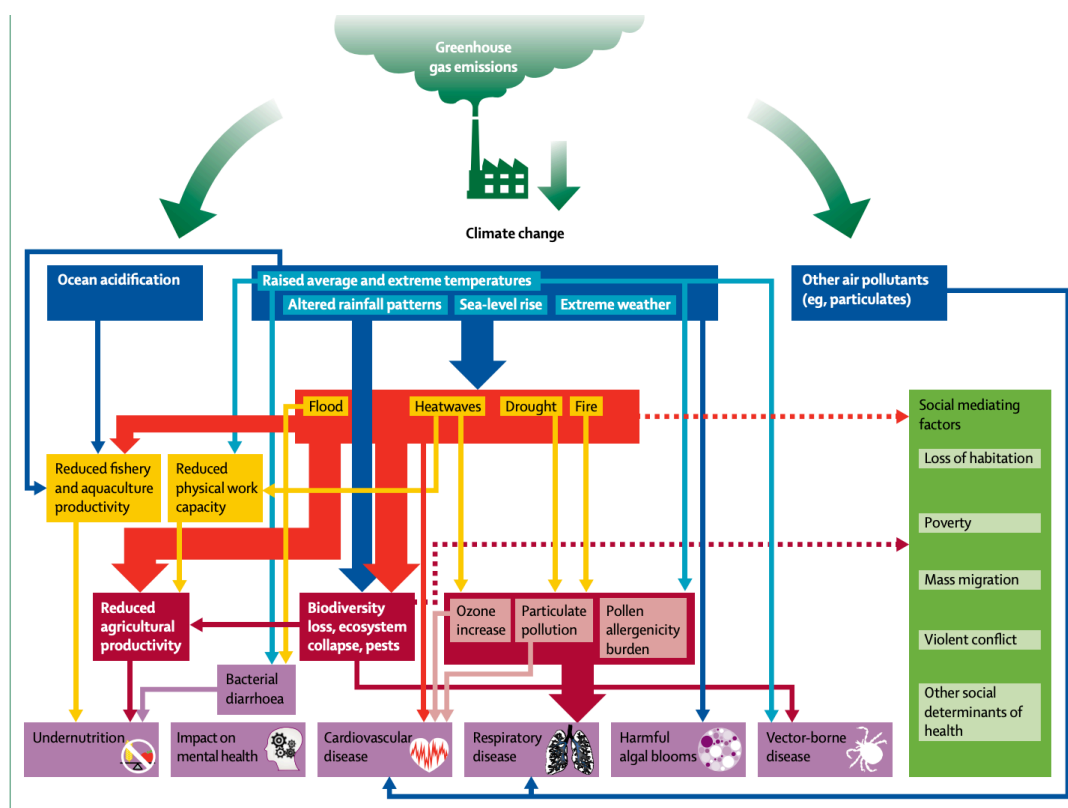


Figure 23: Impact chains between climate change drivers and human health (Source: The 2018 report of the Lancet Countdown)

Climate change effects in health can be broadly categorized as direct effects, effects mediated through natural systems, and effects mediated by human systems.

Direct effects of climate change lead to increased human health risks including: excess heat-related mortality; increased incidence of heat exhaustion and heat stroke; exacerbated circulatory, cardiovascular, respiratory and kidney diseases; increased premature mortality related to ozone and air pollution produced by fires, particularly during heat waves. Health related impacts associated with direct climate effect include the greater likelihood of injury, disease and death from climate induced disasters and wildfires, and exposure to extreme heat.

Exposure to extreme heat poses acute health hazards to specific populations. Individuals over 65, people living in urban areas, and people with underlying conditions are at high risk. Exposure to increased ambient temperatures has been associated with worsened respiratory symptoms, lower blood pressure, increased insulin uptake by patients with type one diabetes, worsened mental health symptoms, and reduced physical functioning⁸⁷. Moreover, people with limited adaptive capacity are disproportionately affected both due to their limited access to cooling and healthcare, and due to worsening of the social determinants of health (income and social protection, unemployment and job insecurity, working life conditions, food insecurity, Access to affordable health services of decent quality, etc.)⁸⁸.

Direct injury and death from climate induced disasters has also increased due to climate change. Hotter and drier conditions caused by climate change increase the risk of wildfires and the

⁸⁷ Tham, S. et al., 2020.

⁸⁸ Romanello, M. et al. 2021.

extent of their damage⁸⁹. Moreover, the past 30 years have seen statistically significant increases in the number of extreme weather events globally, with a statistically significant increase in the number of people affected by these events in low HDI countries⁹⁰.

In particular, tropical cyclones, may directly and indirectly affect health in many ways, for example by:

- increasing cases of drowning and other physical trauma;
- increasing risks of VBDs and WBDs;
- increasing mental health effects associated with emergency situations;

WBD and FBD are mediated by natural systems. Relevant health risks include: accelerated microbial growth, survival, persistence, transmission; shifting geographic and seasonal distribution of diseases ecological changes, droughts and warmer temperatures leading pathogen multiplication; extreme events leading to disruption of water supply system and contamination; insufficient or intermittent water access for health care practices; insufficient quality and quantity of water leading to poor hygiene; flood damage to water and sanitation infrastructures; contamination of water sources through overflow.

WBD and FBD outbreaks have been associated with increased temperatures and irregular but severe precipitation. *Campylobacteriosis*, *Cryptosporidium* sp. outbreaks and noncholera *Vibrio* sp. have been directly associated with parameters such as temperature and precipitation, while the impact of climate change on norovirus and *Listeria* sp. are also depended on other parameters throughout the food chain including cooling the food chain's steps⁹¹. An important aspect especially relevant to WBD is the effects of manure runoff or sewage overflow, during extreme precipitation events, floods and tropical cyclones, that can contaminate watersheds, groundwater, or water treatment plants and distribution systems.

VBD like dengue, chikungunya, zika are affected by climate change. VBD are linked with health risks such as accelerated parasite replication and increased biting rates; prolonged transmission seasons; re-emergence of formerly prevalent diseases; changing distribution and abundance of disease vectors; reduced effectiveness of vector control interventions.

Changes in temperatures and rainfall patterns have led to extended lengths of transmission seasons and/or the expansion/shift of suitable habitats for their vectors⁹². Mechanisms include effects of rainfall on larval densities, changes in spatial and temporal distribution of mosquito habitats, and adult mosquito survival and activity patterns. Additionally, vector abundance is also indirectly linked to climate change drivers through the degradation of ecosystems⁹³.

A set of human system mediated health risks concern the climate induced food insecurity. Health risk include lower food production; lower access to food due to reduced supply and higher prices; combined effects of undernutrition and infectious diseases.

Climate induced food insecurity is an important mediated impact on health that will disproportionately affect people who are the most vulnerable and those already facing

⁸⁹ Op cit.

⁹⁰ Op cit.

⁹¹ Semenza, J. et al., 2012.

⁹² Caminade C. et al., 2019.

⁹³ Op cit.

undernutrition. Climate induced risks include decreased crop yield potential from rising temperatures, changed precipitation patterns and droughts. Moreover, climate change is resulting in changes in marine fish capacity and capture through increases in sea water temperatures (and the associated reduced oxygenation), ocean acidification, and coral reef bleaching⁹⁴. In addition to the above drivers, saltwater intrusion from coastal erosion, sea level rise, and extreme events are the critical climate risks for food security in SIDS in general and FSM in particular⁹⁵.

Climate drivers that lead to indirect impacts are also linked with reduced access to health care services. Tropical cyclones can severely damage healthcare facilities and services, leaving communities without access to health care when they are needed most. Moreover, cyclones can be damaging fundamental infrastructure, such as food and water supplies reinforcing the effects on WBD and FBD.

Additionally, to the above there is emerging evidence that climate change may contribute to zoonotic spillovers. Zoonotic spillovers are of great importance because they can lead to epidemics or pandemics, such as Ebola and COVID-19. Climate-induced changes in vegetation increase the exposure of humans to zoonotic reservoirs and therefore also increase the risk of pandemics⁹⁶. Additionally, while the role of climate in modulating the various COVID-19 pandemic waves remains an open question, there is some evidence supporting the effects of climate parameters, and temperature in particular in epidemic progression⁹⁷.

Evidence Box 1: Key Facts on Climate Change and Health (WHO, 2018) [Global Evidence]

1. Climate change affects the social and environmental determinants of health - clean air, safe drinking water, sufficient food and secure shelter.
2. Between 2030 and 2050, climate change is expected to cause approximately 250,000 additional deaths per year from malnutrition, malaria, diarrhoea and heat stress.
3. The direct damage costs to health (i.e., excluding costs in health-determining sectors such as agriculture, water and sanitation) is estimated to be between USD 2-4 billion per year by 2030.
4. Areas with weak health infrastructure - mostly in developing countries - will be the least able to cope without assistance to prepare and respond.
5. Reducing emissions of greenhouse gases through better transport, food and energy-use choices can result in improved health, particularly through reduced air pollution.

Evidence Box 2: IPCC Special Report 1.5 degrees (IPCC, 2018) [Global Evidence]

Human Health Impacts at 1.5°C vs 2°C of Warming.

⁹⁴ Romanello, M. et al. 2021.

⁹⁵ ADB, 2011.

⁹⁶ Gupta, S. et al. 2021.

⁹⁷ Rodó, X. et al., 2021.

Warming of 2°C poses greater risks to human health than warming of 1.5°C, often with complex regional patterns, with a few exceptions.

A warming of 1.5°C compared to 2°C would lower:

1. The risk of temperature related morbidity and smaller mosquito geographic ranges;
2. The exposure of 3,546-4,508 million people to heatwaves;
3. The exposure of 496 million people exposed and vulnerable to water stress; and
4. 110-190 million fewer premature deaths.

If climate change continues as projected, major changes in ill health could include:

1. Greater risks of injuries, diseases, and death due to more intense heatwaves and fires;
2. Increased risk of undernutrition resulting from diminished food production and reduced nutritional quality of some cereal crops in poor regions;
3. Lost work capacity and reduced labour productivity; and
4. Increased risks of food-, water-, vector-borne diseases.

If climate change continues as projected, potentially limited positive health effects could include:

1. The reduction of cold-related morbidity and mortality in some areas due to fewer cold extremes;
2. Geographic shifts in food production; and
3. Reduced capacity of disease-carrying vectors due to exceedance of thermal thresholds.

However, these positive effects are projected to be increasingly outweighed, worldwide, by the magnitude and severity of the negative health effects of climate change.

Evidence Box 3: Executive Summary highlights from IPCC AR5, 2014 [Global evidence]

1. The health of human populations is sensitive to shifts in weather patterns and other aspects of climate change (very high confidence).
2. Until mid-century climate change will act mainly by exacerbating health problems that already exist (very high confidence).
3. In recent decades, climate change has contributed to levels of ill health (likely).
4. Impacts on health will be reduced, but not eliminated, in populations that benefit from rapid social and economic development (high confidence).

5. In addition to their implications for climate change, essentially all the important climate-altering pollutants other than carbon dioxide have near-term health implications (very high confidence).
6. Some parts of the world already exceed the international standard for safe work activity during the hottest months of the year (high confidence).
7. The most effective measures to reduce vulnerability in the near term are programs that implement and improve basic public health measures (very high confidence).
8. There are important research gaps regarding the health consequences of climate change and co-benefits actions, particularly in low-income countries (confidence level not applicable).

Evidence Box 4: IPCC AR5: Climate Change and Health (SIDS) [Regional Evidence] (Nurse et al., 2014)

Observed Impacts on Human Health

General: Globally, the effects of climate change on human health will be both direct and indirect, and are expected to exacerbate existing health risks, especially in the most vulnerable communities, where the burden of disease is already high. Many SIDS currently suffer from climate-sensitive health problems, including morbidity and mortality from extreme weather events, certain vector- and food- and water-borne diseases (Lozano, 2006; Barnett and Campbell, 2010; Cashman et al., 2010; Pulwarty et al., 2010; McMichael and Lindgren, 2011).

Extreme weather and climate events such as tropical cyclones, storm surges, flooding and drought can have both short and long-term effects on human health including drowning, injuries, increased disease transmission and health problems associated with deterioration of water quality and quantity.

Infectious disease: Most SIDS are in tropical areas with weather conducive to the transmission of diseases such as malaria, dengue, filariasis, and schistosomiasis.

The linkages between human health, climate variability, and seasonal weather have been demonstrated in several recent studies.

3.5 FSM specific health risks identified

The following sub-section discusses in detail the specific health risks that have been identified in FSM, by firstly presenting an overview of FSM specific context and then elaborating on the diseases and their impact pathways.

There is a scarcity of relevant health data and research on a country and local level concerning the health impacts of climate change. Therefore, while this sub-section utilizes primarily available data on a country or local level when these were not available regional or global and research was used.

Figure 24 presents the main climate drivers, pathways and health impacts identified in FSM. The overview is not exhaustive, but focuses on the most crucial drivers, impact pathways and their respective steps.

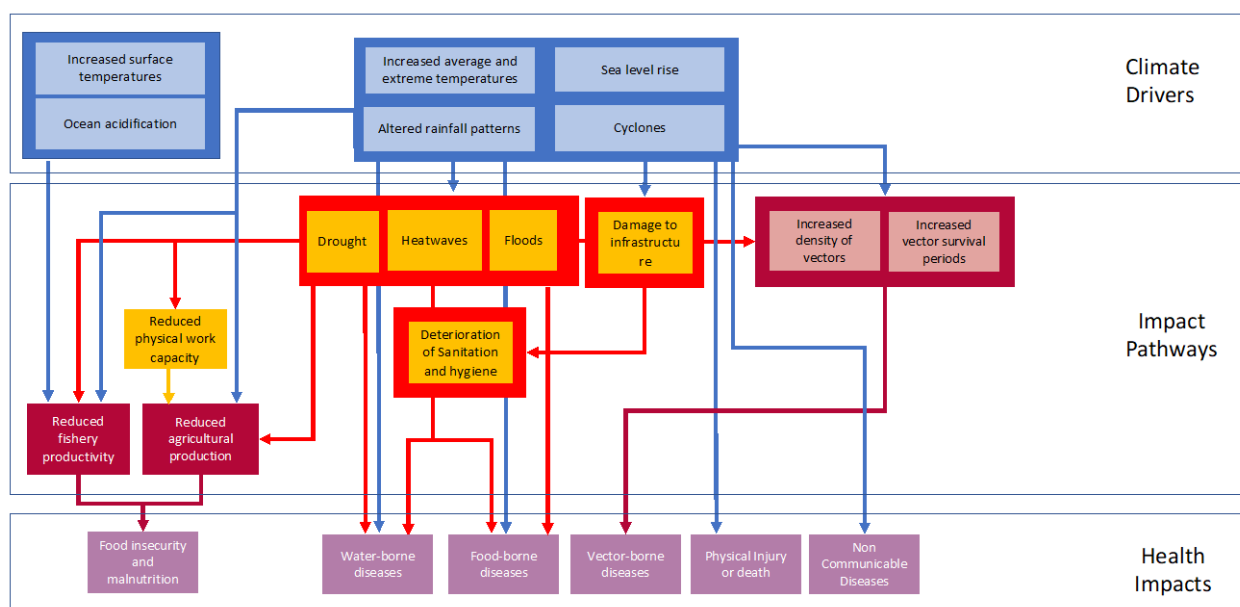


Figure 24: Main climate drivers, pathways and health impacts identified in FSM.

The most recent vulnerability, capacity and adaptation assessment conducted in 2015 in FSM revealed infectious diseases and malnutrition to be of primary concern (Table 6). This analysis used an impact (considering consequence and coping capacity) and likelihood matrix to prioritize health risks as high, medium and low.⁹⁸ Diarrheal disease, leptospirosis, dengue fever and other VBDs are considered to represent high risks with respect to future burdens of disease attributable to climate change.⁹⁹

Table 14: List of climate change and health vulnerabilities in FSM (Source: McIver et al., 2015)

Climate-sensitive disease	Risk (likelihood versus impact)
Diarrhoeal disease (water and food-borne)	High
Vector-borne disease (esp. arboviruses like Dengue)	High
Zoonosis (primarily Leptospirosis)	High
Malnutrition	High
Non-communicable diseases	Medium
Mental ill health	Medium

⁹⁸ McIver et al., 2015.

⁹⁹ McIver et al., 2015.

Respiratory diseases	Medium
Skin disease	Medium
Poverty and socio-economic disadvantage	Medium
Traumatic injuries and death	Low
Ciguatera	Low

Evidence Summary Tables: baseline incidence of climate-sensitive diseases, regional and national evidence of the observed and projected estimates of climate-sensitive diseases

Table 7 presents the number of cases of the key climate sensitive diseases over seven years. The incidence per 10, 000 people per year is calculated to give a baseline. By disease category, WBDs carries the heaviest burden, followed by VBDs, then FBDs. By disease itself, diarrhea/gastroenteritis carries the heaviest burden, followed by chikungunya, then dengue, other mosquito borne viral fevers and ascariasis.

Table 8 presents the national and regional evidence, both observed and predicted of the evidence of climate-sensitive diseases categorized as water-borne, food-borne, vector-borne and other infectious diseases. We note evidence gaps particularly at the national level for predicted rates of climate sensitive disease in which case we refer to regional and global evidence/projections. Some broad conclusions can be drawn from this evidence synthesis including that there are **no mechanisms in place at the national level to project the incidence of climate-sensitive disease relating to various climate scenarios**. There is **insufficient evidence on the past observed prevalence of climate-sensitive diseases** to draw adequate conclusions. Observed and projected evidence at the regional and global scale show that **climate change is likely to increase the risk of climate sensitive diseases (CSDs)** in the country and the region however, these relationships are complex. Health impacts will depend on various drivers in addition to climate change including national level mitigation and sustainable development efforts, underlying health conditions, levels of urbanization and demographic change.

Table 15: Baseline incidence of climate sensitive diseases in FSM - 2013-2019

Climate sensitive disease	2013	2014	2015	2016	2017	2018	2019	Total	Avg. p.a	Incidence per 10K p.a		
Water borne disease												Population FSM
Typhoid Fever	0	4	1	0	2	1	0	8	1.142857	0.103841351		2013 105936
Botulism	0	1	0	0	0	0	0	1	0.142857	0.012980169		2014 107446
Giardiasis (lambliasis)	10	5	8	6	16	13	39	97	13.85714	1.259076383		2015 108895
Diarrhoea / Gastroenteritis (presumed infectious)	3187	5172	4236	4163	3777	3894	2708	27137	3876.714	352.2428434		2016 110215
Hepatitis A (without hepatic coma)	6	1	5	4	1	2	3	22	3.142857	0.285563716		2017 111459
Schistosomiasis (unspecified)	0	0	0	0	0	2	1	3	0.428571	0.038940507		2018 112640
Total WDB burden								27268	3895.429	353.9432455		2019 113815
Vector borne disease												Mean 110058
Dengue fever (classic)	244	66	5	1	3	3	815	1137	162.4286	14.75845204		
Dengue hemorrhagic fever	0	0	0	0	0	1	25	26	3.714286	0.337484391		
Chikungunya virus disease	2095	289	0	1	0	0	0	2385	340.7143	30.95770282		
Other mosquito borne viral fevers	1	0	0	2	59	94	954	1110	158.5714	14.40798748		
Malaria (unspecified)	0	0	0	1	0	1	1	3	0.428571	0.038940507		
Filaris (unspecified)	1	3	2	0	0	3	1	10	1.428571	0.129801689		
Total VBD burden								4671	667.2857	60.63036892		
Food borne disease												
Salmonella (unspecified)	0	0	0	1	0	0	1	2	0.285714	0.025960338		
Shigellosis	0	0	0	0	1	0	0	1	0.142857	0.012980169		
Acute gastroenteropathy (Norwalk agent)	0	1	0	0	1	0	0	2	0.285714	0.025960338		
Toxoplasmosis (unspecified)	0	0	1	3	1	2	3	10	1.428571	0.129801689		
Ascariasis (unspecified)	122	139	74	75	48	67	46	571	81.57143	7.411676441		
Trichuriasis	1	0	0	0	0	0	0	1	0.142857	0.012980169		
Other bacterial agents causing food borne disease	42	54	62	106	93	48	86	491	70.14286	6.373262929		
Total FBD burden								1078	154	13.99262207		

Table 16: Baseline burden of FBDs, VBDs and WBDs in 4 FSM States in the period 2013-2019
(Source: EpiNet State Hospital Surveillance System in FSM, 2019)

States:	Chuuk	Pohnpei	Yap	Kosrae
Foodborne disease	555 (10.5%)	364 (1.1%)	159 (1.4%)	0
Vector-borne disease	5 (0.0001%)	8 (0.0002%)	4363 (39.6%)	295 (3.9%)
Water-borne disease	5588 (10.5%)	12573 (37.5%)	3531 (32.1%)	5576 (74.3%)

Table 17: Summarized narrative evidence on the estimates of climate-sensitive disease (observed and projected) regionally (Pacific and SIDs) and nationally (FSM) synthesized from the existing evidence base.

Regional evidence¹⁰⁰: Observed	Regional evidence: Projected	FSM national evidence: Observed	FSM national evidence: Projected
Water-borne diseases			

¹⁰⁰ When regional evidence was not available, we used global evidence and noted as such.

Regional evidence ¹⁰⁰ : Observed	Regional evidence: Projected	FSM national evidence: Observed	FSM national evidence: Projected
<p>The risk of WBD in PICs generally increases with increases in temperature, rainfall extremes (scarcity/drought as well as abundance/flood) and during natural disasters (Brown & Murray, 2013; Cann et al., 2013 in WHO, 2015).</p>	<p>There is growing concern in Pacific, Indian Ocean and Caribbean SIDS that freshwater scarcity and more intense droughts and storms could lead to a deterioration in standards of sanitation and hygiene (Cashman et al., 2010; McMichael and Lindgren, 2011 in IPCC AR5 SIDS). This would create circumstances of increased exposure to a range of communicable health risks (Nurse et al., 2015).</p> <p>The cholera risk is projected to increase as a consequence of climate change (Russell, 2009 in IPCC AR5 SIDS).</p> <p>While the aetiological pathways between climate change and diarrhoeal disease are complex, there is strong evidence linking diarrhoeal disease¹⁰¹ to climate variability and change (McIver et al., 2015). The evidence links diarrhoeal illness to climatic factors such as temperature, rainfall, hydro-meteorological events and ENSO cycles in the Pacific region (McIver et al., 2015).</p>	<p>There is a heavy burden of diarrhoeal disease in FSM, particularly in children under five. Strong evidence links diarrhoeal illness to climatic factors such as temperature, rainfall, ENSO cycles & hydro meteorological disasters in the Pacific region (Samo & Elymore, 2010; McIver et al., 2015).</p> <p>On the four main islands of FSM there have been 27,268 cases of waterborne disease recorded over 7 years (2013-2019): Chuuk (5,588); Pohnpei (12,573); Yap (3,531); and Kosrae (5,576). The key WBDs are Typhoid, Botulism, Giardiasis, infectious diarrhoea and gastroenteritis (most common), hepatitis and schistosomiasis (ESHSS-FSM, 2019).</p> <p>In Micronesian countries including FSM, water-borne pathogens have been linked to large outbreaks of diarrhoeal illness in recent years (McIver, et al., 2015).</p>	<p>No national evidence found.</p>
<p>Food-borne disease Food insecurity & malnutrition</p>			

¹⁰¹ Diarrheal disease is a broad category of disease, which is not limited to infectious pathogens as there are also non-infectious causes. Of the infectious origins, not all are transmitted via water (or food). Diarrhoeal disease arising from water (and food) contamination are considered most sensitive to environmental changes including temperature and rainfall. Despite this complexity, reporting of diarrhoeal disease is often in the aggregate (McIver et al., 2015).

Regional evidence ¹⁰⁰ : Observed	Regional evidence: Projected	FSM national evidence: Observed	FSM national evidence: Projected
<p>Ciguatera fish poisoning (CFP) is the most common non-bacterial food-borne illness associated with consumption of fish and typically occurs in tropical regions. CFP is related with sea surface temperature. Climate change has been associated with increased burden of CFP (Gingold et al. 2014). High rates of CFP occur in the Pacific in Tokelau, Tuvalu, Kiribati, Cook Islands, and Vanuatu (Chan et al., 2011 in IPCC AR5 SIDS).</p> <p>Other studies clarify associations between climate variability and CFP incidence suggesting that climate change could increase the burden of CFP. These findings have implications for disease prediction, surveillance, and public health preparedness for climate change (Gingold et al, 2014). However, when considering the impact of climate change on ciguatera, there are two thresholds, namely waters that remain warm enough for a long enough period can lead to ciguatera and that extended periods where the water remains too hot may depress ciguatera case rates (Llewellyn, 2010).</p> <p>In the Western Pacific Region, a combination of climate-related rising temperatures, poor air quality and variable rainfall patterns is</p>	<p>Increased air temperatures and increased relative humidity due to heavy precipitation could lead to an increase in pathogens in food. This is associated with increased incidence of and changes in risks associated with FBDs (El-Fadel et al., 2012; Fleury et al., 2006; Rose et al., 2001).</p> <p>In other settings, higher temperatures are an established cause of elevated salmonellosis (ref: Australian cities). There is a need to ascertaining regional effects and pathogen-dependent differences concerning FBDs (GCF, 2020).</p> <p>As the intensity of tropical cyclones is expected to increase in certain Pacific regions, pathogens dispersed by wind may become of increasing climate change concern (IPCC, 2013). Salmonella and Campylobacter (pathogens for gastroenteritis) increase with higher rainfall, in Pacific coastal areas (Wilkes et al., 2009). Higher temperatures also enhance Salmonella's resistance to environmental stress (Montville et al., 2012). Salmonellosis is correlated to increased temperatures (Tirado et al., 2010). Increased intensity of storm systems may bring more foodborne pathogens into</p>	<p>On the four main islands of FSM there have been 1,078 reported cases of foodborne disease over 7 years (2013-2019); Chuuk (555), Pohnpei (364), Yap (159), and Kosrae (0), with more than half of them directly associated with climate-sensitive diseases (ESHSS-FSM, 2019). Based on the relevant data key climate-sensitive FBDs in FSM include Salmonella, Shigellosis, Ascariasis (most common), Trichuriasis and other unspecified food-borne agents causing disease.</p> <p>The links between climate change and FBD relate largely to the effects of rising temperatures that are likely to increase the burden of certain pathogens in the pathway from transport, preparation handling, cooking and storing. Several authors have made reference to the potential increased risk of pathological contaminants in food in warmer conditions including Salmonella, Shigella, Campylobacter, Escherichia coli and a range of viruses (Britton et al 2010; D'Souza et al 2004, El-Fadel et al 2012; Kovats et al, 2004)</p> <p>Food security in the Pacific, especially in Micronesia, has worsened in the past half century in both urban and rural communities. Climate change will</p>	<p>The pathways by which factors such as temperature, rainfall, ENSO and extreme events affect the multiple pathogens causing infectious diarrhoea creates a complex aetiological picture (McIver et al., 2015). In Pohnpei and Kosrae (and elsewhere in the Pacific) a significant association has been established between climatic factors such as temperature and the incidence of diarrhoeal disease (McIver, et al., 2015).</p>

Regional evidence ¹⁰⁰ : Observed	Regional evidence: Projected	FSM national evidence: Observed	FSM national evidence: Projected
<p>expected to reduce crop yields, compromising food security and worsening undernutrition (WHO, 2017). Rising level of malnutrition contribute to adverse health outcomes and increased disease burden, especially amongst vulnerable groups.</p>	<p>the water column and elevate the risk of disease transmission (GCF, 2021).</p> <p>Distribution and abundance of the organisms that produce the toxins that lead to CFP (chiefly dinoflagellates of the genus <i>Gambierdiscus</i>) correlate positively with water temperature (Nurse et al., 2014). Increasing temperatures associated with climate change could increase the incidence of CFP in the island regions of the Pacific (Chan et al., 2011; Rongo and van Woesik, 2011 in IPCC AR5 SIDS). There is growing concern in island communities in the Pacific and Indian Oceans and the Caribbean Sea that freshwater scarcity and more intense droughts and storms could lead to a deterioration in standards of sanitation and hygiene (Cashman et al., 2010; McMichael and Lindgren, 2011 in IPCC AR5 SIDS). This would create circumstances of increased exposure to a range of communicable health risks (Nurse et al., 2015).</p>	<p>further hamper local food production (Connell, 2015; Campbell, 2015).</p> <p>Climate change is a significant threat to food security, impacts all dimensions of food production, availability, stability and utilisation. Climate change has reduced food production and increased variability of supply in PICs (Cvitanovic et al., 2016). Climate change affects the ability of individuals to access and use food effectively by altering the conditions for food safety and increasing the risks of food-, water- and vector-borne diseases (Githeko et al., 2000; Patz et al., 2005). The profound impact of climate change on the production of coastal fisheries throughout the Pacific Island region (Bell et al., 2013) will adversely affect the ability of communities to access fish, which is a significant concern given that fish provide between 50% and 90% of animal protein for rural communities in the majority of PICs (Bell et al., 2009). Resultant increased reliance on imported food (that is more likely to be processed, high in sugar, fat and/or salt) increases the risk of NCDs (Cvitanovic et al., 2016).</p> <p>In Micronesian countries including FSM, food-borne pathogens have been linked to large outbreaks of diarrhoeal</p>	

Regional evidence ¹⁰⁰ : Observed	Regional evidence: Projected	FSM national evidence: Observed	FSM national evidence: Projected
		illness in recent years (McIver et al., 2015).	
Vector-borne disease - General			
The most relevant climate-sensitive vector-borne diseases in PICs are malaria, dengue fever, leptospirosis (zoonosis) and lymphatic filariasis and rarer arboviruses such as Chikungunya and Zika (McIver et al., 2015).	The health risks associated with VBDs increase with greater warming. Changing weather patterns associated with climate change are shifting the geographic range, transmission intensity and seasonality of selected climate-sensitive VBDs, with increases and decreases projected with additional warming (IPCC SR 1.5, 2018). Projections of infectious disease transmission depend on the disease, the region and the degree of temperature change. Similarly, the pattern and magnitude of future impacts depend on the scale and effectiveness of adaptation and vulnerability reduction, and on mitigation for risks past mid-century (IPCC SR 1.5, 2018) [Global evidence].	The most recent data on the baseline burden of disease in FSM is provided by the EpiNet State Hospital Surveillance System in FSM. On the four main islands of FSM there have been 4,671 cases of VBD recorded over seven years (2013 - 2019); Chuuk (5) Pohnpei (8) Yap (4,363) and Kosrae (295). The occurrence is sporadic and there has not been a steady increase on every island over time according to reported cases. The key VBDs recorded are dengue fever (classic), dengue haemorrhagic fever, Chikungunya, other mosquito-borne viral fever, unspecified malaria and filariasis. The most cases were recorded on Yap in 2013 (2,055 cases of Chikungunya) (ESHSS-FSM, 2019).	No national evidence found.
Malaria (VBD)			
Malaria is currently a leading cause of morbidity and mortality in many PICTs - with worse outcomes for pregnant women and children under five. The Asia-Pacific aims to eliminate malaria by 2030 (WHO, 2013). There is well established influence of climatic	Social and environmental conditions favour the spread of malaria in some island regions and are expected to be enhanced under projected changes in climate in Papua New Guinea, Guyana, Suriname, and French Guyana (Michon et al., 2007; Figueroa, 2008;	While VBDs are high priority CSDs in FSM, malaria occurs in some, but not all PICs. The relationship between malaria and climate is the subject of significant research however, in the Pacific, this research is limited. There is evidence of an 'ideal temperature range' for malaria (WHO, 2015).	Although it is possible climate change will affect the geographic range of the malaria vector, causing intrusion into non-endemic countries, this is currently considered to be a relatively low risk for FSM where malaria is not considered endemic (McIver et al., 2015).

Regional evidence ¹⁰⁰ : Observed	Regional evidence: Projected	FSM national evidence: Observed	FSM national evidence: Projected
<p>factors on malaria vector density and parasite development (Chaves and Koenraadt, 2010; Béguin et al., 2011). Previous statistical modelling studies have assessed the potential influence of climate change on malaria (Martens et al., 1999; Pascual et al., 2006; Parham and Michael, 2010).</p> <p>Solomon Islands and Vanuatu are two of 22 countries in the Asia-Pacific with endemic malaria (Maude et al., 2019). Both are currently on track to halt and reverse the incidence of malaria (SDG 3).</p> <p>The WHO Western Pacific Region (WPRO) had an estimated 1.7 million cases in 2019, a decrease of 43% from the 3 million cases in 2000. Over the same period, malaria case incidence reduced from five to two cases per 1000 population at risk (WHO, World Malaria Report, 2020). In WPRO, malaria deaths reduced by 52%, from about 6,600 deaths in 2000 to 3,200 deaths in 2019. The mortality rate reduced by 60%, from one to 0.4 malaria deaths per 100K population at risk (WHO, World Malaria Report, 2020). The geographic distribution and biological activity of the malarial parasite and its vector are sensitive to climatic influences, especially temperature and precipitation.</p>	<p>Rawlins et al., 2008; Nurse et al., 2015).</p> <p>In the last 10 years in the Caribbean, malaria occurrence in non-endemic island countries suggests that all of the essential malaria transmission conditions now exist (Nurse et al., 2015).</p> <p>Owing to the greater geographic range for the malaria vector, a longer season, and/or an increase in the number of people at risk, many global scientific studies suggested the negative health impact of malaria could increase with climate change (WHO SR 1.5, 2018).</p>	<p>Recent modelling of climate change and malaria suggests in many regions the climate will become more suitable for malaria parasites and vectors (Caminade et al., 2014). Another study deemed malaria to represent significantly lower risks than arboviruses in the context of climate change in FSM. While the possibility remains that climate change will affect the geographic range of the malaria vector, causing intrusion into non-endemic countries, FSM is not currently one of the PICs considered endemic for malaria and this is currently considered to be a relatively low risk for FSM (McIver et al., 2015)</p>	

Regional evidence ¹⁰⁰ : Observed	Regional evidence: Projected	FSM national evidence: Observed	FSM national evidence: Projected
Assessment of the potential impact of global climate change on the incidence of malaria suggests a widespread increase of risk due to expansion of the areas suitable for malaria transmission [Global evidence].			
Dengue (VBD)			
<p>There have been outbreaks of dengue fever in PICTs over several decades. The incidence of dengue fever in the Pacific appears to be rising in part due to increased urbanisation, which results in more breeding sites for the main vector, <i>Aedes aegypti</i>. Increasingly mobile and interconnected populations may be exacerbating dengue incidence by introducing the virus from other islands or endemic countries (McIver et al., 2015).</p> <p>Malaria & Dengue fever have been increasing in some Pacific islands, especially in Tonga, Samoa, and Kiribati. Studies in the Pacific have established a direct link between malaria, dengue, and climate variability (Russell, 2009 in IPCC AR5 SIDS).</p> <p>Models of dengue (and malaria) suggest that socioeconomic development will partly offset the adverse effects of global climate change on incidence of</p>	<p>Many studies have found associations between climatic conditions and dengue transmission. However, there is a debate about the future impacts of climate change on dengue transmission. Most studies in a systematic literature review showed that the transmission of dengue is highly sensitive to climatic conditions, especially rainfall, temperature, and humidity. Future projections this century indicate increased climatic suitability for transmission and an expansion of the geographic regions (Naish et al., 2014).</p>	<p>There were major outbreaks of dengue fever in the Marshall Islands and FSM in 2011 and 2012. Dengue fever (amongst other VBD) has been shown to be especially sensitive to hydro-meteorological phenomena, including temperature, rainfall, humidity and ENSO (Banu et al., 2011; Hales et al., 1999), including in the Pacific region (McIver et al., 2015).</p> <p>Dengue fever epidemics affect FSM roughly every 3-6 years. In 2011, Yap reported around 700 dengue fever cases, with 140 requiring hospitalisation. A state of emergency was declared (Johnston, 2011). In 2012-2013, Kosrae experienced a major dengue outbreak. Approximately 3.7% of Kosrae State residents had been hospitalized with suspected dengue. In August 2019, FSM government reported a type-3 dengue fever outbreak was affecting the State of Yap. By the end of the month FSM reported 406 suspected cases of dengue fever</p>	No national evidence found.

Regional evidence ¹⁰⁰ : Observed	Regional evidence: Projected	FSM national evidence: Observed	FSM national evidence: Projected
<p>the disease (Astrom et al., 2012)</p> <p>In the small island countries of Trinidad, Tobago and Singapore dengue outbreaks have been significantly correlated with rainfall and temperature (Chadee et al., 2007; Koh et al., 2008).</p>		<p>and 91 confirmed cases, with 32 hospitalized cases and one reported death. In addition, there were 14 reported co-infection cases with leptospirosis</p>	
Leptospirosis (VBD and WBD)			
<p>SIDs are considered highly-endemic zones for leptospirosis (Nurse et al., 2014) including several countries in the Pacific (Colt et al., 2014). Studies in Guadeloupe demonstrated a link between leptospirosis incidence and El Niño occurrence, with rates increasing to 13 per 100,000 population in El Niño years, as opposed to 4.5 cases per 100,000 inhabitants in La Niña and neutral years (Herrmann-Storck et al., 2008).</p> <p>During the 1996-2007, in Trinidad, Leptospirosis cases show seasonal patterns of occurrence, with significantly more cases occurring in the wet season than during the dry season (Mohan et al., 2009).</p>	<p>Changes in leptospirosis epidemiology have been recorded in tropical islands due to climatic and anthropogenic contributing factors (Pappas et al., 2008) that may be enhanced with increases in ambient temperature and changes in vegetation, precipitation, and water availability as a consequence of climate change (Russell, 2009).</p>	<p>FSM lacks surveillance data for human leptospirosis. A hospital-based serologic study of 66 hospital patients in Pohnpei demonstrated a high burden of leptospirosis. 54 participants tested showed serologic evidence of acute infection (Colt et al., 2014).</p> <p>In August 2019, there were 378 suspected cases of leptospirosis in Yap State. Over all cases recorded in 2019, 82 were reported positive based on Rapid Diagnostic Test of which 14 cases were co-infected with dengue. There were 25 hospitalized cases of leptospirosis, but no deaths reported (WHO, 2019).</p> <p>Risk factors for the transmission of Leptospirosis present in FSM include: a humid tropical climate; close association between animals and humans; horticultural or pastoral livelihoods; slaughter or</p>	<p>Risk factors for leptospirosis transmission in FSM include: a humid tropical climate; close association between animals and humans; horticultural or pastoral livelihoods; slaughter or food preparation of carrier animals; and recreational activities like swimming, hiking, and children's outdoor play. FSM experiences high annual rainfall contributing to a potentially endemic environment. Compounding these factors, climate change estimates predict that these conditions will worsen with increasing temperatures and annual rainfall (Colt et al., 2014; Lau et al., 2010).</p>

Regional evidence ¹⁰⁰ : Observed	Regional evidence: Projected	FSM national evidence: Observed	FSM national evidence: Projected
		food preparation of carrier animals; and recreational activities like swimming, hiking, and children's outdoor play. Pohnpei, FSM experiences high annual rainfall contributing to a potentially endemic environment. Compounding these factors, climate change estimates predict that these conditions will worsen with increasing temperatures and annual rainfall (Epstein, 2005; Colt et al., 2015).	
Other climate sensitive VBDs (Zika, Chikungunya, Lymphatic filariasis)			
Lymphatic filariasis is endemic in most of the PICTs (WHO, 2013) including FSM where it is becoming less prevalent due to mass drug administration and vector control programs (McIver et al., 2015; Burkot et al., 2002). FSM and several other PICTs (Marshall Islands, Tonga, Niue, Vanuatu, Cook Islands) expected to eliminate lymphatic filariasis as a public health problem by 2013-2015, following mass drug administration (WHO, 2017). Climate change can increase filariasis disease transmitted by a number of vectors however, other factors play an important role such as environmental sanitation, human behaviour, and the nature of the relationship between climate variables (temperature, rainfall,	The two key vectors for dengue fever, yellow fever, chikungunya, and Zika virus are projected to increase in number , with a larger geographic range by the 2030s than at present, which could put more individuals at risk of the diseases they carry, with regional differences (IPCC, SR 1.5, 2018) [Global evidence]. Climate change could increase or decrease future negative health impacts of leishmaniasis, Chagas disease, and other vector-borne and zoonotic diseases , with generally greater negative health impacts at higher degrees of warming (WHO, 2018) [Global evidence].	FSM carries a heavy burden of disease due to other arboviruses including Zika virus and Chikungunya (McIver et al., 2015; Duffy et al., 2009; Savage et al., 1998). The first observed outbreak in a human population occurred in 2007 on the Yap main island. There have not been recorded outbreaks of Zika virus in FSM since then (WHO, 2018) From August to October 2013, the Yap State Department of Health identified an unusual cluster of illness, with patient samples having evidence of recent chikungunya virus infection. Over the year-long outbreak, 3% of residents on Yap Main Island were hospitalized (Pastula et al. 2017). A chikungunya case was also lab confirmed on	No national evidence found.

Regional evidence ¹⁰⁰ : Observed	Regional evidence: Projected	FSM national evidence: Observed	FSM national evidence: Projected
<p>humidity) (Syafii et al., 2021).</p> <p>Regions experiencing extreme climatic conditions also experience a striking peak in the geographic distribution of Zika virus in the subsequent month (correlation). Temperature is known to have a role in adult vector survival, viral replication, and infective periods. Elevated temperatures (within a certain range) can expand the geographic vector range, decrease the incubation period of the pathogen, and increase the biting rate. Precipitation provides essential habitat for larvae during the aquatic stages of the <i>Aedes</i> lifecycle, and drought can indirectly expand the vector's range (Paz & Semanza, 2016).</p> <p>Transmission of vector-borne infectious diseases like Zika virus, depends on many factors that include socioeconomic and ecologic conditions, urbanisation, access to health care and intrinsic human immunity. Vectors, infectious agents and replication of pathogens are dependent on climatic variables. A temperature increase generally favours vector proliferation and reproduction. Climate changes in temperate locations can further expand the length of the transmission season (Asad et al., 2018).</p>		<p>Pohnpei in 2015 (FSM, 2019).</p>	

Regional evidence ¹⁰⁰ : Observed	Regional evidence: Projected	FSM national evidence: Observed	FSM national evidence: Projected
It is likely that arboviruses, such as Chikungunya , will continue to emerge in new areas in the Pacific & be associated with a changing global climate (Derriak et al., 2010).			

3.6 Adaptation needs

Adaptation needs for this project have been identified through reviews of primary and secondary sources, as well as through stakeholder consultations. The primary sources include FSM GCF Country Programme, FSM NCCHAP and the Stakeholder Consultations Background Study Report submitted in support of the project's concept note.

The main adaptation needs identified are presented below.

1) Institutional Arrangements and Policy

- a) To achieve an enabling environment for the effective implementation of adaptation measures there is a need for the **development of a full range of sector policies and strategies** that ensure public health adaptation considerations are taken into account in relation to project climate trends. Policies and strategies that ensure the health impacts of climate change due to VBD, WBD and FBD considerations are reflected in all relevant development and social economic and plans and activities, is yet to be achieved.
- b) To achieve effective implementation of policies, all institutions should **have clear understanding** of responsibility and mandates related to managing the health impacts of climate change due to VBD, WBD and FBD, **to successfully implement their roles**. Institutions should be specialized in dealing with the health impacts of climate change in all sectors, including health, economy and disaster, water and agriculture.
- c) There is a need for the **identification of appropriate adaptation measures** that take into account the local specificities and risks due to VBD, WBD and FBD.
- d) There is a need to **consolidate the fragmented VCA processes** since assessments lack continuity and have specific focus limiting possible synergies among the different sectors.

2) Personnel capacity

- a) Implementation of effective adaptation measures **requires adequate highly skilled personnel** in permanent positions to take on the task of managing risks for the health impacts of climate change due to VBD, WBD and FBD over the near and long term.

- b) There is a need to **strengthen the understanding of health and technical personnel** concerning the vulnerability to the health impacts of climate change at the National, State, island or community levels caused by VBD, WBD and FBD.

3) Institutional Capacity

- a) There is a need for **effective cooperation between different government levels and sectors** departments to effectively implement climate adaptation actions.
- b) There is need to **develop institutional capacity** in climate change impacts on health issues, as well as develop processes that will allow continuation of effectiveness in cases of staff turnover.

4) Information and Knowledge

- a) There is a need for a **centralized system on health and climate information** that will support centralized data collection and accessibility, learning and planning, as currently surveillance systems in FSM remain fragmented and lack interoperability.
- b) There is a need for tailored measures to strengthen the **public awareness and for the effective communication** concerning climate change impacts on health issues.

5) Climate Resilient WASH infrastructure

- a) There is an important need to improve the **climate resilience of WASH infrastructure** for an important part of the population to reduce the impact of FBD and WBD.

6) Interventions to reduce vector populations and VBD impact

- a) There is an important need to **increase the awareness** of local communities on the importance of **implementing community-level interventions and good practices** (such as environmental clean-ups), in order to decrease vector populations and therefore VBDs prevalence and impact.

1) Institutional Arrangements and Policy

FSM have made some initial progress in developing policies and planning tools to address climate-induced health risks and impacts. These include the development of NCCHAP and the development of systems for vulnerability and capacity assessment. Nevertheless, it is essential to increase the institutional capacity to develop effective policies and improve coordination.

The NCCHAP, which is the main strategic document concerning the adaptation of the health sector, has shortcomings in its operational aspects. Broad knowledge and mainstreaming of this plan, or roadmaps of implementation, are not prevalent in FSM - rendering the NCCHAP ineffective. Updating and improving the NCCHAP and the overall improvement of the institutional capacity to keep policies and measures up to date would greatly benefit the effective transition of policies to practice.

Additionally, a major institutional gap is linked with the implementation of VCAs in the FSM. The FSM.

As it was highlighted by the stakeholder consultations and is evident from the vulnerability assessment available for the FSM there is lack of continuity¹⁰². Moreover, there is a lack of coordination between the different state and national departments. In particular, in the health sector the roles and responsibilities concerning vulnerability assessments fragmented and with limited focus and capacity to develop synergies across the different sectors¹⁰³. This fragmentation also contributes to the information and knowledge gaps discussed in point 4.

2) Personnel capacity

The NCCHAP recognises that there are important needs in training and educating health professionals in climate-induced risks and impacts. According to the NCCHAP, the lack of personnel capacity influences the surveillance of vectors; timely and accurate diagnosis, including the capacity to differentiate between pathogens for FBD; and the outbreak response.

This applies to all healthcare professionals (doctors, nurses and allied health), but also includes other public health professionals. Other needs therefore include training environmental health officers in mosquito surveillance, training animal/agriculture professionals concerning the risks of climate-sensitive diseases, and training water and sanitation technicians.

The knowledge and capacity gaps also affect the effective monitoring of climate-sensitive diseases. As far as effective monitoring is concerned, the lack of capacity affects the timely and accurate diagnosis; the proper, timely and ongoing reporting of cases; and the capacity to properly analyse data.

3) Institutional Capacity

To achieve an enabling environment for the effective implementation of adaptation measures there is a need for cooperation and coordination between the sector departments at national and state levels. As it is identified by the NCCHAP and the consultations for the preparation of the Stakeholder Consultations Background Study Report, there is a need for stronger cooperation between the different sectors. Cooperation is crucial especially taking into consideration the limited resources that FSM has available.

Moreover, since there is a high turnover rate of personnel, there is a need to ensure the smooth transition. The knowledge gaps that are created during personnel changes hinder the effectiveness of the interventions. Therefore, the development of institutional processes that ensure that transitions do not lead to discontinuation of the interventions are essential.

4) Information and Knowledge

¹⁰² The most recent health vulnerability assessment is the following: McIver (2015) Health Impacts of Climate Change in Pacific Island Countries: A Regional Assessment of Vulnerabilities and Adaptation Priorities.

¹⁰³ DECEM is undertaking GIS mapping and providing post-disaster response for communities, FSM Food Lab does limited testing for FDB, State utilities assess WASH needs and provide assistance, EPA and DHSA assess vulnerability concerning WBD.

A common underlying issue concerning the adaptation to climate-induced health risks discussed in the NCCHAP¹⁰⁴ and research papers¹⁰⁵ is the absence of effective monitoring of climate-sensitive diseases. While there has been a study assessing the impact of climate parameters on climate-induced diseases that was able to reach statistically significant associations, the analysis has been based on data from two hospitals. Moreover, the data series had significant gaps, reflecting the lack of capacity in each of the states over the period in question.¹⁰⁶ There are no reliable datasets available for all islands, something that reflects the overall paucity of data. The lack of data for FBD, WBD, and VBD has been identified as a significant gap in the NCCHAP, which also highlights that the health information/data collection system should be improved.

There are currently two formal surveillance systems that are primarily used in FSM in terms of diseases surveillance:

- 1) Syndromic Surveillance System (WBD and FBD), that monitor Dengue-like diseases (e.g., influenza); and,
- 2) Notifiable Disease Surveillance System (lab-confirmed cases from stool sample findings).

There is also an informal monitoring system in FSM that provides significant - albeit not formal - amount of information: the “Coconut Wireless” System provides information coming from families and households. Nevertheless, the above systems have significant shortcomings, concerning reliability and verification, and lack meaningful interoperability with systems of environmental monitoring as it was noted in the consultation with EPA representatives.

Reliable health data concerning climate-sensitive diseases are the basis for any meaningful intervention to address climate risks to public health. Nevertheless, the overall need of FSM is the improvement of the effectiveness of disease control, ideally by intervening before or at the beginning of the epidemic curve, instead of the later stages of the outbreak. Improved capacity for routine surveillance can lead to better timing of interventions, though relying on such systems often excludes any meaningful preventive response¹⁰⁷.

Currently, there are important gaps and fragmentation in the surveillance systems in FSM, which, as the NCCHAP identifies, can lead to problematic responses. The development of a centralised, reliable system that would be able to effectively guide the decisions for timely interventions would contribute significantly to curbing the burden of climate-sensitive diseases.

The lack of technical equipment limits the capacity of laboratories to effectively monitor climate-sensitive diseases. As the NCCHAP points out, there are significant gaps in the technical capacity for accurate diagnosis of WBD and FBD, and there is a need for ongoing certification of laboratory and water/sanitation technicians. The limitations are further accentuated by the lack of capacity and certification of health and technical personnel.

Another aspect of information and knowledge needs concerns the public awareness and knowledge in the communities. The NCCHAP identifies community practices as a factor that contributes to the vulnerability to climate-sensitive diseases. Practices can greatly affect the vulnerability to FBD, WBD, and VBD (e.g., food handling, sanitation practices). While part of this practices is due

¹⁰⁴ National Climate Change and Health Action Plan (NCCHAP) for the Federated States of Micronesia - December 2012.

¹⁰⁵ e.g. McIver et al., 2015.

¹⁰⁶ Ibid.

¹⁰⁷ WHO, 2021.

to the lack of sufficient sanitation infrastructure, the need to promote knowledge about the risks that climate change poses concerning climate-sensitive diseases. According to the NCCHAP, an important adaptation need is to increase awareness concerning the transmission and risks of the diseases and their links with climate change.

5) Climate Resilient WASH infrastructure

Successfully addressing the challenges that climate change poses concerning WBD and FBD requires climate-proofing WASH infrastructure. Currently, there are significant gaps in WASH infrastructure, leading to increased risks for WBD and FBD outbreaks. Increased floods and droughts will further accentuate these risks posing more challenges to sanitation. Climate proofing WASH is crucial to reduce contamination from floods and ensure adequate water supply to households.

6) Interventions to reduce vector populations and VBDs impact

Reducing the impact of VBDs relates to a great extent to the surveillance and control of vector populations. There is an urgent need to increase the knowledge and awareness of communities for the adoption of good practices to minimize vector populations and communities' exposure to them. Community level interventions, such as environmental clean ups and the identification and removal of vector hotspots are crucial for reducing VBDs prevalence and impacts.

3.7Barriers

Barriers to this project have been identified through reviews of primary and secondary sources, as well as through stakeholder consultations. The primary sources include the project's the Concept Note, FSM GCF Country Programme, FSM NCCHAP, and extensive in-country consultations with various health experts at the national level, state level and community level. Consultations were conducted during the project preparation stage. The secondary review was carried out through a desktop-based search of studies with a focus on different climate and development sectors and, more specifically on FBDs, VBDs and WBDs, health, water, agriculture, the socio-economic situation, and the administrative organisation of FSM and other Pacific Small Island States. The main barriers are elaborated below:

Table 18: identified barriers and project approach to overcome these barriers

Type	Barriers	Project Approach overcome barriers
Information	(1) Public awareness on climate risks and their relationship to FBDs, VBDs and WBDs including transmission risks and prevention measures is generally considered low, especially at the community levels (Identified need 4b and 6a)	The project will strengthen the development of and access to tailored information concerning climate risks and their relationship to FBDs, VBDs and WBDs. Public awareness raising will be achieved through Output 3.2. State Departments of the DHSA from selected areas will develop a plan for a public awareness raising campaign, by bringing in perspectives of various stakeholders - local women's and youth associations, disadvantaged groups, traditional leaders and other stakeholders. The campaign will consist of a wide range of activities, such as preparation and distribution of brochures and posters, creation of social media posts and videos, and participation in community meetings or local radio programmes, all aimed at reaching the target groups with the right message
Technical	(2) Low technical capacity at the local level to address the causes that contribute to the spread of FBD, WBD, VBD transmitted diseases (Identified need 5a)	The project will support the installation of climate resilient infrastructure to reduce transmission of WBD and FBD. Through Output 1.2 (activity 1.1.2) the project will validate the actual situation on the ground for high-risk areas. The most vulnerable population will be identified and considered as priority beneficiaries for the implementation of the subsequent activities of Output 3.1. Through Output 3.1, the project will improve vectors surveillance and control, year-round access to a climate-resilient, safe and reliable drinking water supply, and climate-resilient pit latrines. Through these interventions, it will reduce the risks of FBD, WBD and VBD transmission.
	(3) Equipment gaps in health facilities which limits the capacity to monitor climate-sensitive diseases (Identified need 4a)	Output 2.1 (Activity 2.1.1) the project will equip the FSM's Food Safety laboratory. The improved testing facility will provide the technical capacity to monitor and identify the aetiology of key CSD. The new equipment will support the operationalization of the HIEWS with the necessary data.

Type	Barriers	Project Approach overcome barriers
Institutional	(4) Insufficient supportive policies and ineffective coordination, which limits the effectiveness of responses to address climate-induced health risks and impacts (Identified needs 1a, 1b, 1c, 3a, 4c))	The project will institutionalise and strengthen existing vulnerability and capacity assessment (VCA) processes and will strengthen institutional capacity and policy instruments on climate adaptation in the health sector. Through Output 1.1, the project will ensure that the current fragmented systems for the VCA will be consolidated in order to support effective ongoing assessment. The project will ensure that information collection and analytical processes at the national- and state-level systems are harmonised and integrated. Through output 1.2, the project will improve existing policies, addressing gaps that render them ineffective and/or introduce new policies. It will improve cooperation with the formulation of Standard Operating Procedures for FBD, WBD, and VBD. Moreover, it will strengthen operational readiness and mainstreaming of climate adaptation in public health policy planning through training and sensitisation workshops to key stakeholders.
	(5) Insufficient systems and practices for climate-sensitive disease surveillance and tracking (Identified need 4a)	The project will support the integration of the health information and early warning system (HIEWS) with existing climate-information early warning systems (CIEWS) and processes. Through Output 2.1, the project will introduce improved health data and data analysis capacity and overlay this with climate and weather data. The HIEWS will allow reporting and input into an accessible and consolidated platform, available to all states of FSM. In tandem with establishing a pioneering HIEWS in the Pacific Islands, through Output 2.1, the project will also provide the necessary tools and training for relevant stakeholders. The HIEWS will provide the capacity to (i) monitor environmental conditions; (ii) forecast high-risk conditions and initiate active surveillance; (iii) send alerts and communication; and (iv) establish a mechanism for early response.
	(6) Limited knowledge and operational capacity to manage climate-health risks (Identified need 2a, 2b, 3b)	The project will strengthen the capacity of the health workforce and technical staff to support the surveillance and response to increased climate-induced risks. Output 2.3 will improve the capacity of the health workforce and technical staff to support the surveillance and response to climate-induced health risks.

3.7.1 Information and knowledge barriers

(1) Low levels of public awareness on climate-related FBDs, VBDs and WBDs

While an increasing body of work (projects) has been undertaken to improve water and food security, the impact of climate change on the spreading of water and food diseases has been neglected. To date, addressing health risks associated with climate change impacts is considered a co-benefit of sectoral interventions such as water management and disaster-risk reduction, rather than forming part of integrated solutions. It is understood that diseases can lead to epidemics impacting a country or region's economic and social stability, however, less is understood about the impact at community levels, especially among vulnerable community members such as women, children, the elderly, people with disabilities (mental and physical), and related issues such as poverty, malnutrition, social isolation, low productivity, etc.

Public awareness on climate risks and the relationship to FBDs, VBDs and WBDs, including transmission risks and prevention measures, is generally low, especially at the community levels. This assessment is supported both by the NCCHAP and the stakeholder consultations presented in the Stakeholders Engagement Plan. During the consultation, awareness raising has been identified as an important part of the project. Moreover, public awareness has been included in the recommendations for the adaptation of the health sector in relation to high-priority climate-sensitive infectious diseases in FSM¹⁰⁸.

To address these information gaps, technical knowledge must first be created and then awareness of the risks posed by climate change as drivers of higher transmission rates of FBDs, VBDs and WBDs and related diseases must be raised.

The links between specific weather events and disease transmission factors are not yet fully observed through health and climate information systems and effectively communicated to the public, together with the participatory development of preparedness plans and prevention measures. In particular, social determinants, such as very vulnerable groups in certain communities, should not be left out when educating and responding to climate and health impacts at the community level.

3.7.2 Technical barriers

(2) Low technical capacity at the local level to address the causes that contribute to the spread of Food, Vector, Water-transmitted diseases

Given the geographical features and fragmented governance of FSM (with some very remote areas), there are significant differences in the availability of health services, water and sanitation coverage between and within the four states¹⁰⁹. Chuuk and the outer Yap Islands are especially behind¹¹⁰. Water quality and consequent health problems remain a major challenge in the country. Only five of the approximately 70 public or municipal water systems serving the main islands have some kind of treatment, and even there, safe water is not consistently guaranteed due to inadequate system maintenance and irregular supplies. The approach also varies depending on socio-economic status; poorer households are less likely to use improved sanitation facilities than richer households.

¹⁰⁸ McIver et al., 2015.

¹⁰⁹ National Climate Change and Health Action Plan (NCCHAP) for the Federated States of Micronesia - December 2012.

¹¹⁰ Proceedings of the Pacific Regional Consultation on Water in Small Island Countries - Country Briefing Papers.

The absence of climate resilient sanitation infrastructure further strengthens the health risks that increased temperatures and precipitation pose¹¹¹. This barrier has been identified in all levels and states during the stakeholders' consultations (see Stakeholder Engagement Plan).

FBDs, VBDs and WBDs have been documented to affect people in tropical climates with lack of access to health services, poor housing, infrastructure, governance structures and socio-economic underdevelopment. One of the main preventions of these diseases is to ensure that users receive sustainable water and sanitation services, in parallel with the programming of hygienic and preventive measures, which can mitigate the impact of climate change on health. The root causes of this barrier are the prevalence of poverty and the lack of public funds. It has been observed that the more vulnerable the community, the less financial and technical capacity to implement and maintain such projects.

(3) Equipment gaps in health facilities that limits the capacity to monitor climate-sensitive diseases

FSM currently operate a national Food Safety Laboratory with the purpose of analysing food samples to determine compliance with national food safety law and regulations of the Department of Health and Social Affairs. The laboratory is managed by the national government - Environmental Protection Agency (EPA) in Pohnpei, but also collaborates with other food officers at the national and local levels of government, and therefore covers all the states of FSM. The Food Safety Laboratory partly covers the need for monitoring climate-sensitive diseases, in particular with its capacity to identify their FDBs aetiology.

Nevertheless, both due to its limited scope (FBDs) and the equipment limitations, the laboratory cannot support the extended functions required by a HIEWS. The laboratory needs to extent its scope to also include WBDs and VBDs. The extended scope would require the procurement and installation of additional equipment and the provision of training of the relevant personnel. Additionally, the laboratory needs to be relocated in new purpose tailored facilities.

3.7.3 Institutional barriers

(4) Insufficient supportive policies and ineffective coordination that limit the effectiveness of responses to address climate-induced health risks and impacts

The institutional response to climate-induced health risks and impacts through policies and planning tools is at an inception stage in FSM. FSM has limited institutional capacity and resources to implement coordinated climate and health adaptation projects as it is highlighted by the gaps of the NCCHAP. Part of this challenge is exacerbated by spatial distances between states that make it difficult to transfer institutionalization and consistency from the national to the state and local community levels. Moreover, the fragmentation of VCA systems accentuates the difficulties for on-going and timely responses.

¹¹¹ McIver et al., 2015.

Addressing this barrier will contribute significantly to WHO's recommendation to develop a methodology that can be replicated to develop state level risk assessments¹¹². Moreover, it will support FSM Country Cooperation Strategy 2018-2022 priority 2. "To build IHR (2005) core capacities for proactive preparedness in health emergencies and natural disasters"¹¹³.

So far, FSM has developed sectoral strategies largely aligned to the topic of climate-sensitive health risks. However, these have only been partially implemented. Namely, the NCCHAP which identifies key climate-sensitive health risks and issues related to health information systems and adaptation needs falls short in developing further policy needed to embed tangible actions, implementation and financing plans. Subsequently, these strategies are now outdated and inadequate to respond to the climate and health changes being experienced today and projected into the future.

Furthermore, FSM's climate change policy is not currently mainstreamed across all sectoral policies, in part due to poor levels of coordination between sectors. Hence, efforts to address climate change currently take place in silos, without a fuller understanding of -sectoral linkages, synergies and potential co-benefits. Climate project planning (costs-benefit estimations) and implementation are additional challenges facing FSM, in terms of coordination with the States and local government levels.

Overall, existing environmental and sanitation policies and regulations are not currently adequately enforced by government, which will likely result in climate change posing additional challenges to an already weak health sector in the future. In addition, cross-sectoral mechanisms on climate-health issues have not yet been created, including sharing of critical information from the weather, climate and health sectors. There has been little political buy-in to act on inter-agency support for implementation of climate change and health projects. Currently there is insufficient policy framework, programs and regulations, both within the Department of Health and other Departments, that would enable managing climate-related FBDs, VBDs and WBDs.

(5) Insufficient systems and practices for climate-sensitive disease surveillance and tracking

FSM relies on a passive and somewhat inefficient process for recording, collecting, and analysing health data. The FBDs, VBDs and WBDs monitoring systems have so far been periodic and diffuse, have not been linked to the causes of disease acceleration and are generally not delivered on time. FSM Health Information System relies on paper records, leading to inefficiencies in the collection, recording, sharing and monitoring of information. In general, the digital readiness of FSM institutions is still very low.

A dedicated disease monitoring system integrated with hydro-meteorological, climate and spatial information system does not exist. Ideally a health information portal linked to weather forecasts and warnings of possibly adverse health effects would be applied in a highly vulnerable country such as FSM. Climate information has its own portal located on the Pacific Climate Change Portal (www.pacificclimatechange.net) but is not linked to the exchange of information in health sectors. FSM National Meteorological Service has a coordinated and comprehensive

¹¹² WHO, 2018.

¹¹³ WHO, 2017.

data collection system in the four FSM states. This information is easily accessible and updated daily.

It is therefore necessary to intervene, especially with regard to the harmonisation of health and climate information systems, including early warning, where variability and climate change could affect the spatial and temporal distribution of disease.

(6) Limited knowledge and operational capacity to manage climate-health risks

FSM has a limited number of highly skilled personnel to take on the management of climate-health risks in the short and long term. In particular, there is a shortage of health staff in the country (working on all levels), which was evidenced during the COVID-19 pandemic where all health centres were full, leaving no ability to manage regular checks and standard interventions. Health facilities (including food safety labs) are under-equipped, both in terms of physical and human capital, which also differs geographically across FSM.

Availability of quality health services varies across different locations of FSM, with the majority of well-educated health workers remaining in the Chuuk or Pohnpei, while on the outer islands it is more challenging to attract and retain such personnel. Improving the knowledge and operational capacity of health professionals and the technical staff has been identified as one of the barriers to address the risks that the high-priority climate-sensitive infectious diseases pose in FSM.¹¹⁴

The limitation of knowledge and capacity reduces the overall effectiveness of policies, plans, and procedures in place to address climate-induced health risks. While there are already significant differences in the technical knowledge of staff and the operational capacity across FSM (e.g., laboratory testing availability), the implementation of additional interventions centrally would further accentuate these differences. Therefore, a balanced approach between the different states and taking into consideration the needs of outer islands is needed.

Surveillance and early warning mechanisms rely on personnel capable of correctly collecting and submitting data, interpreting and disseminating alerts. Moreover, health professionals should be able to identify the contributing drivers and take the necessary measures in cases of climate-induced outbreaks.

4. Project Description

4.1 Project targeting

The project aims to contribute to the overarching adaptation impact areas ARA1: Most vulnerable people and communities and ARA 2 Health and well-being, and food and water security. In particular, the project will benefit all states and islands by:

¹¹⁴ McIver et al., 2015.

- Institutionalising and strengthening existing vulnerability and capacity assessment processes
- Strengthening institutional capacity and policy instruments on climate adaptation
- Establishing a HIEWS for tracking climate-sensitive diseases
- Strengthening and expanding the technical capacity of testing facilities to focus on identifying FBDs, WBDs and VBDs pathogens
- Providing operational training to health workforce and technical staff
- Establishing knowledge-sharing and coordination mechanisms

A preliminary selection based on available data has been conducted for the selection of communities and the estimation of direct and indirect beneficiaries. Nevertheless, this selection will be validated and updated if needed during the implementation period of the project. The following paragraphs present the preliminary selection and the criteria to be used during the implementation phase of the programme.

4.1.1 Selection of communities and beneficiaries

The preliminary beneficiaries' selection has been based on 2010 FSM Census data and the climate-sensitive burden of disease data. In particular, the criteria used were:

- the percentage of households with unsafe water source
- the percentage of households without an improved toilet facility
- the burden of FBD, WBD and VBD diseases per state for the period 2013-2019

Table 19: Housing units and main source of drinking water, main toilet facility per state

	Total	Yap	Chuuk	Pohnpei	Kosrae
Total Housing units	19,588	2,671	8,272	7,288	1,357
Occupied	16,767	2,311	7,024	6,289	1,143
Main Source of Drinking Water					
Total	16,767	2,311	7,024	6,289	1,143
Safe water source	13,564	2,059	5,747	4,720	1,038
Unsafe water source	3,203	252	1,277	1,569	105
		8%	40%	49%	3%
Main Toilet Facility					
Total	16,767	2,311	7,024	6,289	1,143
Improved toilet facility	10,877	1,382	3,689	4,680	1,126
Non-improved toilet facility	5,890	929	3,335	1,609	17

		16%	57%	27%	0%
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The prioritisation was based on the normalised scores for each criterion per state which are presented below.

Table 20: Normalised scores for the selected criteria per state

Normalised scores	Yap	Chuuk	Pohnpei	Kosrae
Unsafe water source	0.10	0.80	1.00	0.00
Non-improved toilet facility	0.27	1.00	0.48	0.00
Foodborne disease	1.00	0.82	0.72	0.00
Vector-borne disease	1.00	0.00	0.00	0.12
Water-borne disease	0.27	0.00	0.32	1.00
Sum	2.64	2.62	2.52	1.12

The selection of communities was based on the number of households without a safe drinking source and non-improved toilet facilities. The categorization between safe/unsafe water source and improved/non improved toilet facilities was based on the respective census criteria.

In particular, households using public utility, community water, household tank, water truck, protected well, and bottled water were assumed to be using a safe source, while households using unprotected well, spring / river / lake or other sources were categorised as unsafe.

In terms of toilet facilities, households using flush toilets in the housing unit, flush toilets in the building, outhouse VIP, flush outside building were categorized as improved, while households using outhouse not VIP, using outhouse/sea, and using no toilet facility were categorized as not improved.

Based on analysis of the 2010 Census data (most recently available census data) and taking into consideration other projects contributing to WASH needs, the project focuses on outer islands for water availability and main island communities for toilet facilities.

The final selection of communities was based on the highest number of households without improved toilet facilities for main islands and the highest number of households without safe water source for outer islands. In both cases, communities that have received prior support with WASH interventions were excluded. The final selection per state is presented below.

Table 21: Selected communities for WASH interventions per state.

State	Island/Municipality	Population	Housing units	Outer Island*
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Yap	Faraulep	193	37	Yes
	Weloy	1030	245	Yes
	Fanif	509	116	No
Chuuk	Makur	159	25	Yes
	Uman	2554	369	Yes
	Kuttu	323	67	No
Pohnpei	Madolenihmw	5767	1023	Yes
	Nett	6639	1031	Yes
	Kitti	6470	1032	No
Kosrae	Tafunsak	2173	347	No
	Malem	2169	397	No
Total		27997	4689	

*Population of outer islands = 16,342.

Based on the above, the WASH interventions include the installation of 500 household level first-flush rainwater harvesters and 500 of household-level latrines.

Taking into consideration that before the implementation of the project, updated data on the level of unsafe water and sources and non-improved toilets will be available, as well as that state VCAs will be implemented under activity 1.1.2, the project will further elaborate the selection of the beneficiaries in two stages. In the first stage, vulnerable communities will be selected, while specific households will be selected in stage two.

Communities' updated selection will be based on the following criteria:

- past outbreaks (based on available disease surveillance data)
- sensitivity to future outbreaks (access to health services, level of water and sanitation infrastructure)
- additional vulnerability to the effects of climate change (vulnerability to floods and dry spells of coastal and rural communities)
- previous resettlement from low lying atolls
- population with higher percentage of vulnerable population (elderly/children)
- differences in income and livelihoods (dependence on highly vulnerable occupations) between communities
- communities supported by other WASH projects (exclusion criterium)
- representation of all states in the selected communities

At a more granular level, the project in a second stage will primarily target lower income households, following the selection guidelines of the State EPAs (e.g. Pohnpei State EPA selection criteria in Appendix B). Lastly, the willingness of local government and communities to participate in the project will be ensured through proper consultations.

4.1.2 Beneficiaries' estimation

The methodology utilized for the estimation of the direct and indirect beneficiaries follows the GCF-prescribed methodology, as defined within the GCF indicator reference sheet.

Direct beneficiaries are defined as individuals who receive i) targeted support from a GCF-funded intervention and ii) a measurable adaptation benefit from a GCF-funded intervention. Based on the above definition and taking into consideration the project interventions, direct beneficiaries are calculated based on the Outcomes 2 and 3. Outcome 1 as well as interventions that build capacity are not considered to have direct adaptation benefits and therefore are only taken into consideration for the calculation of indirect beneficiaries.

Outcome 1 will deliver improved capacity building, regulatory framework improvements and operational documents that will have significant indirect benefit to the whole population of FSM. Therefore, as mentioned above the indirect beneficiaries from Outcome 1 are equal with the total FSM population 102,843.

Outcome 2 contribution to ARAs

ARA	Indicator	Target
ARA 1 Most vulnerable people and communities under the	Core 2 Direct and indirect beneficiaries reached	102,843 direct and indirect beneficiaries (50,650 women)
ARA2 Health, well-being, food and water security	Core 2: Direct and indirect beneficiaries reached	102,843 direct and indirect beneficiaries (50,650 women)

Outcome 2 will deliver a HIEWS that will cover all FSM. Direct beneficiaries that receive targeted support for the GCF are those that receive information of outbreak events through the project communication channels, as well as additional communication channels identified through the HIEWS reference documents (SMS, radio communication, TV broadcasting). The measurable adaptation benefits are the precautionary measures that the informed population will take such as, increased personal hygiene practices, reduced exposure to vectors etc.

Based on the above methodology, direct beneficiaries are those household members with access to mobile phone. According to FSM telecommunication statistics there were 21,611 subscribers in 2019¹¹⁵. Taking into consideration that one subscription will cover more than one member of the one household¹¹⁶ with a modest assumption that the network covers 60% of the population, direct beneficiaries would be equal to the 60% of the FSM population i.e., 61,706¹¹⁷.

Indirect beneficiaries are considered those that will receive measurable adaptation benefits without being targeted explicitly. In this case adaptation benefits additional to the above also include public health intervention such as outbreak responses identified in the HIEWS reference documents. Based on the above outcome 2 contributes both to ARA 1 indirect beneficiaries through the HIEWS and ARA 2 indirect beneficiaries through the H-NAP and the improved SOPs. Therefore, all the population of FSM is considered to be indirect beneficiaries.

¹¹⁵ <https://www.fsmstatistics.fm/other-statistics/communication-statistics/>

¹¹⁶ The average household size for 2010 is six according to the FSM Statistics, 2010 Census.

¹¹⁷ Alternative we can assume that one subscriber covers 60% of household members therefore 21,611 subscribers cover 64,833 people.

Outcome 2 contribution to ARAs

ARA	Indicator	Target
ARA 1 Most vulnerable people and communities under the	Core 2 Direct and indirect beneficiaries reached	61,706 direct beneficiaries (30,390 women) and 41,137 indirect beneficiaries (20,239 women)
	Supplementary 2.4: Beneficiaries (female/male) covered by new or improved early warning systems	Direct beneficiaries: 61,706 (30,390 women)
ARA2 Health, well-being, food and water security	Core 2: Direct and indirect beneficiaries reached	102,843 indirect beneficiaries (50,650 women)

Outcome 3 will focus on particular communities. The project's WASH interventions, as well as the environmental clean-ups and mosquito net distribution, are considered the targeted support that will provide measurable adaptation benefits, i.e., improved access to water and reduced exposure to pathogens and vectors.

Direct beneficiaries from outcome 3 include community members of communities receiving WASH interventions and environmental clean-ups support. All the community members are direct beneficiaries as i) latrines can benefit the community as a whole, not necessary a household, ii) reduced prevalence of WBD due to reduced wastewater effluence that affects all community water resources not only those of the household iii) water tanks also serve all the community not only a household in cases of prolonged drought, iv) environmental clean ups reduce vector populations across all members of the communities and not only a household.

For the above reasons and especially since the environmental clean-ups and the reduced prevalence of WBD from wastewater effluence reduces climate sensitive diseases prevalence in all the community, all the community is receiving "targeted" benefit.

Following the above direct beneficiaries include all community members where interventions will take place i.e., 27,997 direct beneficiaries (13,788 women).

Moreover, it is assumed that the direct beneficiaries located in the outer islands (installation of first flush diverter water tanks), both due to their location and due to their vulnerability, do not have access to mobile phones and therefore these direct beneficiaries are additional to those of outcome 2.

Based on the above, the number of additional direct beneficiaries from this outcome is expected to be 16,342 (2,730 households¹¹⁸).

¹¹⁸ Corresponds to the households and population of Faraulep, Weloy, Makur, Uman, Madolenihmw, Nett based on the 2010 census.

No indirect beneficiaries are calculated, as they are already accounted for in outcome 2.

Outcome 3 contribution to ARAs

ARA	Indicator	Target
ARA 1 Most vulnerable people and communities under the	Core 2 Direct and indirect beneficiaries reached	102,843 indirect beneficiaries (50,650 women)
ARA2 Health, well-being, food and water security	Core 2: Direct and indirect beneficiaries reached	Direct beneficiaries: 27,997 (13,788 women)
	Supplementary 2.3: Beneficiaries (female/male) with more climate-resilient water security	Direct beneficiaries: 16,342 (8,048 women)
	Project specific indicator for Output 3.1: Beneficiaries (female/male) with increased resilience to FBD, VBDs and WBDs	Direct beneficiaries: 11,655 (5,740 women)

Therefore, the project will have 78,048 direct beneficiaries (76% of the total population) and 24,795 indirect beneficiaries (24% of the FSM population).

Project level beneficiaries

Total beneficiaries	Indicator	Target
Total beneficiaries	Core 2: Direct and indirect beneficiaries reached	Direct beneficiaries: 78,048 direct beneficiaries or 76% (38,439 women) Indirect beneficiaries: 24,795 or 24% of the population (12,398 women)

The proposed intervention recognises that bridging practical gender needs (e.g. access to water) with strategic gender interests (e.g. changes in power and roles) is critical to achieving transformational changes in gender equality in FSM, where underrepresentation of diverse gender groups limits the efficacy of existing infrastructure and the potential of new investments. Trainings are planned with a targeted 50:50 gender balanced beneficiary distribution alongside

this co-benefit to ensure increased, meaningful participation of women in climate-disease control responses. Based on the above, the gender breakdown of direct and indirect beneficiaries is expected to follow the countries' sex-ratio.

4.2 Project objective and outcomes

Outcome 1: Relevant policies, systems, processes and guidelines are institutionalized in FMS the FSM for effective adaptation response to climate change-related vector-, water- and food-borne diseases

Expected outcome:

Enhanced policies, capacities and cross-sectoral collaboration to mainstream and manage climate-sensitive health risks associated with FBDs, VBDs, WBDs at national- and state-level health governance.

Outcome 1 focuses on addressing the policy gaps related to both climate change and health factors in FSM. In doing so, the component will take a two-pronged approach:

- It will ensure that VCAs will remain up to date to support intervention planning and implementation by improving the current vulnerability and capacity assessment processes (output 1.1). VCA processes will be improved at the national and state level and piloted to ensure their applicability under FSM specificities.
- It will improve and mobilise policy instruments such as the existing National Climate Change and Health Action Plan (NCCHAP 2012). The work will involve a comprehensive, context-specific vulnerability and adaptation assessment of the health sector, mainstreamed into the NAP process to ensure informed and whole-of-government planning, and it will lay the groundwork for revising the NCCHAP to become the Health National Adaptation Plan (HNAP).

This outcome will also include a robust training output (1.2) to develop the capacity for:

- implementing and monitoring the improved policies,
- enabling ongoing intersectoral coordination, and,
- ensuring public health adaptation aspects are mainstreamed in national and state-level policies.

Output 1.1: The relevant stakeholders are informed of baseline situation of climate change vulnerability on health and adaptation response capacity of the four states of FSM

Activity 1.1.1 - Perform a stocktaking exercise of existing climate VCA protocols and update (as necessary) for integration into the FSM DHSA's processes

This activity will focus on institutionalising the fragmented systems of VCAs that currently exist in FSM. These include: public health documentation and systems used by hospitals, localised and ad-hoc research conducted on climate change, health and disaster risk reduction, and UNICEF documents on GIS mapping to generate data for digital health. It will build on stakeholder

engagement and consultations undertaken during the project design stage to ensure information collection and analytical processes in the national- and state-level systems are harmonised and integrated into institutional processes. The updated VCA processes will use various participatory tools such as comprehensive stakeholder and community participation, participatory observation and community mapping to gauge people's exposure to and capacity to adapt to climate change impacts and natural hazards. The processes will acknowledge grassroots priorities for appropriate action to mitigate risks and validate the design of programmes that are mutually supportive and responsive to the needs of the people most affected and at risk to climate impacts on health.

Activity 1.1.2 - Implement the updated climate VCA methodology in selected communities to ensure their applicability and relevance within the FSM setting

The updated VCA processes will be implemented in the four states to ensure their applicability and relevance within FSM setting. In this activity, health service personnel will conduct needs assessments (basing it on the VCA processes established through Activity 1.1.1), to establish the applicability and relevance of the processes. Needs assessment will focus on developing effective prevention mechanisms and improve climate risk management of FBDs, VBDs and WBDs. The VCAs results will inform the development of the Health National Adaptation Plan (H-NAP) developed in activity 1.2.1 providing crucial granular information for the prioritization of the H-NAP interventions. In addition to the main contribution to the H-NAP, the assessments will further support the selection of communities benefiting from Outcome 3. The VCAs will support the elaboration of the selection methods/criteria and provide data for the communities and beneficiaries selection (see beneficiaries selection section).

The output will also complement FSM NAP proposal that has recently been submitted by SPREP and in particular the activity 3.2.2, which develops framework and methodologies for participatory assessment of climate change vulnerability, risks and adaptive capacity of people and ecosystems.

Output 1.2: FSM's health sector has access to recommended policy papers and enhanced technical capacity to effectively manage FDBs, VDBs, and WBDs.

Activity 1.2.1 - Develop the FSM Health National Adaptation Plan (H-NAP) and supporting documents

FSM has developed a National Climate Change and Health Action Plan (NCCHAP) in 2012, with support from the WHO. Nevertheless, the plan has been since rendered outdated and is in need of revision. Through this activity the four state VCAs and the original NCCHAP will feed into the process of developing a key instrument Health National Adaptation Plan (H - NAP) and the documents that will support its operationalization. The activity will address the policy gap on climate change and health in FSM. The activity will ensure a participatory and integrated approach engaging all relevant government entities in the development process. The integrated process will ensure that the new H-NAP will not have a vertical and narrow scope focusing only on FBDs, WBDs, and VBDs, but a holistic approach to the climate change impact on health, while at the same time clearly delineating roles and responsibilities concerning borderline issues with relevant fields such as agricultural management and water management. In particular, the activity will develop policy documents/briefs to inform policy planning processes, develop the H-

NAP, and update and align FSM's vector control plans with the "Manual for Surveillance and Control of Aedes vectors in the Pacific" regional guideline developed by WHO, CDC and SPC.

Activity 1.2.2 - Formulate gender-responsive Standard Operating Procedures (SOP), that defines roles and responsibilities for cooperation and collaboration in managing FBDs, VBDs, and WBDs

Activity 1.2.2 will improve operational readiness through tailored SOPs for FBDs, VBDs, and WBDs, which is key to ensure a transition of core policies into effective praxis. Through the activity, a gap assessment will be conducted with the engagement of relevant stakeholders. Existing processes will be documented and reviewed, particularly targeting:

- FBDs and standards for food safety/handling (commercial and household contexts);
- VBDs and vector management and response programmes; and
- WBDs existing procedures implemented to outer islands (particularly on diarrheal diseases, which are most prevalent).

The activity will document current processes implemented in FBDs, VBDs, and WBDs. More crucially it will update or develop SOPs for Salmonella, Toxoplasmosis, Shigellosis, acute gastroenteropathy, Trichiasis, dengue, zika, chikungunya.

Activity 1.2.3 - Conduct training and sensitisation workshops to increase operational readiness of health and climate change policies and action plans at national and state level.

A key pitfall of the 2012 NCCCHAP was the limited delivery of the actions identified, due to the lack of operational readiness and mainstreaming of climate and health interlinkages in adaptation planning. This activity will ensure that key government stakeholders (key personnel of public health and public health related government entities) at the national and state level will improve their understanding of the emerging climate-induced challenges and solutions concerning public health in their respective sector. The training will include a training of trainers sub-activity and a sensitization and training workshops sub-activity. The training of trainers will take place in all states developing a knowledge community to support the implementation of the project and the H-NAP interventions. Sensitization workshops would target all operational staff, while training workshops would target a specific pool of government officials. The training will provide evidence concerning how climate change is resulting in poorer health outcomes, how it is increasing mortality and morbidity, and how it is an important driver of health inequities in FSM. It will focus on understanding climate risks and help the trainees to fulfil their respective roles effectively, improving the coordination of interventions, the documentation of best practices and lessons learnt, and ensuring that operationalisation readiness of policies.

Outcome 2: The Health Information Early Warning System becomes effective in supporting timely planning and responding to climate change sensitive diseases in FSM.

Expected outcome:

Improved surveillance of and response to FBDs, VBDs, and WBDs through harmonized climate and health information and early warning system (HIEWS) in FSM, with health personnel and other, relevant stakeholders trained.

Outcome 2 focuses on establishing a health information and early warning system (HIEWS), overlaying health data to existing climate information early warning systems (CIEWS) and processes. The core elements of the climate-informed EWS envisioned for FSM through this Outcome, will be to: (i) monitor environmental conditions; (ii) forecast high-risk conditions, initiate active surveillance; (iii) send alerts and communication; and (iv) establish a mechanism for early response. The component will focus on all the different elements of the HIEWS including:

- the introduction of improved health data collection techniques through improved testing facilities
- the development of the structural, statistical and operational features of the HIEWS that will allow data input, data analysis, and reporting through an accessible and consolidated platform, including the overlay of historical health data with climate and weather data
- provision of training to key personnel concerning (i) data reporting, (ii) operation and maintenance of the HIEWS (iii) response actions including active surveillance, interpretation of alerts and communication, and early response mechanism processes

This effort will include the integration of community-level data and laboratory data to support a more efficient early warning system (EWS). A probabilistic health information system will be critical for early health planning, disease prevention and epidemic management in all states of FSM.

In tandem with establishing a pioneering HIEWS in the Pacific Islands, the tools and training of this outcome will ensure the HIEWS is operational and sustained and can increase the effectiveness of disease control by intervening before or at the beginning of the epidemic curve.

Output 2.1: Technologies, Procedures, and Capacities for an Effective and Timely HIEWS Operation Established

Activity 2.1.1 - Equip FSM Food laboratory with specialized diagnostic equipment to test FDBs

Currently, FSM is facing equipment gaps in health facilities that limit its capacity to monitor climate-sensitive diseases. To address this barrier, the project will support the equipment of the FSM Food Safety Lab and expand its capacity to address also WBDs and VBDs. The project will support the procurement and installation of the latest testing capacity and diagnostic equipment available. The laboratory will continue to be managed by the national government - EPA in Pohnpei, but also collaborates with other officers at the national and local levels of government.

To increase the number of sample collections and improve its diagnostic capability, including additional testing parameters for water-, food- and vector- borne diseases, the Food Safety lab will be fully equipped with the necessary equipment and technology.

The Food lab will improve its capacity to monitor important WBD and FBD pathogens, including, *Vibrio cholera*, *Salmonella spp*, *Shigella spp*, *Campylobacter*, *Clostridium botulinum*, *Ascaris*, *Giardia*, *Schistosoma spp*, and *Trichuris spp*.

It will also increase its capacity to monitor VBD, including dengue, zika, chikungunya, lymphatic filariasis, west Nile virus, and ross river virus.

Moreover, this activity will link the existing and future FSM Food Safety Laboratory database to the public health disease surveillance system as well as the HIEWS. The laboratory will support the HIEWS by providing confirmation of clinical diagnosis, supporting the existing symptomatic and clinical surveillance systems.

The activity will include the training of laboratory personnel on new analytic techniques and the operation and maintenance to ensure that the equipment is being properly used and maintained.

Activity 2.1.2 - Development of the structural, statistical and operational features of the HIEWS.

Currently FSM has insufficient systems and practices for climate-sensitive disease surveillance and tracking. Initiation of health interventions is heavily reliant on routine disease surveillance systems or ad-hoc reporting without centralization of information - with data that often arrive too late for preventative response. Nevertheless,

This activity will support the development of a HIEWS for FSM that would comply with the 2021, WHO Quality Criteria for the Evaluation of Climate-Informed Early Warning Systems for Infectious Diseases. FSM HIEWS would follow the WHO designing parameters for establishing the new HIEWS that will be based on climate as well as health data to enhance preparation and response measures.

A key premise of the activity is to overlay the HIEWS on existing CIEWS processes in FSM. By overlaying with hydrometeorological, spatial and climate data with health data it will be possible to improve both the timeliness and impact of disease control in FSM. For the successful implementation the activity will further strengthen the cooperation and coordination with the National Weather Service that will be established under activity 1.2.1.

The activity will include the development of a joint monitoring and warning service development (IT solutions) and the development of the electronic data management system of the HIEWS, that will allow the incorporation of climate and non-climate historical health data, enable data analysis and reporting to refine warning system progression, and improve geographical information system (GIS) capacities. Moreover, it will accelerate the transmission of key information through alerts to the public through a warning system platform that is openly accessible. This will ensure a single-entry point for reporting, analysing and prioritizing information as well as verifying signals, assessing risks, and monitoring outbreaks. Ultimately, this will enable proactive and faster response to acute public health events.

The proactive response will be further supported by the development of a predictive model of island-scale dengue spread based on weather conditions, local dengue epidemiological data/situation and FSM-specific socio-demographic variables to serve as an early warning system for outbreak detection.

The national disease information system would allow planners, policy- and decision-makers on healthcare with access to historical and current data on climate-induced outbreaks of VBDs, WBDs and FBDs. This would allow users to overlay and cross-reference the locations of disease outbreaks with meteorological parameters (e.g., temperature, precipitation, flooding events) as well as other environmental and socio-economic factors that affect such outbreaks (e.g., population density, WASH facilities, ecosystem change). Users would thus be able to better characterise the climate- and non-climate-related drivers and predictors of disease outbreaks.

The coordination of human, financial and technical resources for HIEWS is important for maintaining efficient and resilient EWS (early warning system) function. A unit responsible for the EWS coordination will be housed in the national DHSA, with counterparts at the state levels of FSM.

Moreover, the project will support the development of a HIEWS reference documents that will support its operational effectiveness in terms of cooperation, surveillance and response. The reference documents will include guidelines for the:

- management of acute public health issues
- surveillance for and response to the burden of disease
- control practices and tools
- monitoring, protection and treatment of field workers.

Activity 2.1.3 - Conduct training to support effectively and timely operationalisation of HIEWS. While the operational effectiveness of the HIEWS relies on efficient governance and institutional arrangements and the involvement of all stakeholders, a key barrier identified in FSM is the limited knowledge and operational capacity to manage climate-health risks. Activity 2.1.3 will ensure that all relevant government stakeholders, health workforce and technical personnel at national and state levels have the required capacity for operationalizing the HIEWS and coordinating with the Pacific Public Health Surveillance Network (PPHSN).

Training under activity 2.1.3 will ensure that:

- (i) there is adequate technical capacity to maintain the sustainability of the HIEWS systems including routine maintenance and updates;
- (ii) key government stakeholders have an understanding of functionality and uses to efficiently coordinate successful delivery of cross-sector or multisector response in the case of early warning;
- (iii) key health workforce and technical personnel can successfully implement the guidelines concerning reporting, analysing and prioritizing information, verifying signals and assessing risks; and responding to early warning and acute public health events;
- (iv) Vector surveillance & VBDs prevention training workshops will be provided to programme managers and technical officers.

Each of the above trainings will be developed to ensure that the capacity will be sustained after the implementation period of the project. Each training will include the development of training material and a specialized training of trainers module. Moreover, the training material will be

specifically tailored for FSM and the HIEWS needs. Trainers will be recruited from the relevant government entities and material will be made available to the stakeholders and technical personnel. The development of the trainers' pool will ensure the sustainable operation of the HIEWS providing the capacity to address staff turnover or other issues.

Training (i) will ensure the technical functionality and sustainability of the HIEWS, while training (ii) will address the coordination and cooperation sustainability. Training (iii) will be conducted by the State EPAs and Health Departments and will cover the following topics:

- collection and submissions of data in the HIEWS (related to medical and non-medical indicators);
- supporting communities through control practices and tools, including vector management;
- interpretation and dissemination of alerts and early warning messages;
- local response guidelines;
- response actions to acute public health events

Lastly, to strengthen the sustainability and surveillance of VBDs, the project will provide Vector surveillance & FBDs, VBDs and WBDs prevention training workshops to programme managers and technical officers. These workshops will support rolling out of activity 3.1.1.

Outcome 3: Communities have increased resilience to climate-related FBDs, WBDs and VBDs as well as capacity to manage associated health burdens

Expected outcome:

Targeted interventions designed for communities, alongside the establishment of knowledge-sharing and coordination mechanisms (for community action, prevention and response), will ensure improved awareness and prevention controls for FBDs, VBDs, and WBDs.

Outcome 3 focuses on implementing specific adaptation interventions in selected vulnerable communities to better address FBDs, VBDs and WBDs as major climate-sensitive health risks. Working in tandem with the previous two outcomes, outcome 3 will provision for concrete prevention measures to be taken at the community, household and individual levels. These measures derive from a policy framework set at national level and serve to pilot the approach for validation.

The provision of climate-resilient, safe and sanitary water management and latrines is directly related to reducing the emergence of FBDs, VBDs and WBDs. The activities envisioned under this Outcome aim to improve the resilience of households in need and at risk through the installation of climate-resilient water tanks and the construction of toilets. At the same time, awareness-raising and education activities will be carried out at the community level, with the goal of achieving an understanding of FBDs, VBDs and WBDs and the proper application of preventive measures, both at the personal and household level. Innovative methods will also be used to manage mosquito breeding sites.

Output 3.1: Adaptation interventions to prevent the spread of FDBs, VBDs and WBDs implemented in selected communities.

Activity 3.1.1 - Identify and manage high-risk vectors, such as mosquito breeding sites (using: GIS mapping, distribution of mosquito nets and conduct environmental clean-ups, and other relevant interventions).

The activity will tackle the low technical capacity at the local level to address the causes that contribute to the spread of VBD. To prevent the transmission of VBDs, this activity will involve application of GIS for mosquito mapping and effective allocation of resources for mosquito control interventions in selected areas with a high incidence of VBDs (past outbreaks, susceptibility to future outbreaks, vulnerability to climate change impacts and other factors). First, State EPA's field technicians will set traps, record and add their locations to GIS database. Next, they will carry out mosquito sampling to develop data to monitor and mosquito population dynamics. Identification of main mosquito habitats and breeding sites will serve as a basis for distribution of mosquito nets and conduction of environmental clean-ups, with proper handling of found waste (e.g., recycling of scrap metal).

Monitoring of suspected areas prone to mosquito breeding and transmission will be continued and feed into activity 2.2.2 under Outcome 2 (integration with HIEWS). In addition, the effect of climatic factors on mosquito proliferation and VBDs diseases will be studied. Findings in relationships between occurrence of mosquitos, VBDs and climatic factors, bolstered by climate change, will be shared with national level institutions working on VBDs policies and mosquito surveillance (DECEN - Department of Environment, Climate Change and Emergency Management).

Activity 3.1.2 - Community-level resilient WASH interventions.

There are significant WASH infrastructure gaps on the outer islands and in the rural areas of FSM. Gaps include the absence of improved water supply systems and sewage systems. Household water systems are unable to meet water demand during droughts and require standardization, improvement and particularly - climate-proof design to meet the environmental and health requirements. Similarly, a large number of households still have dysfunctional toilets or other unhygienic disposal systems (open defecation as some people do not use sanitary structures or have limited poor sanitary structures). The project will address these gaps with climate-resilient WASH interventions to reduce exposure to climate sensitive FBD and WBD at the household level.

The project will improve year-round access to climate-resilient, safe and reliable drinking water through the following sub-activities. The State Water Utilities will be installing 500 climate-resilient first-flush rainwater tanks in selected households in outer islands of all four states (see Appendix C). In addition to that, water sanitisation tablets and household testing kits will be procured to ensure preparedness to address WBD events. The tablets and testing kits will be rolled out, in outer islands, in the case of such events to ensure the safety of the water collected.

Moreover, to address FBDs and WBDs from faecal-oral infections, the project will improve existing sanitation practices with the installation of 500 climate-resilient latrines in at-risk communities in the main islands in all four states (see Appendix C). The latrines will follow the FSM specifications and will support communities in main islands in all four states. In particular,

latrines will follow the State EPA regulations on “Toilet Facilities and Sewage Disposal” under Type 2¹¹⁹. The disposal of the septic waste will be ensured by the utilities company Utilities Corporation that will also ensure the proper management of the waste. Beneficiaries would have to fulfil a number of conditions (including socioeconomic and land ownership criteria) and an agreement between the state EPA and the beneficiary will ensure the beneficiaries contribution to the operation and maintenance of the latrine.

The operational sustainability of all WASH interventions will be ensured by the project by providing maintenance training and support. The project will involve the vulnerable communities (and especially women, who will be taking a leading role in this) in the cleaning and maintenance of basic water infrastructure, among others through preparing and using a maintenance schedule. The project will also support the training of technical officers on the maintenance of the different assets and develop and distribute maintenance guides.

The selection of the communities and the beneficiaries will be supported by Activity 1.1.2, and specific community-level selection criteria will ensure that the most vulnerable households will be selected (please see beneficiary selection criteria).

Output 3.2: Community awareness and prevention communications consolidated and distributed among key community stakeholders.

Activity 3.2.1 - Run public awareness campaigns and provide tailored training to vulnerable communities for prevention and response.

Currently, FSM has limited preventive mechanisms against FBDs, VBDs and WBDs, as well as a limited prevalence of climate risks and their interlinkages to FBDs, VBDs and WBDs, which will be further exacerbated in the future by the burgeoning impacts of climate change.

In order to effectively raise awareness of climate risks and FBDs, VBDs and WBDs among communities, it is necessary to consider their cultural specificities, especially in parts of rural areas that are inhabited by indigenous people. Namely, a number of cultural factors can influence the way groups use the environment, adapt to weather conditions or approach health options and access to health services. There are also significant gender disbalances which impact these behavioural patterns, such as low literacy rates and lower enrolment rates among women.

State Departments of the Department of Health & Social Affairs from selected areas will develop a plan for public awareness raising campaign, by bringing in perspectives of various stakeholders - local women’s and youth associations, disadvantaged groups, traditional leaders and other stakeholders. The campaign will consist of a wide range of activities, such as preparation and distribution of brochures and posters, creation of social media posts and videos, participation in community meetings or local radio programs, all aimed at reaching all target groups with the right messages.

The campaign will inform communities on climate health risks and precautions associated with FBDs, VBDs and WBDs, including safety practices for prevention (e.g., food preparation and handling, vector management, larval habitat management, and other interventions); detailing

¹¹⁹ Type 2 refers to a toilet which is flushed with water and connected to a septic tank, cesspool, or combination of both.

action plans in case of suspected cases/outbreak; and ensuring overall behavioural change to manage FBDs, VBDs, and WBDs better. In addition, State Departments of Health and State EPAs will provide content and carry out tailored trainings for vulnerable communities focusing on interpretation of messages spread through HIEWS.

The activity will be sustained by the continuation of scheduled public awareness campaigns after the implementation period of the project, rolled-out according to the timing elaborated in the H-NAP. The campaigns will be ensured through the trainers pool created in Activity 2.1.3.

Output 3.3. Monitoring, Evaluation, and Learning (MEL) framework established, and lessons learned disseminated to enhance climate-sensitive disease management.

Activity 3.3.1 - Establish a project-level MEL framework The project will develop a comprehensive MEL framework to ensure continued assessment and improvement of project interventions. This activity will involve collating existing MEL practices at the state and national levels and integrating them into a robust MEL protocol. Besides guiding the implementation of mid-term and final project evaluations, the protocol will guide generating insights into the attributable impact of project interventions while also strengthening the MEL system of the H-NAP. Independent evaluations will assess the effectiveness, efficiency, and scalability of interventions, contributing to evidence-based decision-making and improved resilience of the public health system.

Activity 3.3.2 - Disseminate Lessons Learnt and Best Practices on climate-sensitive disease management

This activity will focus on capturing and sharing key lessons learned and best practices derived from the MEL processes. Findings from mid-term and final evaluations will be analyzed to identify successful approaches and challenges in managing climate-sensitive diseases. These insights will be disseminated through a Best Practice Guide on technical interventions and number of a number of workshops aimed at sharing lessons learnt and contribute to enhancing public health responses to climate change, particularly in regions facing geographical barriers, and inform future interventions at national and global levels.

4.3 Theory of Change

The following diagram presents the Theory of Change of the project that was developed based on the barrier analysis. The Theory of Change has been developed with outputs geared towards delivering improved resilience to climate-related health impacts with an overall focus on improving the climate resilience of public health in FSM.

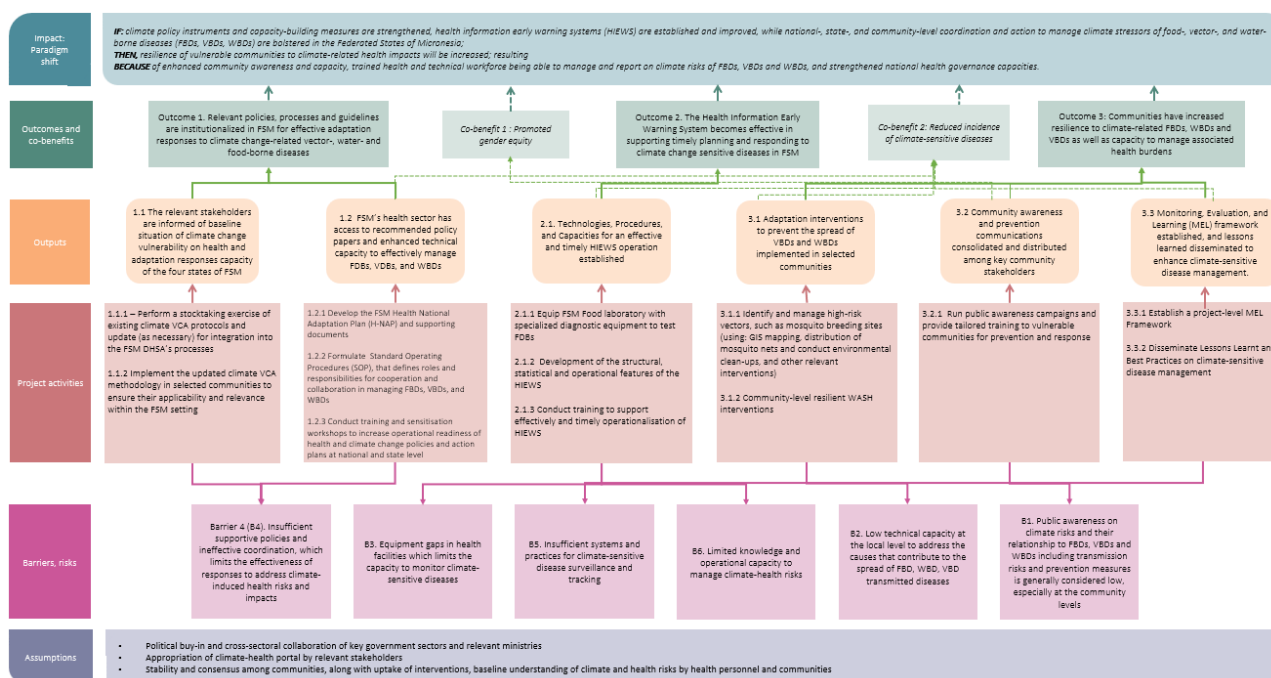


Figure 25: The project's theory of change.

This presents how the project will contribute towards a paradigm shift for climate-transformational investments in the public health sector in FSM.

Co-benefits:

The project is expected to lead to an important gender co-benefit for FSM, from the improvement of women participation in the community-level.

Gender:

The project will contribute in several ways in improving gender equality on community and policy levels. In particular, the development of a HNAP will ensure that intervention will address the needs of all members of society. The collection of gender disaggregated data will allow the improved planning and response. Gender sensitive interventions in the community level and the inclusion of women in the decision-making process of the health system strengthening will enable women empowerment.

Environment:

The project will contribute to improving environmental conditions within the supported communities by promoting cleanliness, proper waste management, and sustainable resource use. These measures will enhance the overall liveability of communities, reducing pollution and improving sanitation, thereby fostering healthier living environments.

Economic:

The project is expected to lead to improved economic resilience by reducing the incidence of climate-sensitive diseases within the supported communities. Through improved water and sanitation systems, enhanced hygiene practices, and community-based awareness initiatives, the project will help mitigate health risks associated with inadequate environmental conditions and

simultaneously enhance economic resilience by reducing the financial burden associated with healthcare costs and lost productivity, ultimately fostering long-term economic stability and well-being among the communities.

4.4 Cost reasoning

The Department of Health and Social Affairs has limited resources available to address climate-sensitive diseases, especially during the COVID-19 crisis. The data from the World Bank show that overall health expenditure per capita has recovered back to the 2005 levels in 2019, after the 2006 collapse and is amounting to USD 415.2. This is despite the fact that the general government health expenditure has been increasing in the last two decades in terms of per capita expenditure, but also moderately increasing in terms of percentage of GDP. In comparison, the average world per capita expenditure is USD 1,121.9, more than double of that in FSM. The additional burden from climate change on the health sector exacerbates the limited public resources, and there are currently no dedicated financing options from the public and private sector to cope with increasing climate change impacts.

Funding from GCF will allow the Government of FSM to achieve a paradigm shift towards climate resilient health sector. The project will fund key policies that will unlock the potential for climate proofing the health sector in FSM. By providing a HNAP, the project will allow the prioritization of integrated interventions for the development of a climate resilient public health sector. In this way, the GCF will ensure government-owned and -led processes to deliver climate-innovative and climate-resilient health interventions.

Moreover, the HIEWS will provide crucial data for the continuing adaptation efforts of the health system. The data will provide the basis for evidence-based decision making and increase the effectiveness and impact of the adaptation interventions. Grant financing from the GCF is justified for this project because of the extreme vulnerability of FSM communities to both climate sensitive disease and the lack of resources at all levels (local, state, and national).

5. Feasibility assessment

5.1 Technical assessment of project activities

The following table presents the project outputs and activities with the corresponding proposed measure. For each measure the alternatives are evaluated in terms to provide the reasoning behind the specific selection of each measure.

Project Output and Activity	Baseline activity and barrier(s) addressed	Description of measure	Alternatives evaluated (Cost-effectiveness)
<p>Output 2.1 Technologies, Procedures, and Capacities for an Effective and Timely HIEWS Operation Established</p> <p>Activity 2.1.1: Equip FSM Food laboratory with specialized diagnostic equipment to test FDBs</p>	<p>Currently FSM operates a Food laboratory situated in Pohnpei with limited capacity to address the needs for a comprehensive HIEWS. The laboratory cannot address the needs for WBD and VDB (partially covered by hospital laboratories) and has limited capacity that does not address all states' needs.</p> <p>Moreover, the Food laboratory is not equipped to analyse environmental samples, in order to support a HIEWS that will monitor not only the prevalence of climate sensitive diseases in the human population but take into consideration environmental and vector parameters.</p>	<p>A new equipment for the FSM Food laboratory will be procured, along with the necessary supporting testing agents to ensure that the Food lab will have the necessary capacity to cover all key climate sensitive diseases expanding its original scope.</p> <p>The increased capacity of the Food lab would provide valuable input to the HIEWS supporting diseases prevalence monitoring.</p> <p>The increased capacity will be able to cover needs of all four states.</p> <p>The FSM food lab will address gaps in the analytic surveillance of CSDs contributing to the existing surveillance systems.</p>	<p>Alternative #1 Develop a national diagnostic laboratory</p> <p>The development of a national diagnostic laboratory would serve multiple needs concerning clinical surveillance of diseases, including the development of a national reference lab.</p> <p>The development of a new diagnostic lab with this scope would increase the overall cost disproportionately with regards to the additionality that it would provide.</p>
<p>Output 2.1 Technologies, Procedures, and Capacities for an Effective and Timely HIEWS Operation Established</p> <p>Activity 2.1.2: Development of the structural, statistical and operational features of the HIEWS</p>	<p>A national-level health and climate information portal does not exist in FSM. Separate health information portals are operating at the national and state levels, and these include some information and educational materials on FBDs, VBDs and WBDs. Weather forecasts can be tracked from a variety of sources, of which the National Weather Service is the official one. Climate information has its own portal located on the Pacific Climate Change Portal.</p> <p>In general, information on climate-sensitive health diseases is limited in FSM due to a lack of consistent surveillance for each state (passive, delayed reporting), while there are some studies providing evidence of the association of FBDs, VBDs and WBDs with climate events, such as with ENSO oscillation.</p> <p>In addition, there is no characterization of relationship between FBDs, VBDs and WBDs outbreak and climatic (or other) factors which would provide a base for an early warning system that helps predict outbreaks and gives public health officials time to prepare for and prevent major epidemics.</p>	<p>National information system on climate-sensitive diseases (for FBDs, VBDs and WBDs) with control and early warning for FBDs, VBDs and WBDs will be established.</p> <p>This system will be based on modern mosquito control techniques and health database management based on digitized medical documentation and e-health, with information overlaid with hydrometeorological, sectoral and spatial data. It is expected to increase the effectiveness of disease control by intervening before or at the beginning of the epidemic curve.</p> <p>The core elements of the HIEWS are expected to be: (i) monitor environmental conditions for vectors or food/water pathogens; (ii) forecast high-risk conditions, initiate active surveillance; (iii) send alerts and communication; and (iv) establish a mechanism for early response. HIEWS will be used to standardize information sharing at all levels of government and will be</p>	<p>Alternative #1 State-level or local HIEWS</p> <p>Systems at the local level could work if each unit had the same health conditions (health workforce, technicians, equipment), but nonetheless, coordination and joint prevention efforts are needed on a much broader scale. Early warning of different territorial units is important to stop the spread.</p> <p>Therefore, national level HIEWS is appropriate, especially given the size and spatial distribution of FSM.</p>

Project Output and Activity	Baseline activity and barrier(s) addressed	Description of measure	Alternatives evaluated (Cost-effectiveness)
	Therefore, the activity will address barrier (5) Insufficient systems and practices for climate-sensitive disease surveillance and tracking (Identified need 4a)	available to the regional HIEWS - the PPHSN.	
Output 3.1 - Adaptation interventions to prevent the spread of VBDs and WBDs implemented in selected communities Activity 3.1.1 - Identify and manage high-risk vectors, such as mosquito breeding sites (using: GIS mapping, distribution of mosquito nets and conduct environmental clean-ups, and other relevant interventions) GIS mosquito surveillance	<p>Despite recurring VBDs outbreaks, mosquito breeding areas near certain settlements have not been inspected and mosquito control measures (so broader prevention control mechanisms of VBDs) were not undertaken.</p> <p>In addition to natural habitats, some urban or peri-urban or rural sites could also be covered with garbage, debris, stagnant water, or other grounds that are suitable for mosquito breeding.</p> <p>The surrounding population does not implement VBDs prevention measures.</p> <p>Therefore, the activity will address barrier (2) Low technical capacity at the local level to address the causes that contribute to the spread of FBD, WBD, VBD transmitted diseases (Identified need 6)</p>	<p>GIS will be used to map and analyse the spatial spread of mosquitos that serve to identify locations for environmental clean-ups or distribution of mosquito nets to the surrounding population.</p> <p>Continuous monitoring of mosquito populations will be used to predict recurring problematic areas, times of year, and the potential for increased risk of vector-borne diseases. When vector-borne diseases in nearby areas occur, additional measures will be taken to control mosquitoes or prevent the spread of VBDs.</p>	<p>Alternative #1: Mosquito surveillance without GIS</p> <p>Mosquitoes can be monitored and data analysed without a GIS system, using traps, regular field visits and sampling. However, this method does not provide a variety of data and analysis to support decision-making, which is vital in managing time-sensitive projects where public health is concerned.</p> <p>Alternative #2: Widespread spraying without surveillance</p> <p>Possible downside to mosquito spraying, especially if done by an aircraft or over a large territory, is that it will affect everything in its path. The insecticide will not spare bees or other beneficial insects for pollination and natural biodiversity and will also affect agriculture and households.</p>
Output 3.1 - Adaptation interventions to prevent the spread of VBDs and WBDs implemented in selected communities Activity 3.1.2: Community-level resilient WASH interventions Installation of climate-resilient first-flush rainwater tanks	<p>In certain communities, there is no improved and reliable water supply system in place, neither public nor individual. This indicates that there is a lack of year-round access to climate-resilient, safe and reliable drinking water supply which increases the chance of WBD spread.</p> <p>During droughts, water shortages occur, while heavy rains and cyclones cause floods, both of which affect water availability, safety and security.</p>	<p>Household rainwater tanks are low-cost solutions that can be installed and used immediately. Collecting rainwater will ensure the availability of water during the dry season. Proper use of water tanks will increase water safety and access among households.</p> <p>Water purification tablets and household test kits will be provided through the project. In addition, beneficiaries will be</p>	<p>Given the geographic arrangements with a number of outer islands a relatively high cost for provision of networked water supply is to be expected. Other options are not only unfeasible but can be socially unacceptable to the outer island communities.</p> <p>Alternative #1: Concrete water tanks</p>

Project Output and Activity	Baseline activity and barrier(s) addressed	Description of measure	Alternatives evaluated (Cost-effectiveness)
	Therefore, the activity will address barrier (2) Low technical capacity at the local level to address the causes that contribute to the spread of FBD, WBD, VBD transmitted diseases (Identified need 6)	<p>educated on how to clean the water tanks.</p> <p>Water tanks will be built with a high level of climate resistance (to flooding, storm surges / wind gusts, extreme temperatures), by grounding them with fixtures, to ensure they are not damaged during fast-onset weather events.</p> <p>These will also be placed above the flood zone and have covers and be made of HDPE (high density polyethylene). Lifespan of HDPE water tanks is expected to be 15-20 years.</p> <p>Besides providing water for personal usage, they can also provide water for plants and animals. In addition, having water tanks will decrease the spread of WBDs, as well as the costs and time that is currently spent (primarily by women and children) on domestic water provision and household water collection.</p> <p>A first-flush system will provide protection against sediments and contaminants accumulating in the tank, by diverting the initial flush of rainfall that contains the majority of them. First-flush systems have been found to improve significantly the water quality¹²⁰. Moreover, as sediments are reduced O&M needs are also decreased.</p>	<p>Plastic tanks (HDPE) with covers are easy to clean, maintain and moved allowing for use of land for other livelihood activities.</p> <p>Concrete tanks have to be constructed, take up more space, cannot be moved, and are harder to clean. In addition, concrete tanks are usually built in the ground and can get flooded.</p> <p>Alternative #2: Community water tanks</p> <p>Collecting rainwater in a household harvesting system is much more efficient than relying on groundwater supplies, especially if they need to be pumped. Increasing the catchment area is the most cost-effective way of ensuring that each drop of rain is collected and stored safely.</p> <p>Community water tanks is usually a service that is charged and requires some kind of supervision or inspection. The location of community tanks may be further away from some rural households and can open up possibilities of heightened conflict among communities/individuals. Moreover, opting for community water tanks can cause waiting in lines at certain times of the day.</p>
Climate resilient latrines	Only limited areas of FSM are equipped with a sewage system, while a large number of households use septic tanks or toilet pits, indicating that a number of households still use informal and unhygienic excretion disposal system.	The proposed interventions are based on applicable solutions already implemented successfully in Pohnpei State.	<p>Alternative #1: Bucket latrines</p> <p>The simplest form of toilet consists of a structure in which there are secretion is</p>

¹²⁰ Kus, B., Kandasamy, J., Vigneswaran, S., & Shon, H. K. (2010). Analysis of first flush to improve the water quality in rainwater tanks. *Water Science and Technology*, 61(2), 421-428. doi:10.2166/wst.2010.823.

Project Output and Activity	Baseline activity and barrier(s) addressed	Description of measure	Alternatives evaluated (Cost-effectiveness)
	<p>Unmonitored discharge of faeces, sewage or effluent into surface waters lead to environmental and health problems, especially diarrheal diseases.</p> <p>Heavy rains and floods result in rising water levels and the consequent flooding of toilets, which in turn collapse, especially where the soil is loose.</p> <p>In these events, WBDs increase as floodwater mixes with faeces, and also due to open defecation due to collapsed or flooded toilets.</p> <p>Therefore, the activity will address barrier (2) Low technical capacity at the local level to address the causes that contribute to the spread of FBD, WBD, VBD transmitted diseases (Identified need 6)</p>	<p>The latrines to be installed will be following the guidelines of the Pohnpei State EPA regulation on “Toilet Facilities and Sewage Disposal”. The proposed types are categorised as Type 2 i.e. toilets flushed with water and connected to a septic tank, cesspool, or combination of both.</p> <p>Since these systems will be ‘off-the-shelf’ procurement, these will provide minimal need for extensive civil works. Moreover, the systems will have provisions for disabled persons.</p> <p>Type 3 latrines pits are solutions that can be relatively quickly and easily built, even by their future users.</p> <p>Such systems will bring people dignity, comfort and privacy. Moreover, it could eliminate unpleasant and unhygienic living or working conditions that often result from poor sanitary conditions.</p> <p>By preventing the spread of WBD, it can be assumed that entire communities will benefit from the measure.</p>	<p>collected in a bucket or container, which is occasionally removed for disposal or processing.</p> <p>The technology is low cost, but it is unhygienic because it can be easily spilled arise in the transfer of ‘night ground’ into large containers and transport to the place of disposal or processing.</p> <p>Alternative #2: Self composting toilets</p> <p>Self-composting toilets could also be an alternative especially for the outer islands without access to running water infrastructure. Nevertheless, recent experience has shown that the installations of self-composting toilets incur significant costs with limited results as they are not utilized by the communities.</p>

5.2 Risk analysis and mitigation factors

Risks associated with this project are relatively low and relate mainly to natural hazards that can damage or incapacitate the health system or prevent communities from engaging in the project. As this risk cannot be eliminated, weather forecasts will be monitored, and necessary adaptation measures will be taken in case of natural disaster. Instability in targeted communities, such as conflict or a change of leadership could lead to delays or unwillingness to engage with outcome 3 of the project. However, this can be mitigated by maintaining strong relationships and good communications with local municipalities so that the engagement approach can be adapted. A loss of political might also slow down the implementation of the project, especially regarding the first outcome. However, this risk remains relatively low since both national and states governments perceive FBDs, VBDs and WBDs as major threats for the future well-being of their constituencies. This risk will be mitigated through ongoing cooperation and communication with stakeholders at national and state level.

Additional possible risks include the limited interest and engagement of the local communities. This will mainly affect activities under outcome 3 and especially operation and maintenance. The project will ensure that buy-in from communities by focusing on traditional leaders, women and youth. The focus of the project on communities that are the most at risk is also expected to lead to an increased interest of the local population for the O&M activities.

The focus of the project on outer islands that have higher vulnerability and lower access to health services, poses the issue of geographic remoteness of the communities. Transportation, communication and outreach activities can be challenging, leading to delays (transportation of materials, travels etc.). The project will take the remoteness criterium under consideration to ensure activities are implemented in a timely manner. Moreover, SPC has well established teams and network in FSM who will adjust to transportation needs accordingly.

The risk analysis and mitigation factors are discussed in detail in Annex 7: Risk assessment and management of the Funding Proposal according to the SAP guidelines.

5.3 Economic and financial viability

While FSM experience significant burden of disease and recurrent epidemic events from climate-sensitive diseases, they have limited resources available to support public health and climate-proofing the health sector. With health expenditure less than half of the average world per capita expenditure and significant dependence on the COFA funds for the health sector, there are significant financial needs and gaps.

The GCF investment will lead to a series of economic benefits which concern public health goods and services. The project will contribute to reduced morbidity and mortality from climate sensitive diseases and lowering their burden of disease. This reduction will lead to lower disability-adjusted life years¹²¹ increasing the productivity of FSM and reducing the need for public and private health expenditure.

Table 22: Summary - Economic Costs & Benefits

Label	Unit	Source of information	Total
Costs - (OPEX costs - leveraged co-finance)			
M1 - CAPEX costs	USD	M1 - Rainwater harvesters	\$ 3,060,000
M1 - OPEX costs		M1 - Rainwater harvesters	\$ 1,848,000
M2 - CAPEX costs	USD	M2 - Climate resilient latrines	\$ 2,750,000
M2 - OPEX costs		M2 - Climate resilient latrines	\$ 9,190,500

¹²¹ <https://www.who.int/data/gho/indicator-metadata-registry/imr-details/158>

M3 - CAPEX costs	USD	M3 - Surveillance laboratory	\$	470,000
M3 - OPEX costs		M3 - Surveillance laboratory	\$	4,211,190
M4 - CAPEX costs	USD	M4 - HIEWS	\$	556,000
M4 - OPEX costs		M4 - HIEWS	\$	800,000
Total	USD	Calculated	\$	22,885,690
Other project costs				
Total non-investment project costs	USD	Project proposal	\$	8,556,711
Total non-investment project costs	USD	Calculated	\$	8,556,711
Total investment costs	USD	Calculated	\$	6,836,000
Total project costs	USD	Calculated	\$	15,392,711
Total costs (with OPEX)	USD	Calculated	\$	31,442,401
Benefits				
M1 - benefits	USD	M1 - Rainwater harvesters	\$	29,065,873
M2 - benefits	USD	M2 - SCT Toilets	\$	20,131,182
M3 - benefits	USD	M3 - Surveillance laboratory	\$	9,042,149
M4 - benefits	USD	M4 - HIEWS	\$	13,483,862
Total benefits	USD	Calculated	\$	72,000,000

Table 23: ENPV and EIRR summary

Measure	Unit	Calculated/ Input	Value
Net costs / benefits	USD	Calculated	\$ 40,280,665

EIRR	%	Calculated		23%
ENPV	USD	Calculated	\$	6,649,146
Net costs / benefits per year	USD / year	Calculated	\$	2,014,033

A sensitivity analysis was performed to evaluate how project returns are affected by changing parameters. The sensitivity analysis looks at the impact of increasing the social discount rate, which has the effect of reducing the weight assigned to costs and benefits that occur in the future.

A second sensitivity analysis examines the effect of reduced project impact. The analysis evaluates economic NPV assuming annual marketable benefits are 10%, 25% and even 45% less than expected.

Table 24: Sensitivity analysis - discount rate changes

Investment costs	ENPV of the investment	EIRR of the investment
60%	\$52,857,625	46%
80%	\$46,569,145	32%
100%	\$40,280,665	23%
120%	\$33,992,185	17%
140%	\$27,703,704	12%

Benefits	ENPV of the investment	EIRR of the investment
60%	\$11,591,439	8%
80%	\$25,936,052	16%
100%	\$40,280,665	23%
120%	\$54,625,278	30%
140%	\$68,969,891	37%

Discount rate	ENPV of the investment
60%	\$14,006,672
75%	\$10,688,613

100%	\$6,649,146
120%	\$4,364,941
140%	\$2,664,061

The results of the economic and financial analysis show that the project generates robust economic benefits from a societal perspective, contributes to the long-term sustainability of the health sector in FSM and supports GCF's goal towards transformative adaptation to climate change.

5.4 Sustainability factors and exit strategy

The project has been designed to maximise the sustainability and replicability of results. The project is taking an integrated approach, tackling the core risks and impacts of climate change in health. The project will address multiple barriers and allow the mainstreaming of health considerations in the overall planning of adaptation, as well as covering an important part of FSM population (75.5 %).

Overall, the project is expected to critically strengthen the adaptation capacity of health sector to climate change. The project will build upon and update existing policies, provide the means for an effective surveillance of and response to climate-sensitive diseases, set the pathways of cooperation between state/national institutions, as well as increase the capacity of health and technical professionals to ensure the effective transformation of policies into practices.

Specific project activities and structural outcomes that enable long-term sustainability of project outcomes include:

Mainstreaming of climate change adaptation into National policies: By updating and operationalising policies at the national level, the project will ensure the required institutional focus in order to maintain the gains made by the project. By developing a key policy instruments the project will be able to address the lacuna on climate change and health in FSM. Moreover, the project will work in synergy with the development of FSM's NAP developing a policy reinforcing loop that would provide a comprehensive, context-specific vulnerability and adaptation assessment of the health sector and ensure informed planning and mainstreaming of health-related climate actions.

Integration of processes in the national and state institutions: The development of standard operating procedures will ensure the integration of the project outputs within the national and state institutions. This incorporation will ensure the takeover of specific processes by specific institutions under a clear mandate and ensure that they will remain effective after the completion of the project.

Strengthened human capital: Providing education and training to health professionals poses a challenge in FSM and Oceania in general, due to the unique logistical challenges in order to reach many populated islands across thousands of miles of water. The specialised training of health professionals and technical personnel to effectively address climate-induced health risks would provide a unique opportunity for FSM to

improve its personnel capacity. With the development of specialised training material and training of trainers, FSM will develop significant human capital and knowhow, that would be replicable in other PICTs.

The project will also ensure the **financial sustainability** of the project interventions on the local, state, and national level.

The HIEWS will build on the existing systems for climatic, health and social data incorporation. The HIEWS design will ensure data unification and interoperability to reduce future workload to keep it up-to-date. Therefore, data incorporation will not bring additional need for staffing. Similarly, O&M of the system will be conducted by DHSA personnel based on the training that they will receive. Operational aspects of the HIEWS such as the coordination unit, will also not require additional staffing. Coordination will be ensured by new processes and clear procedures from national and state healthcare and environmental personnel. After the implementation period, the Secretary of Health and Social Affairs at the government of FSM, as well as the State Directors of Health in Yap, Kosrae, Chuuk and Pohnpei, will designate coordination focal points as necessary.

The FSM laboratory will also be staffed by existing personnel. Additional costs for laboratory consumables will be needed annually. To this end, the government will commit the necessary annual budget (expected 50,000 USD/year). The additional cost that will be needed to ensure the sustainability of the interventions will be allocated from the operational budget of the Department of Health, which is funded at the government of FSM level from local revenues (largely from Fisheries and Captive Insurance sectors of the nation), and at the State Government (SG) level from operational budgets supported primarily from the US Compact Sector Grants. The US Compact Grants and US Federal Health Grants will also be employed to cover non-planned operational needs.

6. Implementation Arrangements

6.1 Stakeholder Engagement Plan

The following section is an overview of the Stakeholder Engagement Plan (Annex 23).

As a high priority in FSM's draft GCF country programme, this project is being fully co-developed with the Nationally Designated Authority (NDA), FSM Department of Health and Social Affairs and other key stakeholders, which guarantees full country ownership. By addressing increasing risks on human health from climate change, and by working directly with affected communities (through community-based adaptation activities), the project is fully aligned with the Government of FSM's climate change strategies and policies: FSM Nation Wide Integrated Disaster Risk Management and Climate Change Policy 2013, FSM Climate Change Act (2014) and the Federated States of Micronesia National Environment Management Strategy 2019-2023.

Given, also, FSM's national institutional arrangement for climate change and disaster risk reduction through the Department of Environment, Climate Change and Emergency Management (DECCEM), the structure of FSM Department of Health and Social Affairs (DHSA), as well as the overall decentralized administration of the national Government through FSM's four state governments, stakeholder engagement is necessary, using existing mechanisms, at national, state and community levels to ensure key players are consulted and committed throughout the life of the project without having to create new and additional mechanisms.

The project will have strong stakeholder engagement throughout the project cycle to ensure that all the stakeholders are being informed and consulted both prior and during project implementation and are given the opportunity to influence project activities.

A comprehensive coverage of the stakeholder engagement process is outlined in Annex 23 summary of stakeholder engagement activities thus far and a proposed plan for ongoing engagement during the course of the project is provided below.

Inception Workshop: November 2, 2021

An inception workshop was held on November 2, 2021, to commence the consultation and engagement process with stakeholder agencies. The workshop was conducted by SPC, E Co. and Palikir Consultants and involved the participation of key players including FSM GCF NDA, DHSA, DECEM, FSM Overseas Development Assistance (ODA), WHO, SPC, United States Agency for International Development (USAID) as well as state government representatives. The workshop was facilitated by Palikir Consultants - with two working groups on co-financing and stakeholder mapping.

State and Community-level Stakeholder Consultations:

- **March 4, 2022 - Pohnpei State and Kosrae State**
- **March 8, 2022 - Yap State and Chuuk State**

Given the reach of the proposed project down to community-level interventions, it was determined consultations at the state level were necessary to inform the design process. Accordingly, the states of Kosrae, Pohnpei, Chuuk and Yap were involved.

The state consultations were conducted during 2 separate days. The first session was conducted in Pohnpei, with the stakeholders in Kosrae attending via Zoom. The second session was conducted in both Yap and Chuuk, with Palikir Consultants co-facilitating via Zoom, with state focal points co-facilitating on the ground.

In attendance during the consultations were representatives from state and municipal governments, traditional leaders, religious leaders, as well as civil society organisations (CSOs) and NGOs.

Documentation of participants attending the four different consultations was by way of the circulation of a registration template. The template requires participants to fill in their names, designation or institution and their contact details.

Consultations at the state and community level followed a structured, workshop type approach beginning with a project briefing, followed by stakeholder feedback with worksheets and a survey, a discussion of the SEP and a discussion of the GRM. The stakeholders engaged were provided ample time for questions and clarifications from after each presentation.

Stakeholder Engagement Plan

The Stakeholder engagement plan is detailed in Annex 23. Nevertheless, the following table provides an overview of the identified stakeholder groups, the method of engagement and key issues.

Table 25: Identified stakeholder groups, method of engagement and key issues.

Project component	Topic of Consultation	Key Stakeholders	Issues Raised / Expected Decisions	Methods Used	Timetable / Dates
Preparation Phase					
All	Proposed project components	DHSA SPC GCF NDA	<p><u>Issues</u>: timeline for implementation of the project and making sure there is enough time allotted to fully complete the project.</p> <p><u>Engagement strategy</u>: timeline revisited.</p>	National consultation that includes state level agencies that will be responsible for implementation of the project components.	Prior to project appraisal
All	Stakeholder consultation on all draft documents: ESMP GA-GAP SEP & GRM	DHSA SPC	<p><u>Issues</u>: quality of the analysis, suitability of the proposed measure to address potential risks</p> <p><u>Engagement strategy</u>: Disclosure of the documents</p> <p>Enabling key stakeholders to provide their opinion, feedback, suggestions on the technical, environmental and social assessments.</p> <p>Integrate and address raised suggestions, opinions and considerations in the assessments.</p>	Emails, letters to stakeholders with appropriate background information and SEP, posting on the Platform/websites for feedback, focus groups	<p>As soon as each individual deliverable is completed/ the documents are elaborated</p> <p>The documents will be available to the public for a period of 10 days to provide comments and suggestions</p>

Project output	Output description	Key Stakeholders	Issues Raised / Expected Decisions	Methods Used	Timetable / Dates
Implementation Phase					
1.1	The relevant stakeholders are informed of	DHSA	<u>Issues</u> : VCA protocols should ensure that cultural	Meetings, workshops,	4 state workshop events taking

	baseline situation of climate change vulnerability on health and adaptation response capacity of the four states of FSM	SPC EPA Offices Department of Health and Social Services (State level) Communities	considerations of local communities are addressed <u>Engagement strategy</u> : Specific sessions in the workshop will address including cultural consideration processes in the VCA protocols	and assessments	place between Y1Q3 and Y2Q3
1.2	Institutional capacity and policy instruments on climate adaptation in the health and health-adjacent sectors strengthened to manage FBDs, VBDs and WBDs	DHSA SPC EPA Offices Department of Health and Social Services (State level)	<u>Issues</u> : Existing state health workforce, communities and municipal governments have limited capacity <u>Engagement strategy</u> : Specific events will target the workforce and government officials to ensure increase in awareness and sensitisation.	Meetings, workshops, and trainings	4 state and 2 national events to ensure engagement of stakeholders implemented within the period Y2Q1 - Y3Q4 2 events focusing in DHSA and EPA personnel and 2 events focusing on government official awareness raising implemented within the period Y3Q1 - Y4Q4
2.1	Technologies, Procedures, and Capacities for an Effective and Timely HIEWS Operation Established	DHSA SPC EPA Offices Department of Health and Social Services (State level)	<u>Issues</u> : No current communication system between weather and health Existing state health workforce has limited capacity <u>Engagement strategy</u> : FSM National Government to set up collaboration mechanism	Meetings, workshops, and trainings	9 events focusing on DHSA and EPA workforce implemented within the period Y3Q1 - Y4Q4

3.1	Adaptation interventions to prevent the spread of FDBs, VBDs and WBDs implemented in selected communities	DHSA SPC EPA Offices Department of Health and Social Services (State level) Communities	<p><u>Issues:</u> Poor community water management/non-functioning water committees</p> <p>Poor community sanitation practices</p> <p>Limited to no knowledge of climate risks</p> <p><u>Engagement strategy:</u> Trainings should be flexible and inclusive so the states can determine who can participate.</p> <p>Stakeholder will participate in vector survey and GIS mapping, distribution of mosquito nets, community environmental clean ups, WASH interventions and O&M workshops</p>	Workshops and trainings	10 community level events implemented within the period Y2Q1-Y4Q4
3.2	Community awareness and prevention communications consolidated and distributed among key community stakeholders	DHSA SPC EPA Offices Department of Health and Social Services (State level) Communities	<p><u>Issues:</u> Existing state health workforce, communities and municipal governments have limited capacity</p> <p><u>Engagement strategy:</u></p> <p>Stakeholder will participate in public awareness campaigns and tailored training for prevention and response</p>	Workshops, trainings and community awareness meetings	2 events focusing on DSHA and EPA workforce and 40 events focusing on communities to be implemented within the period Y3Q1-Y4Q4
3.3	Monitoring, Evaluation, and Learning (MEL) framework established, and	DHSA SPC EPA Offices	<p><u>Issue:</u> Lack of robust M&E mechanisms</p> <p><u>Engagement strategy:</u></p> <p>Stakeholders will be</p>	Training, workshops and conference	2 events focusing on lessons learnt and two events to support the mid-term and final

	lessons learned disseminated to enhance climate-sensitive disease management	Department of Health and Social Services (State level)	trained on M&E mechanism		evaluation data collection. Event will take place on Y2Q4, Y3Q4 and Y3Q3, Y5Q1 respectively
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6.1.1 Grievance Redress Mechanisms

SPC is committed to receiving any concerns or grievances from an affected community, about the environmental and social plans or performance of any SPC project.

The specifics of the Grievance Redress Mechanisms are presented in Section 7 of the Stakeholder Engagement Plan.

6.2 Implementation and governance section

Accredited Entity:

Within SPC, the AE functions will be undertaken by the Climate Change and Environment Sustainability Programme (CCES), which hosts the Climate Finance Unit (CFU) that is SPC's focal point to the Green Climate Fund (GCF). SPC oversight will include:

- entering into contractual agreements with the EEs through established processes;
- managing GCF funds;
- reviewing and collating financial expenditures and progress reports from the EEs;
- overseeing project implementation in accordance with the funding proposal, Annual Work Plans (AWPs) and budgets, agreements with co-financiers and executing entity rules and procedures;
- providing technical guidance to ensure that the appropriate technical quality is achieved in all project activities;
- providing financial and narrative reports to the GCF for project funds received;
- ensuring that the project complies with the terms agreed in the project's Funded Activity Agreement (FAA), SPC's GCF Accreditation Master Agreement (AMA), and all relevant SPC and GCF policies, regulations and procedures; and
- undertaking regular annual supervision missions, as needed.
- managing the reporting to the GCF providing quality assessment to the draft reports compiled by the EE and submitting the reports to the GCF.

Comparative Advantage - SPC is a regional Direct Access Entity (DAE) and its comparative advantage, as an AE, lies in its:

- Extensive ties with Pacific Islands governments, administrations, agencies and partners in all Pacific island countries.
- Micronesian Regional Office, which is hosted in Pohnpei.
- Broad mandate on urgent development issues in the Pacific, including: water, disaster-risk reduction, climate change and environmental sustainability, gender and human rights.

- Large funding base with multi-lateral and bilateral donors, allowing for co-financing options, cost sharing and combined programmatic funding.
- Extensive international partnerships which range from UN agencies to other IGOs, NGOs and civil society groups at grassroots level, including in FSM.

Executing Entity:

SPC through its Public Health Division (PHD): SPC will be the executing entity for the project, acting through its PHD. Under the guidance of the AE and the Project Steering Committee, PHD will oversee the tasks within the overall project management structure consisting of:

- contracting PMU staff (National Project Manager, Health and Climate Change Advisor, Finance Officer, Procurement Officer, Project Administrative Officer, State Coordinators) to be based in DHSA
- undertaking procurement activities directly or through the PMU, based on the guidance from DHSA;
- managing contracts of staff, suppliers and services providers, with guidance from DHSA;
- providing technical assistance from existing PHD epidemiologists for capacity building activities when required (mainly activity 1.2.1, 1.2.2, 2.1.3 and 3.2.1)
- providing technical guidance and supporting the PMU to ensure all project-level reporting outputs are prepared in a timely manner and in alignment with GCF requirements.

Comparative advantage - PHD is the focal point of the Pacific Public Health Surveillance Network and will be one of the two Executing Entities (EE) of the project. PHD's comparative advantage, as an EE lies in its:

- Extensive ties with Pacific Islands governments, administrations, agencies and partners in all Pacific Island countries
- Its previous extensive work in the health sector including both communicable and NCDs
- Its extensive work on health governance on a regional level
- Its extensive work in surveillance, preparedness and response in the region
- Its role as the focal point of the PPHSN
- Its experience in providing technical support in epidemiology, surveillance and response to communicable diseases since more than 50 years.

The Government of FSM: will work in close collaboration with the executing entity and host the Project Management Unit (PMU) for this project, acting through the DHSA. It will be responsible for:

- Supporting the implementation of day-to-day activities as per the project work plan and budget, including the Environment and Social management Plan, the Gender Action Plan and the Stakeholder Engagement Plan;
- community selection and engagement following the workplan and the provisions of the stakeholder engagement plan
- conducting needs assessment and/or validation to ensure that national, state, and community level interventions are addressed, according to the workplan and activity breakdown
- enabling project and activity coordination through meetings, liaising between implementing partners, service providers etc.;

- providing information for the drafting of reports as required by the NPSC (National Project Steering Committee) and under the FAA of the project (those reports under the FAA will be quality assured by the AE before submission).

Comparative advantage - DHSA is one of the executive departments of FSM National Government. Its mandate is to promote the health and welfare of the people of this nation. To achieve that goal, this Department is organized into two main divisions: Division of Health and the Division of Social Affairs.

The Division of Health oversees the implementation of all the health programs ranging from the prevention and control of communicable diseases (TB, Leprosy, STD) to non-communicable disease (diabetes, cancer, tobacco control related diseases), behavioural health and wellness (substance abuse prevention and treatment, mental health conditions), child and women, and immunization programs.

The Division of Social Affairs directs the social development of our youth, sports activities, elderly, and women. With a special lens on gender role advancement, the Division of Social Affairs facilitates implementation of agreements related to human rights on behalf of FSM.

National Project Steering Committee (NPSC): will be formally established as a part of the inception workshop for the project.

The NPSC will be comprised of representatives from

- FSM Departments
 - Department of Health and Social Affairs (DHSA) - Chair
 - Department of Environment, Climate Change and Emergency Management - Climate Change Division (DECEM)
 - Department of Finance and Administration (DFA)
 - Department of Resource and Development
 - Department of Transport, Communication and Infrastructure
 - Department of Foreign Affairs
- a representative of DHSA from each of the four FSM states, and
- one representative from SPC (PHD)
- a representative from the National Women's Council
- representatives from other government Departments, invited as technical advisors

A major aim of this arrangement will be to reinforce the country-driven, federal approach.

The NPSC will provide implementation guidance, strategic support and financial and procedural oversight to the project. Specifically, the NPSC will:

- provide strategic guidance and implementation oversight of the Project through review of progress and evaluation reports and provision of recommendations to the PMU for improved implementation;
- provide guidance and direction on cross-cutting issues which require consensus from the various stakeholders involved in the Project;
- ensure that institutional strengthening through the activities is consistent with the Project's overall objective as well as national policies and strategies;

- facilitate full cooperation of various stakeholders under their jurisdictions to provide access and support to the Project team in carrying out their tasks;
- represent the interests of civil society and communities derived through NDA and DHSA bilateral dialogues;
- approve the project's administrative, financial, accounting and operations manual;
- approve the project's Annual Work Program and Budgets (AWPB); and,
- ensure complementarity with other GCF-funded projects in the country.

The NPSC will act in accordance with best practices and standards for governing bodies and ensure that the PMU delivers expected results with best value for money, fairness, integrity, transparency and effectiveness. The NPSC will meet at least annually, as well as maintain regular contact with the AE, EE and PMU as needed on an *ad hoc* basis.

Project Management Unit: The DHSA will house the PMU and it will be established under the subsidiary agreement between SPC and the GoFSM. On implementation matters, the PMU will carry out AWPBs in alignment with the NPSC approved documentation. Further, the PMU will be embedded within the DHSA to allow the Department to play a central role in guiding implementation of project activities in line with country regulations, policies, processes, and local contexts. Project implementation will be strongly aligned with DHSA processes, with national staff providing guidance to the PMU at the activity level. This will ensure more effective implementation through enhanced knowledge transfer between PMU staff and DHSA extension agents both formally and tacitly through day-to-day interactions.

More specifically, the PMU will be responsible for; i) drafting annual work plans and budgets and relevant reports to the NPSC for approval, ii) drafting reports and submitting them to AE as required under the FAA (AE will provide QA and report to GCF) iii) providing technical assistance and training required through the project and iv) maintaining implementation and compliance with the Environmental and Social Management Plan and Gender Action Plan of the project. The PMU will work together with the various national and state agencies, service providers and other relevant stakeholders, and shall report to and be guided by the NPSC.

All positions will be hired by SPC and done in an open competitive process. The selection and recruitment PMU staff will follow SPC recruitment practices and be done in close consultation with the DHSA, who will provide no objection to Terms of Reference and will provide a representative to participate in the interview panel. All positions will be advertised at local levels and preference will be given to local applicants if they meet the positions criteria. These positions include:

National Project Manager - will be responsible for the day-to-day operations of the PMU, within the parameters laid down by the NPSC through the approved AWPBs and in alignment with their guidance and recommendations. They will also be responsible for monitoring project risks and maintaining the project risk log and will ensure regular communication with all selected service providers, CSO organisation and state governments. This will ensure smooth feedback across all project stakeholders and facilitate implementation as needed. With support from PMU members as required, the National Project Manager will draft and finalise i) AWPBs and other relevant documentation for NPSC approval and ii) all reports required to meet GCF obligations under the FAA. Overall, it is the Project Manager's responsibility to ensure efficient and effective implementation of the project.

Finance Officer - will be responsible for supporting the National Project Manager in managing the project budget and tracking finances in compliance with GCF obligations signed under the FAA and will contribute to the drafting of AWPBs. They will work in close collaboration with DHSA finance officers and provide technical advice and support through capacity building to DHSA staff throughout project implementation.

Procurement Officer - ensures that all contracts and goods and services procured through the use of project funds are in alignment with GCF procurement standards. He/she will work closely with the Stat Coordinators and the National Project Manager who will have the technical knowledge to advise on the procurement of technical equipment and materials as well as the experience and skill sets of service providers targeted for works at local level.

Project Administrative Assistant - will support the PMU through carrying out all necessary administrative tasks required for the smooth operation of the project. They will also carry out secretariat roles for organisation for NPSC meetings and ad hoc communications as needed.

Health and Climate Change Advisor - will support the National Project Manager, State Coordinators and Support Staff as well as the M&E officer, in the implementation of project activities. They will provide strategic technical advice on VCA processes, policies updates, SOPs, surveillance of FBD, VBD and WBD, concrete adaptation interventions, as well as support capacity building and awareness raising activities.

Gender, Environmental and Social Safeguards Officer (ESS/Gender Officer) - will be responsible for the implementation of the ESMP and GAP, ensuring that all project activities comply with the plans. They will also carry out the relevant monitoring and evaluation and support the M&E Officer in reporting obligations under the FAA.

Monitoring and Evaluation Officer - will ensure that the M&E plan is followed and implemented on schedule, liaising with the State Coordinators, GESS Officer and the National Project Manager on a regular basis. He/she will make sure all data collection and monitoring against the Integrated Results Management Framework project-level targets in the logical framework and gender action plan is carried out in a timely and effective manner for reporting to GCF and the NPSC within appropriate timeframes. Further, the MEL officer will utilise this data to create learning products for dissemination and support the National Project Manager in drafting any additional reports as needed.

State Coordinators (X4) - will be recruited at state level and will be responsible for day-to-day implementation of project activities at a local level. They will report to the National Project Manager on a regular basis and keep them informed of project progress and implementation challenges in a timely manner. Data collection of project outputs at state level will be their responsibility and they will regularly connect with the M&E Officer to provide up to date data and support them in drafting reports as required under the FAA.

In support of these PMU positions - SPC in its role as EE will provide additional technical support to the project activities on part-time basis from the Finance and Procurement Specialist based in SPC Micronesia Regional Office (MRO). They will provide training to the PMU Procurement Officer

and Finance Officer to ensure that they are carrying out financial and procurement functions to a level compliant with the SPC Financial and Procurement Policies.

Service Providers: The PMU will recruit and work with Service Providers at the activity level. Service Providers will be selected through a procurement process, in alignment with the SPC policies and will be managed by the Procurement and Finance Officer in the PMU. The Service Providers will receive funds, upon successful delivery and acceptance by the Project Manager that the conditions of their recruitment have been fulfilled. Service providers will include:

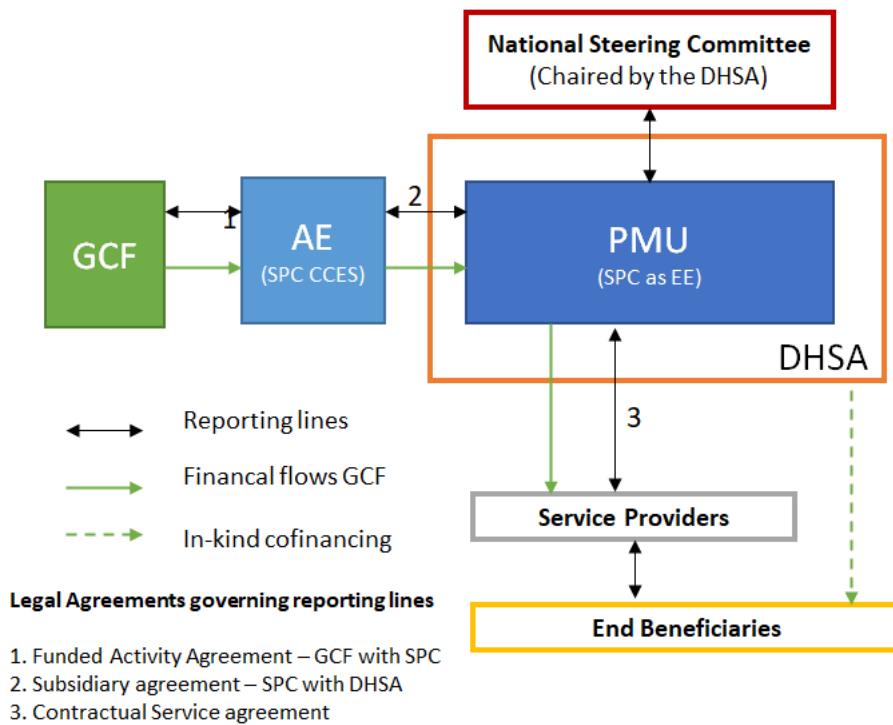
- Health and Climate change international consultant(s) and SPC PHD staff to update the VCA protocols (activities 1.1.1, 1.1.2), develop the H-NAP (activity 1.2.1), update the SOP for climate sensitive diseases (activity 1.2.2), develop the training material for the sensitization and training workshops (activity 1.2.3), develop the HIEWS reference documents and support the establishment of a coordination unit for the HIEWS (activity 2.1.2), develop training material for the coordination of multisector response in the event of early warning (activity 2.1.3), and develop training material for the community level training (activity 3.2.1)
- Contractor(s) to deliver the equipment and the construction cost of for the FSM diagnostic laboratory (activity 2.1.1), the IT solutions for the HIEWS and the predictive model of island-scale dengue spread, the vector survey and mapping equipment and mosquito nets (activity 3.1.1), the equipment and construction costs for the WASH interventions (activity 3.1.2)
- A WASH specialist to be included to support the decision making and the development the training material for the O&M of the WASH infrastructure (activity 3.1.2).

Nationally Designated Authority: FSM's Nationally Designated Authority or NDA to the GCF is the Department of Finance and Administration which includes an NDA Office. The NDA Office will provide essential backstopping support and serve as the interface between GCF and the Government of FSM as and when needed. The NDA will also remain in close contact with the AE once the project moves into the implementation phase. The NDA will receive regular updates on the project progress and will be engaged periodically to provide any feedback from the national perspective.

Figure 26 presents the implementation arrangement and reporting structure.

Figure 26: Implementation Arrangement and Reporting Structure





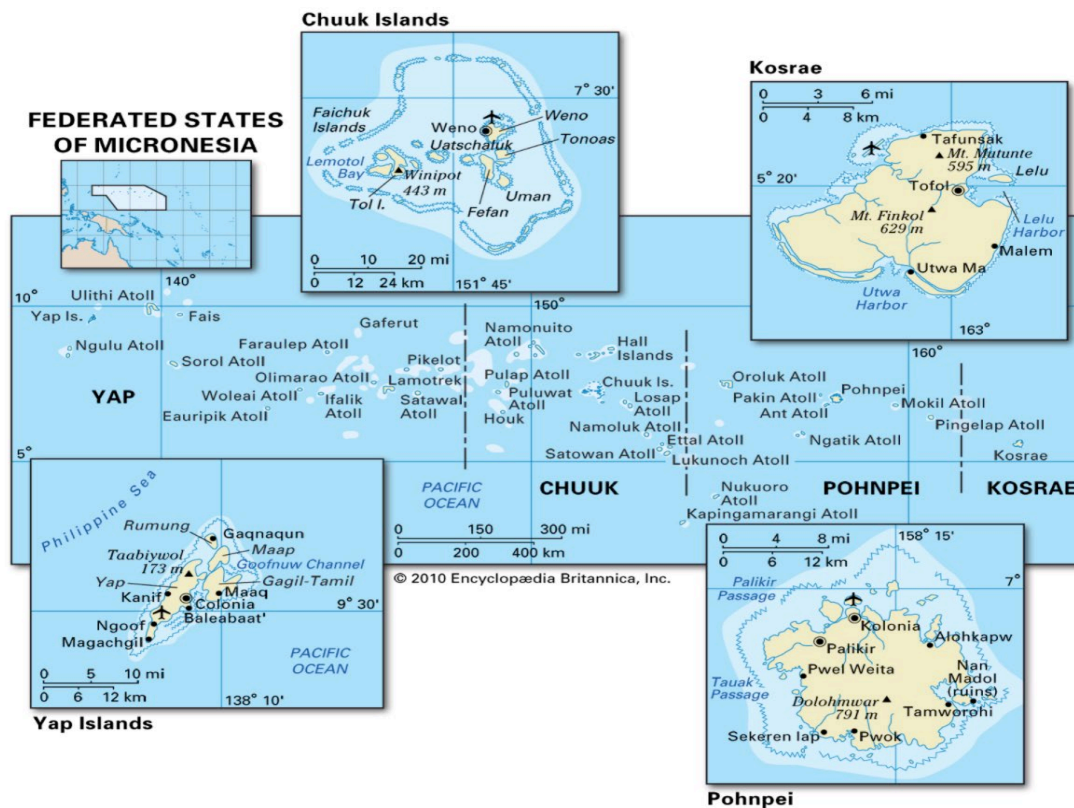
6.2.1 Financial Flows

On successful completion of conditions precedent to disbursement listed in the Project FAA, GCF will disburse funds to the AE. The SPC will then manage all funds as no funds will be transferred to the Government of FSM. Resources will be used to staff the PMU, secure service providers and goods/materials for implementation of activities.

All subsequent allocations and disbursements will be requested by the PMU based on AWPBs approved by the NPSC. The AE will make subsequent allocations and disbursements to the EE only in the case that previous instalments have been utilised in accordance with the GCF financial obligations and reported in Annual Progress Reports. Once there is consensus on the previous instalments, financial and technical reporting, and on approval of the AWPB by the NPSC for the forthcoming disbursement request, the latter will be accepted and communicated to the EE. Following which disbursement will be made.

Appendix A. Map: Federated States of Micronesia

This is a map of the Federated States of Micronesia.



Appendix B. Pohnpei State EPA beneficiary eligibility criteria and template installation agreement

INTERVIEW FOR DETERMINATION OF ELIGIBILITY

1. Shall be a citizen of Pohnpei State, the Federated States of Micronesia.
2. Shall apply for and complete all necessary document forms provided by Pohnpei State EPA.
3. Shall have a very low family income or negative source of income.
4. Shall provide manual labor for construction of the structure, installation of the other fixtures and piping layout.
5. Shall have legal right to property.
6. Shall have access to the public waterline or a community water system, or and individual waterline or an existing water catchment.
7. Shall agree to construct the structure and do excavation work for the septic tank and or cesspool.
8. Shall agree to construct the structure in accordance with the approved plan provided and not to exceed the dimension indicated in the plan.
9. Shall be in the rural area without access to the public sewer line period.
10. Shall agree to remove all or any source of contaminant, less
The 50' ft away from any body of water, within the
Applicant's property.

APPLICANT NAME DATE

INTERVIEWED BY: _____

TEMPLATE INSTALLATION AGREEMENT

This agreement is made between Pohnpei Environmental Protection Agency, and applicant from the rural areas around Pohnpei. (Mr. / Mrs. / Ms/ _____ has agreed to comply

with the requirements of this agreement as listed below:

1. Applicant shall construct the project in accordance with the plans and specifications provided by

EPA, and shall be responsible to provide construction manpower

2. Shall agree to provide excavation of the cesspool

3. Shall agree to provide adequate water system needed for the operation of the facility

4. Shall agree to provide proposed project date started and date completed

5. Shall provide land certification of ownership

6. Before final approval indicating satisfactory completion of the project, all unsanitary toilet facilities and pigpens, located within 50 feet of riverbank or shoreline shall be removed.

7. Shall provide all pigpens on the applicant's property with sanitary waste disposal systems.

8. Shall agree to properly operate and maintain the facility constructed under this agreement, for a period of at least 5 years after the completion of the construction.

I hereby agree to comply with all requirements listed above, to remedy the unsanitary conditions at my residential site and abide by all Pohnpei EPA regulations.

Applicant Date

Francisco Celestine Date

Executive Officer

Pohnpei EPA

Appendix C. Expected WASH interventions examples

This annex provides a view into the expected WASH interventions that will take place in the communities under the project. The nature of the investments i.e., infrastructure upgrades will have no or low environmental and social impacts.

First flush rainwater system



Climate-resilient latrine

