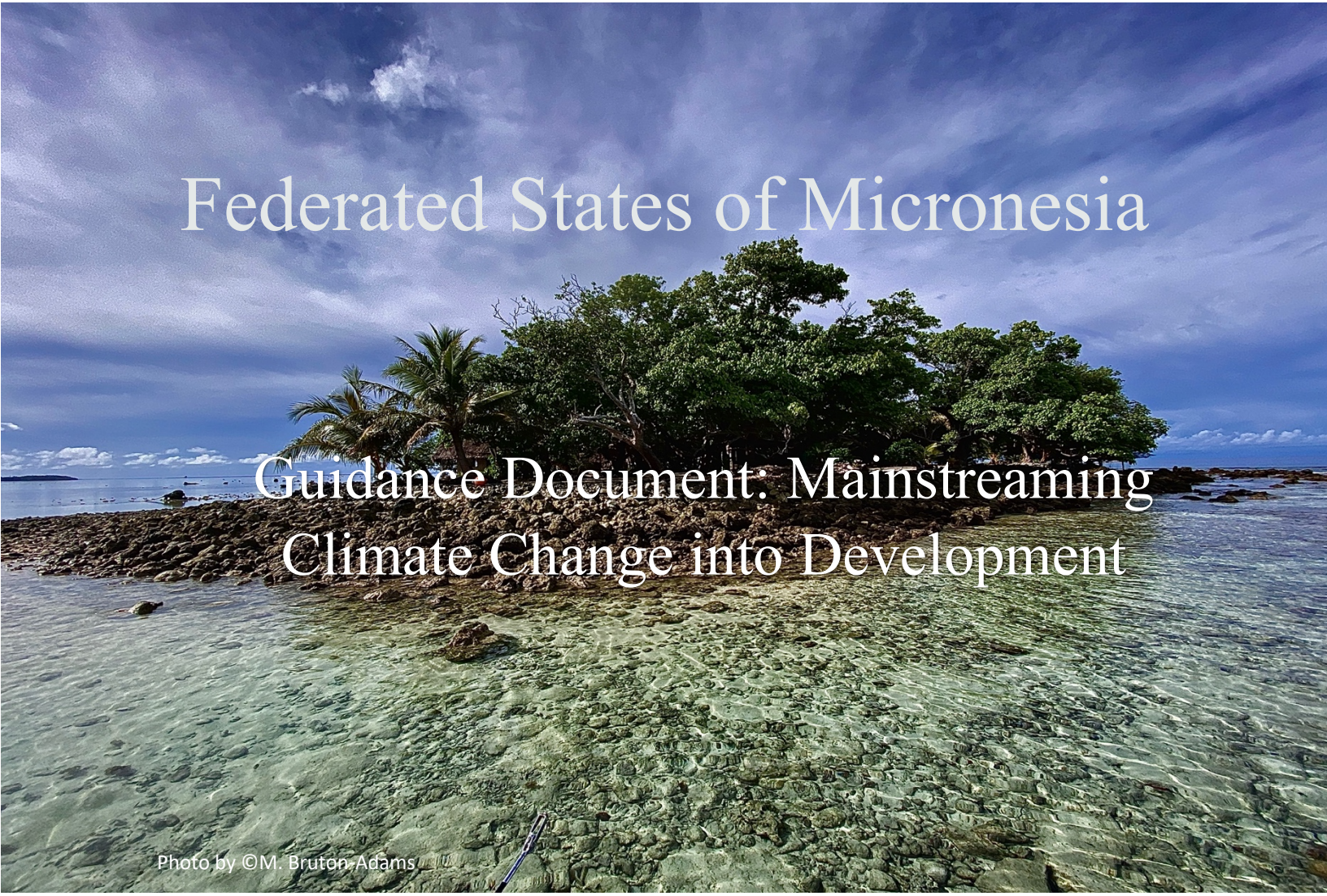

Report prepared for:
Department of Environment, Climate Change and Emergency Management
On behalf of the FSM Adaptation Fund Project*: Enhancing the Climate Change Resilience of Vulnerable Island Communities in FSM*

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Table of Contents

Acronyms

AR	Assessment Report
BPM	Blue Prosperity Micronesia
BUR	Biennial Update Report
CBD	Convention on Biological Diversity
CC	Climate Change
CCGI	Climate Change Guidance for Infrastructure
CCKP	Climate Change Knowledge Portal
CMIP	Coupled Model Inter-comparison Project
CO_2	Carbon Dioxide
CoFA	Compact of Free Association
CP	Climate Proofing
DECEM	Department of Environment, Climate change and Emergency Management
DRMCC	Disaster Risk Management and Climate Change
DTCI	Department of Transportation, Communication, and Infrastructure
EbA	Ecosystem-based Adaptation
EbM	Ecosystem-based Mitigation
ECO-DRR	Ecosystem-based Disaster Risk Reduction
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ENSO	El Niño Southern Oscillation
EPA	Environmental Protection Agency
FSM	Federated States of Micronesia
FSMNG	Federated States of Micronesia National Government
GHG	Greenhouse Gases
ICT	Information and Communication Technology
IDP	Infrastructure Development Plan
IPCC	Intergovernmental Panel on Climate Change
KIRMA	Kosrae Island Resource Management Authority
KRDP	Kosrae Regulations for Development Projects
NGO	Non-government Organization
MC	Micronesia Challenge
MCT	Micronesia Conservation Trust
ME	Monitoring and Evaluation
NbS	Nature-based Solutions
NC	National Communication
NCS	Natural Climate Solutions
NDC	Nationally Determined Contribution
NESP	National Energy Sector Policy
NGO	Non-governmental Organization
NOAA	National Oceanic and Atmospheric Administration
PA	Paris Agreement
PACC	Pacific Adaptation to Climate Change

PCCDP	Pacific Climate Change Data Portal
PIFACC	Pacific Island Framework for Action on Climate Change
RCP	Representative Concentration Pathway
RFA	Pacific Regional Framework for Action on Disaster Risk Reduction Management
SBSAP	State Biodiversity Action Plan
SEA	Strategic Environmental Assessment
SDG	Sustainable Development Goals
SFDRR	Sendai Framework of Disaster Risk Reduction
SLR	Sea Level Rise
SNC	Second National Communication
SSP	Shared Socioeconomic Pathway
UN	United Nations
UNEP	United Nations Environment Program
UNFCCC	United Nation Framework Convention on Climate Change
US	United States
USDA-NRCS	US Department of Agriculture – Natural Resource Conservation Services
WBG	World Bank Group
WCRP	World Climate Research Program

Authors' Note

Coping with the effects of natural disturbances, such as extreme weather and climatic events, is not new to the people of Federated States of Micronesia (FSM). Historically, island communities have adapted and reacted to climate related challenges in a myriad of ways, that were steeped in customs and traditions. As the threat of climate change continues to grow globally, climate adaptation and community resilience for island nations becomes more challenging. Governments and their communities will need to develop climate sensitive policies, legislation, and regulations to protect the fragile resources in which their communities are highly dependent upon.

The FSM National Government (FSMNG) and the four states (Pohnpei, Chuuk, Kosrae and Yap) have been diligent working towards ensuring the adaptive capacity and resilience of its peoples and communities. Pressed an increasing need to expand the FSM's outlook from weather and climatic risk reduction to assertively incorporating and mainstreaming climate change into the nation's development plans and regulatory frameworks. Regionally, climate change and disaster risk reductions have been developed to support the development of Pacific Islands' responses to climate change and reducing the risks of natural disasters. Those actions include the Pacific Island Framework for Action on Climate Change (PIFACC)[1] and the Pacific Regional Framework for Action on Disaster Risk Reduction and Disaster Management (RFA)[2]; and international frameworks for climate change action and disaster risk reduction under the United Nations Framework Convention on Climate Change (UNFCCC) and the Sendai Framework for Disaster Risk Reduction (SFDRR).

The FSM has employed a wide array of initiatives at the national and state levels, focusing on specific sectors: food and water security, agriculture, natural resource conservation, as well as clean energy. These targeted actions has produced legislation, strategic action plans, and policies aimed at creating enabling conditions that supports grassroots and community initiatives that ensures adaptive capacity and community resilience, to reduce the impacts of disasters and support Nature-based Solutions (NbS). The FSM and the four states have expanded their targets from merely focusing on climatic and disaster response, to coupling priority sector development with climate change initiatives. By mainstreaming climate change into the FSM's strategic development plans and developing an array of policies that integrate climate change across key development sectors of government and civil society increases the FSM's capacity to define its economic and socioeconomic growth and security amidst the threat of climate change.

The purpose of this Guidance Document is to support the FSM in its continued efforts to mainstream climate change into development planning. During the development phase of the Guidance Document several stakeholder workshops were conducted to gage the level of understanding and knowledge of climate mainstreaming. The results produced several key challenges and gaps:

[1] Pacific Island Framework for Action on Climate Change – 2006 – 2015. See: https://www.preventionweb.net/publication/pacific-islands-framework-action-climate-change-2006-2015

[2] Regional Synthesis Report of the Implementation of the Pacific Disaster Risk Reduction and Disaster Management Framework for Action 2005-2016 (RFA) & Pacific Island Framework for Action on Climate Change 2006-2016 (PIFACC). See: https://prdrse4all.spc.int/sites/default/files/spc_2016_regional_synthesis_report.pdf

- What is the definition of mainstreaming as it pertains to development?
- Is there a specific process for integrating climate change into development?
- Is there a specific point of intersect between climate change action and the development process?
- Should monitoring and evaluation (ME) of climate activities be incorporated into the development of the ME process? If so, how?

It is the intention of the Guidance Document to aid the FSM in answering these questions and deliver relevant approaches to incorporating climate change considerations into the development process, paying particular attention to several guidelines that already exist within the FSM:

- Kosrae Regulations for Development Projects (KRDP) [Amended]
- Environmental Impact Assessment & Environmental Impact Statement
- Strategic Environmental Assessment (SEA)

The Guide is directed at practitioners working at the development levels, across key sectors, in national, state government, and civil society organizations to assist in mainstreaming climate change into development planning and the decision-making processes. Over the last decade the FSM National Government (FSMNG) has taken steps to incorporate climate change mainstreaming into its strategic development plans. The first attempt to mainstream climate adaptation into development was through the Climate Change Adaptation Program for the Pacific (CLIMAP), piloted by the Asian Development Bank, in the Pacific Department. Through the CLIMAP, FSM had three primary objectives:

- "Climate proofing" a coastal community in Pohnpei;
- "Climate proofing" a roading infrastructure project in Kosrae; and,
- "Climate proofing" the infrastructure, human health, and environment components of the National Strategic Development Plan.[3]

As the FSMNG continues to establish guiding frameworks and policies that incorporate climate change adaptation and climate mitigation, it is important that guidelines for the implementation of development projects are adopted and adapted at the state levels for implementation. As the FSM prepares to submit its Nationally Determined Contributions (NDC), it becomes imperative that the nation has a process for executing its determined goals domestically.

It should be noted that, every effort was taken to ensure that the information written in this report is accurate. This report is provided for informational and educational purposes only. It is intended, but not promised or guaranteed, to be current and complete as of the date of its publication.

The contents of this report, including any errors or omissions, are solely the responsibility of the authors at APLŸS Consulting and Ramp & Mida Law Offices. The authors invite corrections and additions.

[3] PACC Demonstration Guide: Integrating climate risk into coastal road design in Kosrae, Federated States of Micronesia. Apia, Samoa: SPREP, 2015. 28p. 29 cm. (PACC Technical Report No. 18) ISSN 2312-8224

Climate Change Overview in the FSM

This section identifies climate change impacts and risks for the FSM based on the most recent Intergovernmental Panel on Climate Change – *IPCC- 6th report on Impacts, Adaptation and Vulnerability*[4]. The FSM is a signatory to the Paris Agreement (PA) under the UNFCCC. Article 2(a) of the PA aims to "*hold the increase on the global average temperature to well below 2°C above pre-industrial levels and to pursue the efforts to limit the temperature increase to 1.5°C above pre-industrial levels*." However, existing and submitted Nationally Determined Contributions (NDC) will potentially lead to 3°C global warming if the level of ambition does not increase (UN Environment Programme (UNEP). *The Emission gap report 2020*). The IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas (GHG) emission pathways[5], indicates that for island countries (*small islands*) projected increases at 1.5°C and 2°C of global warming will result in multiple climate-related risks affecting their assets and resources. Island nations' development plans should incorporate the effects of global warming and the potential impacts to infrastructures, people, freshwater, agriculture, and marine ecosystems, consistent with the PA targets. The IPCC special report[4] indicates that among the most relevant climate-related risks for island nations are:

- Long-term risks of coastal flooding and impacts on populations, infrastructures and assets, freshwater stress, and risks across marine ecosystems and critical sectors, compared to present-day levels.
- Coastal flooding is projected to increase at 1.5°C, and increase further at 2°C, limiting adaptation opportunities and increasing loss and damage.
- Increased impacts of sea level rise and associated changes to the salinity of coastal groundwater, increased flooding, and damage to infrastructure.
- Long-term changing conditions of coastal ecosystems due to sea level rise which amplifies the impacts of storms and wave action, with robust evidence that storm surges and damages will change living conditions for coastal communities.

Presented below are a few of the current climate conditions for the FSM and climate projections by the end of the 21st century[6].

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[4] IPCC, 2022: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.

[5] IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.

[6] Climate projection data, obtained from the Australian Bureau of Meteorology and CSIRO report (2014), are derived using the Global Climate Model data from the Coupled Model Intercomparison Project, Phase 5 (CMIP5). Projections provided are for four (4) emission scenarios: RCP2.6 (Representative Concentration Pathway; very low emissions), RCP4.5 (low emissions), RCP6.0 (medium emissions) and RCP8.5 (very high emissions). Sea level projections were obtained from the Australian Bureau of Meteorology and CSIRO report (2011; 2014) as well as Leong et al (2014) and Marra et al. (2018).

The FSM has a tropical climate characterized by two seasons, a dry season, that occurs from November to April, and a wet season, from May to September. The West Pacific Monsoon brings storms and typhoons and affects rainfall patterns with additional rainfall occurring during the wet season[7], in the FSM's western states of Yap and Chuuk.

The FSM experiences little seasonal variation in mean air temperatures throughout the year and the mean annual temperature average was 27.1°C (80.8°F), from 1901–2019. Annual mean air temperatures have increased (~0.5 - 1˚C) across the FSM since 1951. Similarly, annual maximum temperatures have increased in the FSM since 1951 (Pacific Climate Change Data Portal, 2021). The long-term average air temperature over the FSM is projected to rise 1-2°C by 2050, potentially affecting human health, crops, and water resources. The frequency and intensity of extreme hot days (warming days) is also projected to increase[8].

Rainfall is generally high on the volcanic islands of Pohnpei, Kosrae, and Chuuk with mean annual rainfall reaching 466.8cm (183.8 inches) over the last 30 years, on the capital island of Pohnpei (NOAA NCEI, 2021[9]). The states of Yap and Chuuk are affected by drought spells associated with the warm and cold phases of the El Niño – Southern Oscillation (ENSO); and more frequent periods of drought can be expected for the most western state of Yap[7].

Average annual rainfall over the last 50 years indicates that the western parts of Micronesia (Yap and Chuuk) are getting wetter, while eastern areas (Pohnpei and Kosrae) are trending drier[10]. In Pohnpei, there has been statistically significant declining trend in rainfall patterns during the wet season, since the 1950. Rainfall interannual variability is associated with ENSO which is typically associated with drought spells of varying intensity. For instance, the droughts associated with El Niño years 1982-1983, 1997-1998 and 2015-2016 were especially severe, which increased localized threats to biodiversity and water resources. In those years, agriculture systems were damaged, water sources were adversely impacted, and problems associated with wildfires and invasive species were greatly aggravated. During the 1997-1998 El Niño, agroforestry systems (i.e., see USDA-NRCS report: Giles 2000, mitigation strategy for taro patches) in some of the outlying islands were severely damaged, with negative implications for food security and the health of these communities. Climate projections indicate that under high emission scenarios (RCP 8.5[11]), moderate droughts will occur once-twice every 20 years and extreme droughts approximately once every 20 years by 2030[7].

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[7] Federated States of Micronesia. (2015). Second National Communication under the UN Framework Convention on Climate Change. Retrieved from: https://unfccc.int/resource/docs/natc/fsmnc2.pdf (Accessed: June 2021)

[8] Australian Bureau of Meteorology and CSIRO, 2014

[9] NOAA National Centers for Environmental Information (NCEI): most recent standard climatological period (1991-2020) for precipitation data was derived from the U.S. Climate Normals Quick Access tool, (https://www.ncei.noaa.gov/access/us-climate-normals/#dataset=normals-annualseasonal&timeframe=30&location=FM)

[10] Marra J.J., Kruk M.C. (2017). State of Environmental Conditions in Hawaii and the U.S. Affiliated Pacific Islands under a Changing Climate: 2017. NOAA NCEI. Available at: https://coralreefwatch.noaa.gov/satellite/publications/state_of_the_environment_2017_hawaii-usapi_noaa-nesdis-ncei_oct2017.pdf

[11] Representative Concentration Pathway (RCP) 8.5: very high GHG emissions- for an more information on RCPs see Annex 1

In the FSM sea level varies due to seasonal and longer-term variations in wind, ocean temperature, and sea-level pressure. Satellite data indicates that sea level has risen over 0.39 inches (10mm) per year since 1993[7]. This is above the global average of 0.11–0.14 inches (2.8–3.6 mm) per year. In the western Pacific, sea level rise (SLR) trends, since the start of satellite records (1993), are double relative to the global rate (although interannual and multidecadal variation in the sea level are caused by phenomena such as ENSO can be quite large).

Climate projections indicate, with high confidence[12], that sea level will rise globally. In the FSM, sea level is projected to continue to rise approximately 5 inches (13 cm) by 2030 and 10 inches (25 cm) by 2050[13]. The consequences of this increase will be felt by communities living in low-lying atoll islands and along coastal areas. Most of the infrastructures and human settlments are barely above high spring tide levels and are in close proximity (less than 500 m) to the coastline. The rise in sea level, combined with natural yearly changes, will exacerbate coastal erosion, exacerbating the impacts of sea swells, anomalous tides, storm surges, and coastal flooding, with adverse consequences for water and food security.

Nation-wide, climate change impacts are detectable, affecting both high and low-lying atoll islands' natural and human systems. The country is affected by increasing air and water temperatures, storm surges, intense typhoons, changing precipitation patterns, droughts, and sea level rise (SLR). These impacts translate into the continued degradation of marine and terrestrial ecosystems, which are exacerbated by human actions such as, but limited to, deforestation and coastal water pollution. The likelihood of an increase above 2°C warming will raise the risk of extinction of many marine and terrestrial species, which will significantly reduce biodiversity and decrease ecosystem and community resilience[3]. Communities across the FSM rely heavily on ecosystem services (food, water, raw materials, medicinal plants) for their wellbeing and socioeconomic security, the loss or decrease of these services will have severe impacts on livelihoods. Similarly, ecosystems degradation represents a concrete threat to ecosystems' regulatory services such as coastal protection, water purification, soil fertility, flood control, and local climate. In time, these degraded systems will adversely impact key natural infrastructure, natural services, and settlements. The likely consequences of the current and projected climate change impacts will be food and water insecurity, climate induced migration, economic instability, and loss of culture.

[12]The level of confidence, associated with climate change projections, represents the degree of certainty that an event will occur in the future. The level of confidence is determined by the validity of a finding based on best available scientific evidence. For the IPCC, level of confidence is expressed using five qualifiers: "very low," "low," "medium," "high," and "very high." Generally, when there are multiple, consistent independent lines of high-quality evidence (robust evidence) the level of confidence is "very high". In Mastrandrea et al. (2010) confidence is defined as "The robustness of a finding based on the type, amount, quality, and consistency of evidence (e.g., mechanistic understanding, theory, data, models, expert judgment) and on the degree of agreement across multiple lines of evidence. In this report, confidence is expressed qualitatively [Mastrandrea, M.D. et al., 2010: Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties. Intergovernmental Panel on Climate Change (IPCC), Geneva, Switzerland, 6 pp.]

[13]Australian Bureau of Meteorology and CSIRO, 2014

Defining Terminology

Due to the cross-cutting nature of climate change and its effects on communities, infrastructure, socioeconomics, and the country's overall socioeconomic health it is imperative that the FSM's sustainable development goals (SDG) incorporate and integrate climate targets into their development plans. Furthermore, it is imperative that climate risk considerations are incorporated into all aspects of project development, policies, government decision-making processes, communities, and the private sector.

According to the IPCCC, **climate change risks** is defined as losses that are expected to occur as a result of impacts from weather-related hazards, exposure, and vulnerability[14]. As such, **climate mainstreaming** is the consideration and eventual integration of weather-related hazards, climate risks, and the drivers of those risks into development processes and activities. Since climate change has multi-sectoral impacts, it is important that decisions made at all levels of government (national and state), private sector, communities, and other key sectors (finance, health, environment, forestry, etc.) factor and incorporate climate change risks and hazards into their strategic plans.

It is important to note that climate change risks will have varying degrees of impact on development, infrastructure, and natural systems, depending on the amount of consideration that climate change and weather-related risk are factored into intended development outcomes and overall goals. Analytical assessments should be conducted to determine the level of impact and influence climate change may have on a policy or development project. Understanding the purpose of climate change mainstreaming is to ensure that a policy or development project is not only aware of the potential negative impacts of climate change, but that it is prepared and has contingencies to ensure its effectiveness in meeting targets, and importantly, supports the reduction of vulnerability and enhances climate change adaptability. Therefore, thoughtful consideration of the degree of climate change inclusion to a policy or a project is crucial for effective climate change mainstreaming. While the immediate need will require the integration of climate considerations into all country development goals, it should be understood that climate change mainstreaming is a process that is intended to support the strategic development outcomes.

[14] Managing Risks of Extreme Events and Disasters to Advance Climate Adaptation Action (IPCC, 2012). See: https://www.ipcc.ch/site/assets/uploads/2018/03/SREX_Full_Report-1.pdf

Figure 1. Key Terms and Concepts from the PACC Mainstreaming 2014 Guidelines[15]

CLIMATE CHANGE

Climate change is commonly referred to as long-term changes in weather and climate conditions, i.e. changes in the mean and/or the variability of a climate property such as precipitation, temperature or wind force, and that persists for an extended period, typically a decade or longer. It also includes changes in sea level rise due to increased global warming. With climate change, disaster risks change in terms of scale, scope, frequency and intensity.

NATURAL HAZARDS

A hazard is a potentially damaging physical event, phenomenon or human activity which may cause loss of life or injury, property damage, social and economic disruption or environmental degradation (ISDR, 2004). Natural hazards include drought, cyclones, and extreme rainfall events. Under the effects of climate change, the frequency and intensity of natural hazard events is changing, however the direction and magnitude of these changes are not well understood. Accounting for this uncertainty is a key part of climate change adaptation policy development, and for mainstreaming climate risks generally.

EXPOSURE

Exposure refers to the inventory of elements – human lives, livelihoods, and economic or environmental assets – that are in an area in which hazard events may occur.

VULNERABILITY

Vulnerability refers to the sensitivity of exposed elements to damage and loss from a hazard event in that area. It also refers to the ability or capacity of affected parties to respond to extreme events and to cope with the immediate effects and rebuild. Vulnerability to natural disasters, development and environment are inextricably linked (ISDR, 2004). For example, vulnerability is high in areas with poor infrastructure, which affects people's ability to engage in income-generating activities and reduces their ability to respond to disasters. Poor infrastructure standards, weak government regulations (such as the absence of building codes) and weak regulatory enforcement also increase disaster risks. Pacific island countries rely heavily on the primary sector and are generally very sensitive to the effects of natural disasters, particularly disasters of hydro-meteorological origin.

RESILIENCE

Resilience can be defined as the ability of a system (human or environmental) to resist, absorb and recover from the effects of hazards in a timely and efficient manner, preserving or restoring its essential basic structures, functions and identity (CARE International, 2010). A resilient community is well-placed to manage hazards, to quickly respond to and recover from any negative impacts, resulting in a similar or improved state as compared to before the hazard occurred. There are strong linkages between resilience and adaptive capacity. It should also be noted that resilience can vary for different groups within a community.

[15] Mainstreaming Climate Change into Development in the Pacific. A Practical Guide (2014). See: https://www.sprep.org/attachments/Publications/CC/PACC_Mainstreaming_2014.pdf

Current Development Guidelines, Development Plans, & Policies

FSM Strategic Development Plan 2004-2023: The Next 20 Years, Achieving Economic Growth and Self-Reliance (SDP)[16] was developed as a socioeconomic and economic blueprint for development in the FSM. The SDP detailed four (4) key development objectives:

1. Preserve, as close to, current economic support for all levels of existing national productivity, and thwart major loss of funding that would be realized while transitioning from current Compact of Free Association (CoFA) funding support.
2. Increase the enabling conditions for economic growth led by the private sector.
3. Improve the health and education status of the FSM.
4. Economic self-reliance and sustainability through the establishment of a Trust Fund that would replace annual funds received from the US government.

The SDP does include a section dedicated to environment planning – the Environmental Sector Strategic Plan, which discusses mainstreaming climate change and adaptation strategies and contains an outcome measure for Strategic Goal 1.

> *"Environmental Impact Assessments (EIA) carried out for 100% of all government and non-government development activities to minimize adverse impacts of development on the nation's environment from 2005 onwards"*[17].

The FSM was one of the first countries to sign and ratify the UNFCCC. While the FSM's global GHG emissions are negligible, the nation assumes its responsibility in working towards the reduction of its emissions and by decreasing "source-oriented mitigation measures in order to control the emissions of GHG into the atmosphere[18]." The planned approach is to:

- "Demand-side management – activities aimed at reducing energy consumption at the level of the user (e.g., conservation strategies, design, and use of energy-saving appliances and technologies, various measures targeted at ground transportation, and education and training programs);
- Supply-side management – activities aimed at reducing the use of fossil fuels (e.g., increasing the efficiency of existing energy systems, increased use of renewable energy sources such as biomass, coconut fuel, solar and wind power); and
- Sink Enhancement – activities aimed at increasing local sinks for removing carbon dioxide from atmosphere with particular emphasis on development of appropriate forestry management systems[19]."

[16] Federated States of Micronesia's Strategic Development Plan (2004-2023). The Next 20 Years: Achieving Economic Growth & Self Reliance. See: https://www.adb.org/sites/default/files/linked-documents/cobp-fsm-2015-2017-sd-02.pdf
[17] SDP, section 7.2.1, para 57. See: https://policy.asiapacificenergy.org/sites/default/files/StrategicPlan.pdf
[18] SDP, section 7.2.3, para 89. See: https://policy.asiapacificenergy.org/sites/default/files/StrategicPlan.pdf
[19] SDP, section 7.2.3, para 92. See: https://policy.asiapacificenergy.org/sites/default/files/StrategicPlan.pdf

The FSM has taken steps to fulfill its obligations by conducting its first GHG inventory, in 1998 (Furow, 1999), and is currently undergoing a GHG inventory to submit its findings in the Third National Communication – First Biennial Update Report (TNC-FBUR). The FSM intends to meet the SDP climate mitigation strategies through a combination of adaptation and mitigation actions. For instance, by implementing conservation of critical terrestrial and marine habitats, with the assumption that it will increase the potential for amassing larger areas of natural carbon dioxide sinks.

Despite the FSM's articulated ambitions, they are constrained by several factors:

- Subsidies are provided to the utility companies.
- Standardized technical and operating procedures are lacking due to the fractured way in which the states' utility corporations operate and minimal coordination and management mechanism between national and state governments and the energy sectors.
- Lack of funds and capacity to sustain alternative energy programs, which negatively impacts the capacity to maintain and replace equipment.
- Due a small market and population, that is largely dispersed across a wide area of ocean, the country's purchasing power is quite low, which hampers their ability to negotiate better fuel prices, or to have oil corporations support the removal and disposal of petroleum waste products.
- There is minimal capacity to accurately and consistently collect GHG data, nor are there standardized methods for data collection within the country.

As indicated later in the document SDP, EIA's and EIS's do not require climate risk assessments for development projects, however it is highly encouraged. Gender inclusion and mainstreaming are lacking in the development planning and implementation phases. Though EIA requires that development projects minimize negative impacts to society in general, regulations guiding the EIA and EIS process are not explicit, nor do they cover the needs of each of the genders.

2023 Action Plan, developed in 2014, was designed to confront fiscal and economic challenges in the wake of post FY2023. It was developed with the idea of an Amended CoFA that intends to "promote the economic advancement, budgetary self-reliance, and economic sufficiency of the FSM". Plan addresses long-term fiscal reforms and sustainable growth focused on the private sector and infrastructure investments. Each state would also be responsible for developing their own development plans.

- Yap – does not have a development plan
- Chuuk – currently in development
- Pohnpei - Pohnpei State Strategic Development
- Kosrae – Kosrae Strategic Development Plan: 2014-2023

The **National Energy Sector Policy**[20] (NESP) outlines four (4) major sections: policy and planning, standard energy (e.g., fossil fuels), energy efficiency, and clean renewable energy. It aims to reduce FSM's dependency on fossil fuels and increase the use of renewable energy across

[20] FSM Energy Policy, Volumes I and II

the whole nation, including its outer and remote islands. The **Energy Master Plans for the Federated States of Micronesia (2018)**[21], is a guide to FSM's approach to developing access to clean energy across the FSM. The document outlines the importance of access to clean energy to support the developmental growth of the FSM. It is important to note that each of the state utility companies have their own masterplans and strategic action plans stemming from the FSM Energy Policy, including renewable energy targets.

Climate Risk to existing and future energy infrastructure is absent from the NESP. Additionally, projections and associated impacts to community and the location of energy infrastructure are not evident in the policy. Placement of key energy infrastructure should be factored into the NESP, as well as cost of climate change impacts to existing energy infrastructure for maintenance and relocation.

The **Information and Communications Technology (ICT) Policy**[22] is intended to:

- Ensure affordable access to communications for all people of the FSM.
- Build and strengthen capacity through better access to communications and technology.
- Improve economic growth by providing good quality communications and ease of access to technology.
- Creating enabling infrastructure by reforming critical telecommunications and technology policies.

The Department of Transportation, Communications, and Infrastructure (DTCI) developed, in consultations with each of the four states, the **Infrastructure Development Plan 2004-2023 (IDP 2004)**, that assessed the infrastructure needs of each of the states in nine (9) key sectors:

- Electricity
- Water/sanitation systems
- Solid waste management
- Roads
- Government administrative infrastructure
- Air and sea transportation
- Telecommunications
- Education
- Healthcare systems

It included programming and budgeting for FY2004-2023 to further develop those sectors. A second Infrastructure Development Plan FY2016-FY2025 (IDP) was developed that further outlined the FSM's infrastructure priorities.

Similarly, the IDP does not factor climate change or weather-related risks to future infrastructure development and on existing infrastructure. A climate risk assessment to current and future development would help to determine the best sites and location for infrastructure, assess cost to climate proof existing and future infrastructure, and determine economic and socioeconomic impacts of disruption of services due to climatic or extreme weather hazards

[21] Energy Master Plans for the Federated States of Micronesia (2018). See: https://prdrse4all.spc.int/sites/default/files/fsm_energy_master_plans_final_report_-_april_2018a.pdf
[22] Federated States of Micronesia ICT and Telecommunications Policy

Gender mainstreaming is also a missing component in the IDP.

The **National Climate Change Policy 2009**[23] has specific requirements as it pertains to infrastructure development:

1. Mitigation
    a. Maintain and enhance FSM as a negative carbon country through effective management of our natural sinks, bio-sequestration, promotion of renewable energy and energy efficiency, and other appropriate means.
    b. To prioritize actions that address both mitigation and adaptation such as water development using renewable energy (solar water desalination) and other relevant actions.
2. Adaptation
    a. To require all development activities in FSM to consider projected climate changes in the design and implementation as stipulated in the FSM Strategic Development Plan/Infrastructure Development Plan (SDP/IDP).
    b. To use ecosystem-based approaches where applicable.
3. Technology Transfer
    a. To optimize the use of local technologies where available.
    b. To identify technologies that are locally appropriate
    c. To enhance easy access to, and sustainable use of new technologies.
4. Finance
    a. To maximize the use of local resources through establishment of sustainable financing mechanism to support adaptation, mitigation, and resource management activities.

As part of the FSM's continued efforts to integrate climate change into national government functions and responsibilities, the national government passed a **Climate Change Law**[24], that required certain national departments to create plans and policies on climate change that were in line with the provisions laid out in the National Climate Change Policy.

The **Nation-Wide Integrated Disaster Risk Management and Climate Change Policy** (DRMCC) was enacted in June 2013. According to the Federated States of Micronesia Infrastructure Development Plan FY2016-FY2025[25], DTCI will integrate the DRMCC Policy into its infrastructure development policy and plans. In 2014, DTCI created the **Climate Change Adaptation Guide for Infrastructure** (CCG)[26]; a first attempt at mainstreaming climate change into all infrastructure development projects.

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[23] FSM National Climate Change Policy 2009. See: https://www.adaptation-undp.org/sites/default/files/downloads/federated_states_of_micronesia_nationwide_climate_change_policy_2009.pdf

[24] Eighteenth Congress of the Federated States of Micronesia Second Regular Session, 2013 Congressional Bill No. 18-72, C.D.1, C.D.2, C.D.3, Pc No. 18-72 Law No. 18-34. See: https://www.cfsm.gov.fm/ifile/18th%20Congress/Public%20Laws/PUBLIC%20LAW%2018-34.pdf

[25] Federated States of Micronesia Infrastructure Development Plan FY2016-FY2025See: https://tci.gov.fm/documents/infrastructure/IDP/FSM%20IDP%20FY2016-FY2025%20-%20Outline%20(version%20151202).pdf

[26] Climate Adaptation Guide for Infrastructure (2014).

Further actions have been developed to actualize the CCG at the state levels, that are in line with the IDP, (IDP FY2016-FY2025):

- *"Strengthen the integrity of the development consent process and environmental impact assessments: environmental concerns, including both impacts and geo-hazard issues should be identified:*
    - *Early in the scoping phase, so that the costs of mitigation can be allowed for when setting budgets;*
    - *During design, so that appropriate mitigation measures are part of the design;*
    - *During construction to ensure the appropriate environmental management plan is followed and mitigations properly implemented;*
    - *Apply land use planning: available flood, sea level change and landslide risk maps are used particularly in assessing sites for infrastructure development;*
    - *Actively enforce building codes: in the absence of formal building codes, adopt and follow standards and practices that are appropriate to the infrastructure being developed, including aspects relevant to climate change adaptation."*

It is evident that the FSM, during the last decade, has made a concerted effort to mainstream climate into national strategic plans, policies, and budgets. Though these strategies and policy have been created, implementation has not been consistent or realized. However, the establishment of these policies and plans have created enabling condition to foster growth and further the development of processes for future implementation.

Gaps in Development Plans and Policies

To support the development of this guidance document it was important to understand what the FSM has done to date to incorporate and mainstream climate change adaptation into the country's legislation, regulations, policies, and development plans. The FSM has made significant efforts to include climate change adaptation into their development plans. It is also shows that the FSM has established climate change and biodiversity policies and regulations to further facilitate the creation of enabling conditions to foster climate change adaptation and resilience. The results of the gap analysis is to examine the areas that need further development and/or may require more explicit policies, regulations, and/or plans.

Intent	Gap
Integrate climate change into polices and plans	Climate change has a presence and references in policies and sectoral plans, and the rationale is clearly defined regarding the need for climate mainstreaming in policies and development plans. However, more specificity is required to fully integrate climate change into development planning. Plans do not clearly articulate actions that need to be taken to ensure that existing and future development will be resilient in the face of climate change or extreme weather-related events.
Identify climate specific activities in National and State Plans	Though national and state plans have been developed with specific activities, it is unclear if implementation of those activities has occurred since their endorsement. Furthermore, several climate change activities occur on a project-by-project basis; however, it is unclear as to whether or not the project outcomes tie back to specific SDP goals.
Include Monitoring and Evaluation (ME) Framework	Part of the issues relating to progress of implementation is the lack of ME framework and protocols for the SDP. Moreover, many of the plans developed for each of the sectors have very broad objectives that make measuring outputs and outcomes challenging.
Coordination & communication	DECEM is mandated to support the coordination of the development of climate change mainstreaming into national department plans. Committees have been developed to support the implementation of sectoral policies to ensure implementation, however coordination between various committees has been challenging, and often effective communication lacking.
Create Budgetary framework	Department operations plans and budgets do not clearly reflect plans that are developed at sector levels (energy, health, agriculture, etc.), partly due to a lack of well-defined or non-existent budget frameworks.
Engage Stakeholders	There is generally a good support and buy-in by various stakeholders across government departments, communities, and civil society. Additionally, the framing of the constitution as it pertains to the environment and the implementation of projects within state jurisdictions, demands state level input and involvement. However, it is unclear whether the coordination of the development of different sector plans included the input of key departments to ensure that cross-cutting activities that have positive and negative climate impacts were clearly identified.

Assessing Key Development Guidelines

Under the AF project: "*Enhancing the Climate Resilience of vulnerable island communities in Federated States of Micronesia*" some of the objectives are to assess legislation, regulations, and policies that exist within the FSM to support community resilience to climate change, with a particular focus on the outer islands of the FSM. There are four (4) primary environmental and resource target areas: 1) freshwater, 2) land use, land management, 3) coastal, and 4) nearshore marine. As detailed above, there are several policies and development plans that address development in the FSM, with an emphasis on infrastructure: energy, roads, and government buildings. Other targets include education and health services. In the absence of a National Project Development framework, the **Kosrae Regulations for Development Projects (amended selected provisions of Regulation No. 67-05)** was assessed and used as a baseline and reference for developing a national Climate Change Mainstreaming Guidance Document. The Guidance document will also incorporate information on the Strategic Environment Assessment[27] (SEA) lessons learned and the Environmental Impact Assessment (EIA) regulations.

Kosrae Regulations for Development Projects

Kosrae state has the most comprehensive set of development guidelines for the environment in comparison to the other states. The guidelines pay particular attention to natural resources and makes clear references to social and cultural considerations. The regulations also mention climate change adaptation measures to be featured within an Environmental Impact Assessment.

The purpose of the Kosrae Regulations is to establish standard procedures for the formal review of development projects, in the state of Kosrae. Within the development regulations, particular attention is placed on the state's Environmental Impact Assessment process, which is intended to support the general public and government officials to make decisions with the understanding that there are environmental consequences based on their decisions, and take actions consistent with the goal of protecting, restoring, and enhancing the environment. The aim is to:

- Integrate the EIA process into the early planning of projects to ensure timely considerations of environment factors in order to avoid delays.
- Identify at an early stage the significant environmental issues requiring further study and de-emphasize insignificant issues, thereby defining scope of the Environmental Impact Statement.
- Identify and require development and public infrastructure projects to incorporate climate change adaptation measures.

The Regulations further details how they are to be applied:

[27] Implementing a Strategic Environmental Assessment (SEA) in small Pacific islands: Lesson Learned from the FSM Ridge to Reef project in Pohnpei, Federated States of Micronesia. (2021) Retrieved from: https://fsm-data.sprep.org/index.php/resource/implementing-strategic-environmental-assessment-sea-lesson-learned-pohnpei-fsm

- Development projects in progress on the effective date of the regulations shall comply immediately to the extent possible, and fully within three (3) months of the effective date of the regulations; and
- All new development projects that begin on or after the effective date of these regulations shall comply fully with these regulations.

Once an EIA has been conducted, an Environmental Impacts Statement will be required if one or more of the following criteria are applicable to a project proposal:

> *"(a) it is reasonably foreseeable that the project will cause a significant environmental impact on:*
> - *Marine and costal resources*
> - *Social/cultural/historical resources*
> - *Plants and animals (especially endangered species)*
> - *Human health and welfare"*

In addition, an Erosion and Sedimentation Control Plan must be prepared to prevent the acceleration of erosion and acceleration of sedimentation and shall consider all factors which contribute to the erosion and sedimentation, including the following:

- Topographic and/or hydrographic features of the project area.
- Types, depth, slope, and areas of soils, coral, and/or reef.
- Original state of the area as to plan and animal life.
- Whether any coral reef which may be affected by the earthmoving is alive or dead.
- Proposed alteration to the area.
- Amount of runoff from the project site based on the project's land area.
- Staging of earthmoving activities.
- Temporary closure measures and facilities for use during earthmoving activities.
- Permanent control measures and facilities for long-term protection.
- A maintenance program for the control facilities including disposal of materials removed from the control facilities or project area.

The Kosrae Regulations are highly technical and will require practitioners with technical capacity in environmental impact assessment to conduct an EIA and develop an EIS to address the issues presented in an EIA.

Environmental Impact Assessment (EIA)

The FSM National Government and each of the four States, under their Environmental Protection Legislation, requires that all development projects include an EIA prior to the implementation of a project. An EIA is a process through which the environmental impacts potentially resulting from a proposed project are identified and assessed early in the planning process. The EIA will assess the impacts to the environment and the threats the project will pose to key features as specified in the national and states' environment regulations.

An **Environmental Impact Statement (EIS)** will be developed should the EIA identify one or more threats or negative impacts to the environment or natural resource, as identified by the EIA. The EIS will identify steps that will be taken to avoid, reduce, and/or mitigate the negative impacts to the environment or reduce them to an acceptable level before they occur. The EIA and the EIS represent proactive and preventative approaches to environmental management and protection prior to and during the implementation of a project.

Strategic Environmental Assessment (SEA)

A SEA is a "systematic process for evaluating the environmental consequences of proposed policy, plan, or program initiatives in order to ensure that the environment and climate change are fully included and appropriately addressed at the earliest appropriate stage of decision-making on par with economic and social considerations" [28]. The tool is designed to include climate risks into development and project planning. It is intended to serve as a way to mainstream adaptation into development plans, programs, and policies. The SEA is also utilized to broaden the understanding of ecosystem management from a socioeconomic and community context.

A SEA was piloted in Pohnpei, FSM, and examined the "threats and identified potential environmental and social impacts of developments[29]." The tool provided stakeholders with a clear vision of how current and future economic direction could impact the economic, environmental, and infrastructure status of Pohnpei. The exercise was designed to inform participants and stakeholders of the long-term economic costs and benefits of development activities, the impacts to the environment, and what the future socioeconomic and economic cost could be if environment and natural environment services were lost.

The SEA is a newly introduced management and assessment toolkit to the FSM. The FSM national government or state governments do not have a set of requirements for the states to initiate a SEA process for the design and implementation of projects.

Gap Analysis of the KRDP, EIA, and SEA

Analyzing the KRDP, EIA, and SEA in the context of the Guidance document is to determine if climate change has been incorporated into the regulations and/or policies. The analysis is not intended to determine the effectiveness, it aims, however, to establish whether or not climate change has been sufficiently incorporated and/or considered the regulations and policy and decide if there is a need to expand the regulations and policies further. The intention of the gap analysis is to facilitate further development of existing climate mainstreaming efforts, not to "reinvent the wheel".

[28] Sadler B. (1996*). Environmental Assessment in a Changing World: Evaluating Practice to Improve Performance.* International Study of the Effectiveness of Environmental Assessment, Final Report. Canadian Environmental Assessment Agency, Canada.
[29] Implementing a Strategic Environmental Assessment (SEA) in small Pacific islands: Lesson Learned from the FSM Ridge to Reef project in Pohnpei, Federated States of Micronesia. (2021).

Regulation/Assessment	Gap
Kosrae Regulations for Development Projects	• The regulations reference social, cultural, and historical considerations in the EIS, however, it does not include specifically gender. It is well documented that different genders[30] are affected differently by climate change and is highly influenced by a range of socioeconomic factors (i.e., poverty, social status, etc.). • Does not require climate risk assessment or disclosure which describes the exposure and vulnerability to climate and weather risks. Nor does it require a detailed set of actions that will be undertaken to reduce those risks. • Does not require spatial planning to redirect development from potential high-risk areas: typhoon vulnerable sites, flood prone areas, shorelines prone to saltwater inundation. • Erosion and Sediment Control Plan does not require a costs/benefit analysis of long-term and/or permanent measures to determine what the country/state will have to shoulder as a result of development. • Does not require development projects to determine impacts of climate and weather-related disruptions to development services (i.e., transportation – land, sea, air – electricity, health services, etc.). • Alignment with the National Sustainable Development Plan (SDP) is not clear. • Climate change mitigation (e.g., GHG mitigation and/or carbon release) is not clearly articulated, nor does it require development projects to state if there will be disturbances to natural mitigation sinks.

Regulation/Assessment	Gap
EIA & EIS	• EIA and EIS do not require climate change adaption and resilience across the screening and scoping during the assessment process. (This may be in part due to a lack of regulatory standards such as technical codes that include climate resilience.) • EIS actions may be based on regulatory and economic standards (e.g., Building Codes) that are outdated and/or are based on US standards that were developed during the Trust Territory government and/or copied directly from US rural development standards (Chuuk Building Codes). • EIS are not required to include a gender impact statement and actions that will be taken to address those impacts. Nor does it require the EIA or EIS to address issues regarding impacts of displacement to the different genders.

[30] Gender in this context refers to birth sex – male and female.

SEA	• Is a voluntary tool that is not supported by legislation or included in any of the state or national government development frameworks (policies, regulations, and/or plans). • Designed to be utilized by non-climate and non-environment experts. Makes the tools user-friendly and easily implementable, however, some mitigation and risk reduction activities may require expert analysis and input. • Does not include a gender analysis matrix[31].

Suggested Guidance for Climate Mainstreaming into development Policies & Plans

Incorporate Climate Change into National Policy Objectives

To fully integrate and mainstream climate change into national policy objectives and development plans, it is important to obtain a comprehensive climate outline for the country. A concise, easy-to-comprehend document that details the most appropriate information that provides historical, present, and projected climate information and the current and potential impacts of climate change and climate variability to communities, infrastructure (natural and manmade). The document should serve as a reference for stakeholders and other key partners to understand the current situation of the FSM. It should be easy to understand, especially for those who are not experts in climate change, but still provide fundamental and technical information. The FSM climate outline will not only provide a current situation of the country as it pertains to climate change, but it will also provide key information on how the country is currently managing the effects of climate change and where improvements can be made in policies, legislation, development, and climate adaptation.

Country Climate Profile Worksheet

Global Climate Trends	Brief summary of global climate situation past, present, and future, and how it will affect FSM.	
FSM's Current Climate Situation	• Geographical composition • Seasonal trends • Precipitation	• Average Temperature • Climate change
FSM's Climate History	• Droughts • Typhoons • Floods • El Niño/La Niña	• Changes seasonal trends • Sea level change (if possible)
FSM's Future Climate Trends	Projected changes in climate and climate variability: • Air and soil humidity • Sea level • Slow onset events	• Storm frequency & intensity • Precipitation

[31] A Gender Analysis Matrix is a tool that is used to determine the gender issues that exist within a community, and how the community is affected by those issues. See: https://www.gdrc.org/gender/framework/matrix.html

FSM's Current & Future Climate Impact Analysis	• Insert maps of areas that will be highly affected such as communities, critical infrastructure – roads, schools, bridges, etc. • Identify critical services that will be affected i.e., utility companies, transportation (air and sea), ports (air and sea), areas of cultural, historical, and biological significance.
FSM's Current Adaptation Measures	Insert a brief summary and/or list of relevant policies, legislation, regulations, and projects that are being implemented or in development.

Establish Clear Roles and Responsibilities for Climate Action

It is important to know the key players involved in the implementation of climate change activities. Therefore, creating a chart of all the departments who have a critical role in defining and implementing climate change activities in government departments is essential. The institutional map should include all relevant partners who support climate change activities (e.g., bilateral, and multi-lateral donors, NGOs, the private sector, and government departments at national and state levels). It should also detail how various stakeholders and partner institutions coordinate their efforts and activities. An actual mapping exercise, to produce a diagram, may be a useful tool to help navigate the relationships and links between the various institutions and departments.

The level of precedence the FSM gives towards the integration of climate change into its policies and sectoral plans should be made in detail, by creating a synopsis of existing institutional and regulatory frameworks for climate change. The institutional overview should include the level of coverage, scale, and coordination that occurs for climate interventions, in the FSM. It is critical that the FSM details the challenges and gaps that exist institutionally, technically, and organizationally; and it should detail how the country intends to mitigate the challenges and address existing gaps.

It is important that the institutional overview is aligned with key national reports, development plans, and multi-lateral regional commitments. It is important to utilize key documents that already describe the countries commitments domestically, regionally, and internationally. These documents should include:

- Sustainable Development Plan (SDP)
- Infrastructure Development Plan (IDP)
- Micronesia Challenge (MC)
- Blue Prosperity Micronesia (BPM)
- National Communications and Biennial Update Reports (NC/BUR)
- Nationally Determined Contributions (NDC)
- FSM State of Environment Report
- FSM State of Conservation Report

Example of Institutional Mapping Worksheet

Adaptation Action	Outcome	Focal Department/Agency	Key Stakeholders & Responsibilities
Micronesia Challenge	Effective Management: 30% Terrestrial Areas 50% Marine Areas	Department of Resources and Development (DRD)	National: • DECEM (NDC/NC/BUR) • OFA (Project support & financial tracking) • Statistics (Mitigation) State: • State EPA's (MC state focal points) • Marine resources • Forestry • Agriculture Nonstate Actors/NGO • SPREP • SPC • MCT • Environment NGOs

Create Activities That Are Specific to Climate Change

There is not a one-size-fits-all method to assessing climate change risks in development programs or processes. The methodology and tools required will be specialized and focused on agency specified needs and the types of projects being implemented (e.g., assessing climate risk of infrastructure development needs of air and sea ports). It is important that climate change mainstreaming is included in department and agency functions, and that each of those functions are underpinned and have direct links to policies, regulations, and development plans of the nation and the states. It is important that activities created are tied to national and state priorities that are identified within the FSM SDP, IDP, and Sectoral Plans (i.e., Agriculture and Energy), as well as regional commitments, such as the MC. Additionally, development activities should not minimize or weaken or undercut conservation or environmental activities that are designed to enhance climate change adaptative capacity, climate mitigation, and biodiversity conservation.

Activities in development plans should include, or at minimum consider, national and state Biodiversity Action Plans and state Joint Action Plans for Disaster Risk Management and Climate Change, and vice-versa, climate change adaptation activities should have a system that measures socioeconomic and overall economic impacts that tracks immediate output, outcomes, and longer-term impacts. Similar to Nature-based Solutions (NbS), development and climate adaptation activities should be seen as complimentary and viewed as supporting the country's and states' overall economic and societal resilience.

Climate proofing Development Projects

Climate Proofing is the process of integrating climate change mitigation and adaptation measures into development projects, including infrastructure development projects.

In light of existing and future climate-related risks, development projects should be planned, designed, and implemented and must include climate change mainstreaming. This will assist the FSM to better adapt to the unavoidable impacts of climate change, minimizing its vulnerability, and strengthening its adaptive capacity, supporting the reduction of loss and damages (natural and infrastructure) caused by climate change impacts.

The process of CP development projects should be consistent with the PA and the country's climate objectives as indicated in the FSM's NDC, Climate Change Policy, and Strategic Development Plan (2004-2023) to ensure that any planned and future development is climate resilient. As such, climate change and weather-related risks that are identified and the measures to mitigate those risks should become an integral part of the planning process and integrated into all aspects of a development plan.

BOX 1:
A development project is the means by which a country operates to achieve economic growth and higher quality of life for all people.

A development project can be defined as:

A planned temporary endeavor for development with a well-defined set of objectives and activities, undertaken by governments, development agencies or donors within clear geographical boundaries.
OR
any plan, proposal or intention by any person to embark on any activity, scheme, construction, development or undertaking, including, but not limited to the (i) construction, alteration, movement, fill, removal disposal or any other modification to the land, coastal or marine area; (ii) installation, placing, or building of surface structure, land reclamation, navigational channels, harbors, utility lines, piers, shopping centers, clearing land, causeway, golf course, apartment complexes, hotels, schools, roads, parking area, or any other similar activity; (iii) Commercial harvesting of marine resources, and/or aquaculture or mariculture of marine resources (….); and (iv) harvest of mangrove or other timber resources (….) [***Kosrae Regulations for Development Projects (Amended)***]

Climate change adaptation measures for development projects should:

- Ensure suitable levels of resilience to the impacts of climate change, which includes acute events (i.e., droughts, typhoons, storms, flooding) and chronic events (i.e., projected sea level rise, changes in rainfall patterns, projected increase in air and sea surface temperatures).
- Systematically integrate intergenerational, distributive, and gender equity.

BOX 2: Integrating equity into climate change measures for effective adaptation:
Equity is the principle of being fair and impartial, and the basis for understanding how the impacts and responses to climate change, including costs and benefits, are distributed in and by society in more or less equal ways. Equity is often aligned with ideas of equality, fairness and justice and applied with respect to equity in the responsibility for, and distribution of, climate impacts and policies across society, generations, and gender, and in the sense of who participates and controls the processes of decision-making.

Intergenerational equity, which in the context of climate change acknowledges that the effects of past and present policies and developments, may impose costs and benefits for people in the future and of different age groups. Therefore, any climate-related risks that the present generations may find unacceptable should not be imposed on future generations.

Distributive equity which explicitly recognizes that the burdens and benefits for adaptation should be shared based on a distributive equity approach.

Gender equity, which recognizes equal rights, resources access and opportunities for women and men. Gender equity should become integral part of development projects process, which should also clearly assess and recognize the different vulnerability of men and women to climate change.

Since climate proofing can be applied at national, sectoral, local and project level, mainstreaming climate change into EIA and EIS can assist in making development measures, on these levels, more efficient and resilient. This process will include the identification of climate-related risks for a development project.

The application of climate proofing for development projects requires for:

- The existence or development of enabling conditions for effective climate proofing. This can be done by climate proofing the regulations, codes, permitting procedures etc. pertaining development projects (e.g., building codes, water management regulations, EIA process).
- The identification of key parameters for the vulnerability and risk assessment and the selection of credible climate scenarios and pathways of GHG emissions reduction
- Understanding the project context (policies, plans, and social, environmental, and economic conditions) boundaries and interactions, including the potential impacts (climate, social, environmental, and economic) that can undermine the success of the project.
- Ensuring compliance with legislations and regulations, for instance compliance with the EIA.

For any development project, the project cycle consists of steps including preparation (or strategy), planning, design, implementation, operation and maintenance, and decommissioning (Fig. 2). Climate change should be systematically mainstreamed at each stage of the project cycle to ensure effective climate proofing.

To be effective, the project development cycle should utilize an adaptive management approach, which will require a return to an early stage of the process to integrate new requirements and information. For instance, when new technological or scientific information becomes available, the project cycle should be flexible enough to allow proper integration of the new information,

making it relevant to revisit some aspects of the design, implementation, maintenance, and operation or ME.

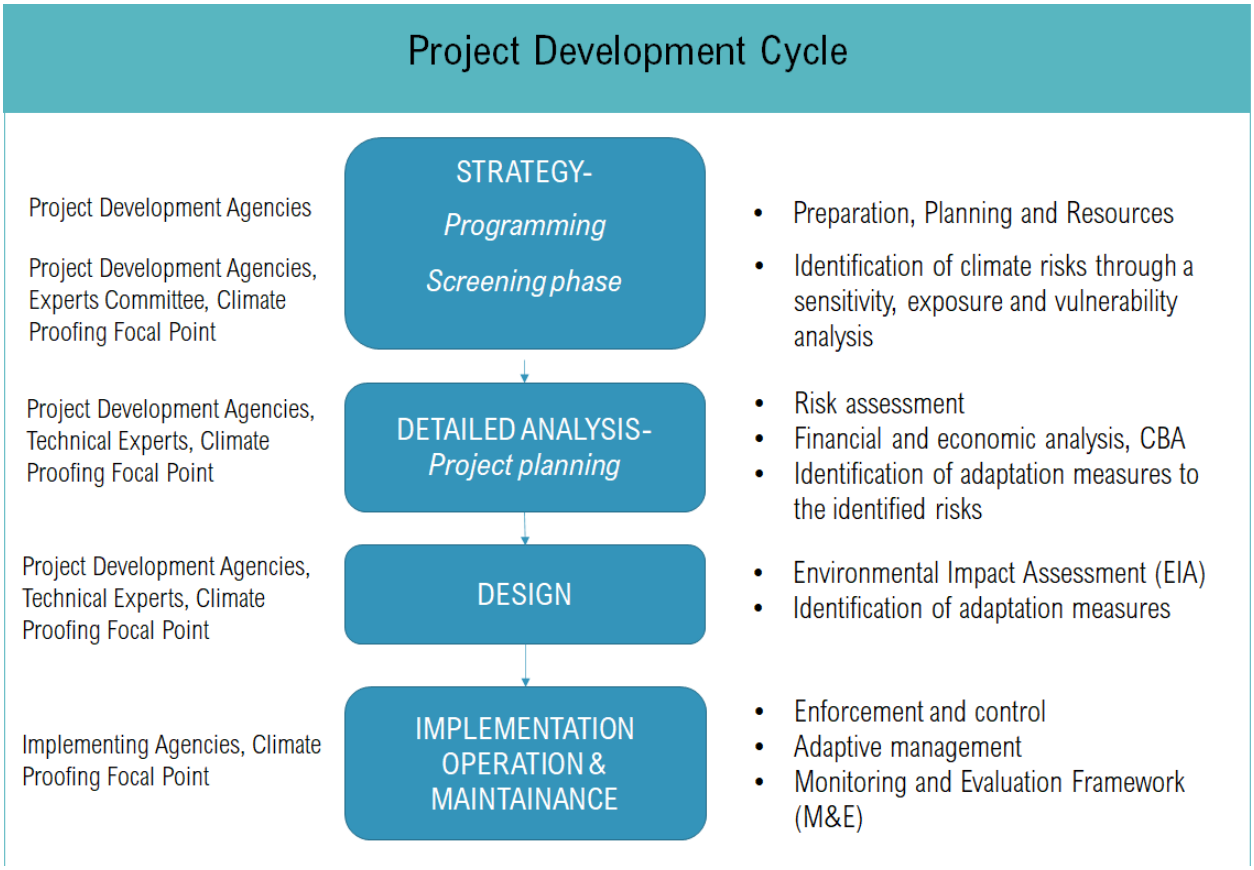


Figure 2. Conceptual diagram describing key stages of a project development cycle from preparation (strategy) to operation and maintenance. On the left are reported key methodologies and process used at a particular stage of the cycle, on the right key stakeholders that should be involved in the process.

Strategy- Preparation, Planning and Resources

When preparing for climate proofing, it is crucial for the climate vulnerability and risk assessment timeline to correspond to the intended lifespan of the investment being financed under the project. This will entail considering the period for which the project output (e.g., infrastructure) will be used, including expected maintenance needs for withstanding climate extreme events.

When preparing and planning for a development project it is important to identify and select the most appropriate climate projection datasets that would be used for the climate vulnerability and risk assessment (see more information on climate scenario in Annex 1). This will help to base decisions on credible, comparable, and objective information. For the FSM some datasets are available at regional level; however, the NOAA Office located in the country can assist in providing indications on the more recent climate projections.

Current climatology data and climate projections datasets can be retrieved from:

- Any relevant and data-based National and state sources of climate information, data and projections.
- Pacific Climate Change Data portal (PCCDP) [http://www.bom.gov.au/climate/pccsp/]: The portal forms part of the Bureau of Meteorology's contributions to the WMO RA-V Pacific Regional Climate Centre Network as Consortium member for the Node on Climate Monitoring. It was initially developed through the AusAID funded Pacific Climate Change Science and Pacific-Australia Climate Change Science and Adaptation Planning Programs 2009-2014 with further improvements/updates undertaken during the DFAT funded Climate and Oceans Support Program in the Pacific 2018-2022. The PCCDP provides site-specific historical climate information as well as trends in mean and extreme indices for the Pacific Islands, including the FSM.

- World Bank Climate change knowledge portal (CCKP)

  [https://climateknowledgeportal.worldbank.org/country/micronesia-fed-sts]: the portal is the hub for climate-related information, data, and tools for the World Bank Group (WBG). CCKP is a web-based platform built to enhance the understanding of changing climate across different level of detail. "Using the latest climate data and scientific research available, CCKP provides development practitioners with resources to explore, evaluate, synthesize, and learn about future climate scenarios, projected risks, and climate-related vulnerabilities at multiple levels of details".

- Australian Bureau of Meteorology CSIRO 2014

  [https://www.pacificclimatechangescience.org/wp-content/uploads/2014/07/PACCSAP_CountryReports2014_WEB_140710.pdf]: Pacific-Australia Climate Change Science and Adaptation Planning (PACCSAP) programs a collaborative partnership between Australian scientists and Partner Countries and regional and non-government organizations in the western tropical Pacific over the period 2011–14. The PACCSAP report provides peer-reviewed and most relevant, science-based evidence to inform decision-making for climate adaptation planning and disaster risk management purposes. FSM climate projection information available in the PACCSAP report include projections for air temperature, rainfall, storm/typhoons, sea level, Sea Surface Temperature and Ocean Acidification, based on Coupled Model Intercomparison Project- Phase 5 (CMIP5).

Screening Phase: Identifying Climate Risks Through a Vulnerability Analysis

The screening phase for resilient development projects consist in analyzing the vulnerability of a project to climate change. This is done by considering the climate change projections to be used during the sensitivity and exposure analysis (Fig. 2).

At this stage the vulnerability assessment would consider climate projections based on one of the Representative Concentration Pathways (RCP) scenarios (see Annex 1). For example, considering RCP4.5 (medium-low emission scenario) for climate proofing means taking into consideration climate change projections for a scenario resulting in a global average temperature rise of no more

than 2 ºC and 3 ºC above pre-industrial temperature levels by the year 2100. Information on climate feature (i.e., sea level, air temperature, rainfall, etc.) projections under the scenario of this example, will be the basis for climate proofing the different stages of the project development cycle.

Therefore, for effectively climate proofing a development project it is crucial the application of the most appropriate RCP scenario and its relative climate projections.
Selection of climate projections should also take into consideration the anticipated lifespan of a project:

- Short-term projects -up to the next decade: in this case, 10 years predictions, based on current climate conditions and recent past changes can be applied, since for this timescale decadal predictions provide a reasonable degree of certainty.
- Medium to long-term projects- beyond 10 years and up to the end of the century: in this case, scenario-based climate change projections should be applied.

The selection of climate projections should be seen as an integral part of the project development cycle and project risk management.

A vulnerability assessment should be conducted to identify the relevant climate hazards for a specific project. The vulnerability assessment provides insights on the impacts of climate hazards on the project itself and on the location of the project. Therefore, it aims to get a clear understanding of:

a) How sensitive the project's components are to climate hazards (sensitivity).

b) The probability of the hazards occurring at the project location now and in the future (exposure).

The vulnerability analysis helps to identify the most relevant hazards that are considered for the risk assessment. It is typically comprised of a sensitivity and exposure analysis which provides insights of the climate hazards that can affect the project components and the location of the project.

Sensitivity Analysis

A sensitivity analysis is conducted to identify the climate hazards that are relevant to the type of project. For example, in the FSM sea level rise is likely to be an important hazard for sea dwarf and jetties, irrespective of their location.

When conducting a sensitivity analysis for development projects it would be important:

- To identify the various components of the projects
- To define how the project operates within the wider system, for example, identify on-site assets and processes, which inputs are requested in terms of water, energy, etc., which are the expected outputs of the project -i.e., services, products; and finally, the transport links and access to transport.

- To identify critical design parameters
- To assign a sensitivity score, which requires inputs from technical experts or specialists that have a good understanding and knowledge of the project

Qualitative scores can be assigned for assessing the sensitivity of the project components to climate change. For instance, a high sensitivity score implies that the climate hazard may have a significant impact on the assets and processes; a low sensitivity score implies that the climate hazard has insignificant impact.

Exposure Analysis

The exposure analysis aims to identify which climate hazards are more relevant to the project location, regardless of the project type. For example, in the FSM coastal flooding due to storm swells and sea level rise can be a significant hazard for projects located near low-lying coastal areas. The exposure analysis asses the exposure to current and future climate, including climate extreme weather events, based on historic and available information for the project location and information derived from climate model projections that will provide insights on how exposure may change in the future.

The analysis provides insights on how the exposure of different geographic areas may change as a result of changing climate hazards. For instance, coastal areas and low-lying atoll islands are more exposed to increasing storm surge, wave height, coastal flooding, and erosion. All these hazards should be taken into consideration and accounted for resilient development projects. Site-specific data and local data are the basis for conducting an accurate exposure assessment.

Detailed Analysis: Risk assessment and adaptation measures

The risk assessment is conducted to identify long-term cause-effect chains linking climate hazards to how the project performs across technical, environmental, social, and financial dimensions looking at the interactions between factors. The goal of conducting a risk assessment is to quantify the risks to the project under the current and future climate conditions thus providing the basis for judging what is an acceptable level of risk for a development project. As climate change unfolds, it is expected that a climate hazard may vary with time, this information should be integrated into the risk assessment in consideration of the lifespan of a project. The assessment should also take into consideration cascading effects and climate extremes.
Risks assessment should:

- Be conducted at an early stage of the project cycle -project planning- to identify risks that can be managed and/or avoided.
- Include a review of the site information, including, but not limited, to historical data, environmental and socio-economic information.
- Include, if necessary, expert judgment by the assessment team.

The risk assessment provides key information for decision-making, by assessing:

a) The likelihood and severities of the impacts associated with climate hazards identified in the vulnerability assessment. This helps to understand how likely the identified climate hazards are to occur within a given timescale (i.e., lifespan of the project). The likelihood for each of the climate variables and hazards to occur can be estimated qualitatively (highly

unlikely, unlikely, as likely as not, likely, highly likely to occur) or quantitively (e.g., percent of an event to occur- there is 5% chance to occur). However, it should be noted that due to climate change the likelihood of the climate variables and hazards may change during the lifespan of the project. Additionally, for some climate risks uncertainty related to the likelihood of occurrence may be high (e.g., rainfall patterns in the FSM are masked by interannual and interdecadal variability which limit the ability to accurately capture trends). The likelihood of the climate variables and hazards can be assessed based on current, available, best information, data, statistics, model simulations and stakeholders' knowledge, but high uncertainty may require expert judgment.

b) The impact of a risk to the success of a project, is done by assessing the effects a risks has to the project when a climate impact occurs. Generally, the impact is assessed on a scale of impact per hazard providing the magnitude or severity of the impact to the project (Table 1). The magnitude of the impact should be measured across different risk areas (e.g., environment, safety, health, social, financial, cultural heritage, asset damage) and it can vary from insignificant (the impact is insignificant or there is no impact) to significant (extreme loss and damage; Table 1). It should be considered the relevant to a development project and to the wider system and may lead to additional impacts, causing a cascading effect.

Table 1. Example of Risk Assessment Matrix summarizing the output of the risk analysis from the combination of likelihood and impact of climate variables and hazards. Each risk level should have associated narrative and explanation.

	Magnitude of Consequences					Legend: Risk Level
Likelihood	1 Insignificant	2 Minor	3 Moderate	4 Extensive	5 Significant	
1 Rare						Low
2 Unlikely						Medium
3 Possible						High
4 Likely						Extreme
5 Almost certain						

When the risk assessment concludes that there are significant climate risks to a project, the risk should be managed and reduced to an acceptable level.

Therefore, adaptation measures should be identified and appraised for each of the identified significant risks. Adaptation measures can include a mix of responses from the modification of the project design, to make it more climate resilient, or the adoption of improved or alternative solutions to training, capacity building and monitoring or use of best practices and standards or risk management insurance or the use of nature-based solution.

Once adaptations measures have been identified they should be assessed to find the measure or mix of measures that can be implemented to reduce the risk to an acceptable level[32]. The assessment of the adaptation options should take into consideration the specific circumstances and

[32] Set the risk reduction to an acceptable level is dependent on the expert team carrying out the assessment the risk that the project implementer is prepared to accept. A cost-benefit analysis can assist the team to weight the costs of adaptation against its benefits at large (including social and environmental benefits).

availability of data. Considerations should be given to no-regret options which are represented by adaptation options that are likely to perform well under the current and future climate.

Finally, the selected adaptation options should be integrated into the project design and management and accounted for into the project implementation, finance, monitoring, and evaluation plans.

It is a good practice to conduct regular reviews of the climate hazards, which may change over time, therefore, risk assessments should be up-to-date and update regularly. This practice is critical to ensure effectiveness of the adaptation options.

Contribution of Nature-based Solutions to Development Projects

There is growing interest in integrating natural solutions into general development and infrastructure planning and design. Nature-based Solutions (NbS) are considered as actions that protect, sustainably-manage, and restore natural or modified ecosystems to address societal challenges, while simultaneously providing human well-being, socioeconomic, and biodiversity benefits. NbS is predicated upon the idea that healthy natural and well managed ecosystems produce an array of services that supports the wellbeing of communities and the critical infrastructure – natural and manmade – on which they depend.

NbS is an 'umbrella concept' for other established 'nature-based' approaches:

- ✓ Ecosystem-based Adaptation (EbA)
- ✓ Ecosystem-based Mitigation (EbM)
- ✓ Ecosystem-based Disaster Risk Reduction (ECO-DRR)
- ✓ Green Infrastructure and
- ✓ Natural Climate Solutions (NCS)

Examples of NbS include carbon sequestration through management of natural carbon sinks (mangroves); controlling floods and stabilizing shorelines and slopes through agroforestry; providing clean air, water, food, fuel, medicine, and genetic material by protecting and conserving critical natural resources.

NbS should be explicitly designed to account for the needs, values, and knowledge of the different sectors of society. The concept of NbS fits with the existing FSM system for local resource management assisting to further enhance local communities' control of their natural resources and partnership between a diverse set of actors (e.g., government agencies, private, public, and civil society sectors, researchers).

Table 2. Nature-based Solutions provisions (Source: Seddon et al 2020[33])

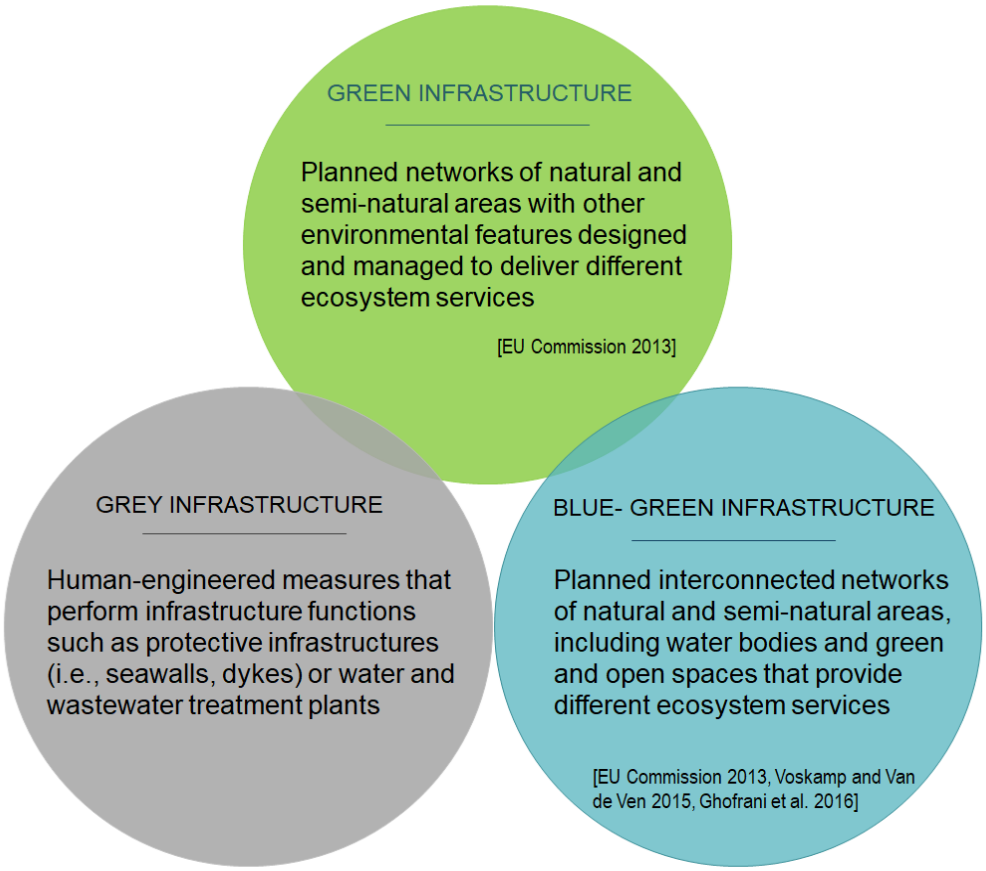
NbS	Provisions
NbS for Reducing Socioeconomic Exposure	Nature plays a key role in reducing exposure to the immediate impacts of climate change. Restoring coastal ecosystems protects communities from flooding, damages from storm surges and limits coastal erosion.
Nbs for Reducing Socioeconomic Sensitivity	Individuals, communities, societies sensitivity to climate change are reduced when NbS are properly implemented and supported by biodiversity. For instance, agroforestry can provide alternative income sources (fruit, wood-fuel) as well as reduce exposure to heat, drought, floods, and soil erosion.
NbS for Supporting Socioeconomic Adaptive Capacity	Conserving and protecting genetic or species diversity helps maintain a reservoir of wild species that support food crop varieties that are resilient to climate, pests, and diseases. The development of systems that manage resources in the face of climate change, improves institutional governance and increases capacity to deal with future challenges to climate change.

[33] Seddon N, Chausson A, Berry P, Girardin CAJ, Smith A, Turner B. 2020 Understanding the value and limits of nature-based solutions to climate change and other global challenges. Phil. Trans. R. Soc. B375:2019020

It is important to note, that climate change can alter ecosystems and the services they provide and potentially weaken green solutions. It is important that any proposed NbS solution go through an analysis that determines future climate change scenarios and the effectiveness of NbS solutions over time. Furthermore, NbS should not be considered as the only choice, but should be deemed as an opportunity that supports and/or compliments traditional options (manmade).

Risks to the environment and therefore, overall adaptive capacity and resilience of people, communities, socioeconomic health, and economy at large, have the potential to be negatively impacted by development projects, particular in island settings, where limited land area increases the chance of pollution and impacts from the ridge to the reef.

As such, understanding the risks that development poses to natural infrastructure and the cost of the loss of the resources that nature provides (food, water, and infrastructure security) should be factored in all development projects. It is important to note, climate proofing and incorporating NbS into development projects and state and national plans is intended to find synergies between human and nature engineered solutions and approaches. It is not a matter of choosing one over the other but finding the nexus between natural and human engineered solutions.



Annex 1: climate models and scenario for reporting on climate projections

The Coupled Model Inter-comparison Projects, or CMIPs are the results of the international scientific cooperation and partnerships coordinated by the World Climate Research Program (WCRP) which provide climate model compilations with the aim of enhancing our understanding of the multi-scale dynamic interactions between natural and social systems that affect climate. The CMIPs also provide different plausible future societal development storylines and associated contrasting emission pathways (scenarios). The scenarios are used to characterize the range of plausible climate futures and to illustrate the consequences of different pathways (policy choices, technological changes, etc) with the goal of outlining how future emissions and land use changes could translate into responses in the climate system.

- CMIP5 provided the foundation for the development of the 5th Assessment Report released in 2013 and 2014 (AR5): the approach of formulating scenarios for AR5 was climate centric focusing on four (4) Representative Concentration Pathways (RCP) which reflected a designated amount of radiative forcing measured in watts per square meter (W/m^2) reached by 2100 (i.e., 2.6, 4.5, 6.0 and 8.5 W/m^2 of change over pre-industrial, respectively).
- CMIP6 presents the last latest collection of climate simulations used to inform the 6th Assessment Report released in 2021, and in 2022 (AR6): the approach of formulating scenarios for AR6 was societal development-centric, focusing on five (5) Shared Socioeconomic Pathways (SSPs), with the underlying goal of providing insight into a range of plausible climate outcomes. CMIP6 introduces 1.9 W/m^2 to offer insight into the climate response that might be reflective of the Paris Agreement target.

CMIP5

The Representative Concentration Pathways (RCPs) describe four different levels of greenhouse gases and other radiative forcings that might occur in the 21st century. Each RCP shows the planet trapping progressively higher amounts of energy from the lowest GHG emissions (RCP2.6) to the highest GHG emissions (RCP8.5). Scenarios without additional efforts to constrain emissions ('baseline scenarios') lead to pathways ranging between RCP6.0 and RCP8.5.

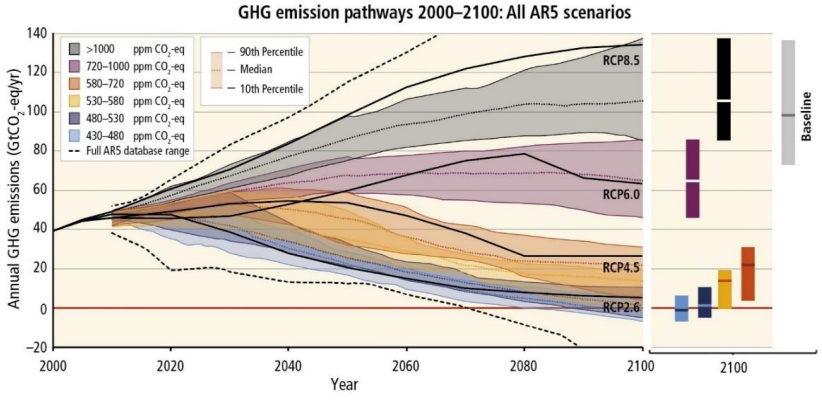


Figure A.1. GHG emission pathways for each RCP from 2000-2100 (Source: IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. IPCC, Geneva, Switzerland.

RCP	Definition	Description
RCP2.6	Stringent mitigation scenario	This low emissions scenario is representative of a scenario that aims to keep global warming likely below 2°C above pre-industrial temperatures. This scenario presents radiative forcing level increasing by mid-century (2050) reaching a value of around 3.1 W/m^2 to then decline by the end of the century (2100) reaching 2.6 W/m^2. In order to achieve this low emissions scenario, GHG emissions (and indirectly emissions of air pollutants) are reduced substantially over time.
RCP4.5	Medium-low emissions scenario	This scenario assumes action is taken to curb climate change by all countries resulting in a global average temperature rise of no more than 2 ºC and 3 ºC above pre-industrial temperature levels by the year 2100.
RCP6.0	Medium-high emission scenario	This scenario assumes that without overshooting the application of a range of technologies and strategies for reducing GHG emissions, the total radiative forcing will stabilize shortly after 2100.
RCP8.5	High-end emissions scenario	Based on this high emissions scenario, the global average temperature is estimated to increase of approximately 5-6ºC by 2100, relative to pre-industrial temperature levels. RCP8.5 is commonly recognized as 'business as usual'.

CMIP6

CMIP6 introduces socio-economic narratives for each RCP scenario: the Shared Socioeconomic Pathways (SSPs). SSPs represent possible societal development and policy paths for meeting designated radiative forcing by the end of the century. GHG emissions associated with CMIP6 scenarios vary depending on socio-economic assumptions, levels of climate change mitigation and, for aerosols and non-methane ozone precursors, air pollution controls. Scenarios from CMIP6 consider conditions under which CO_2 emissions roughly double from current levels by 2100 (SSP7.0 – *high GHG emissions*) and 2050 (SSP8.5 - *very high GHG emissions*) and conditions under which CO_2 emissions remain around current levels until the middle of the century (SSP4.5 – *intermediate GHG emissions*) and CO_2 emissions decline to net zero around (SSP1.9 - *very low GHG emissions*) or after 2050 (SSP2.6 – *low GHG emissions*), followed by varying levels of net negative CO_2 emissions.

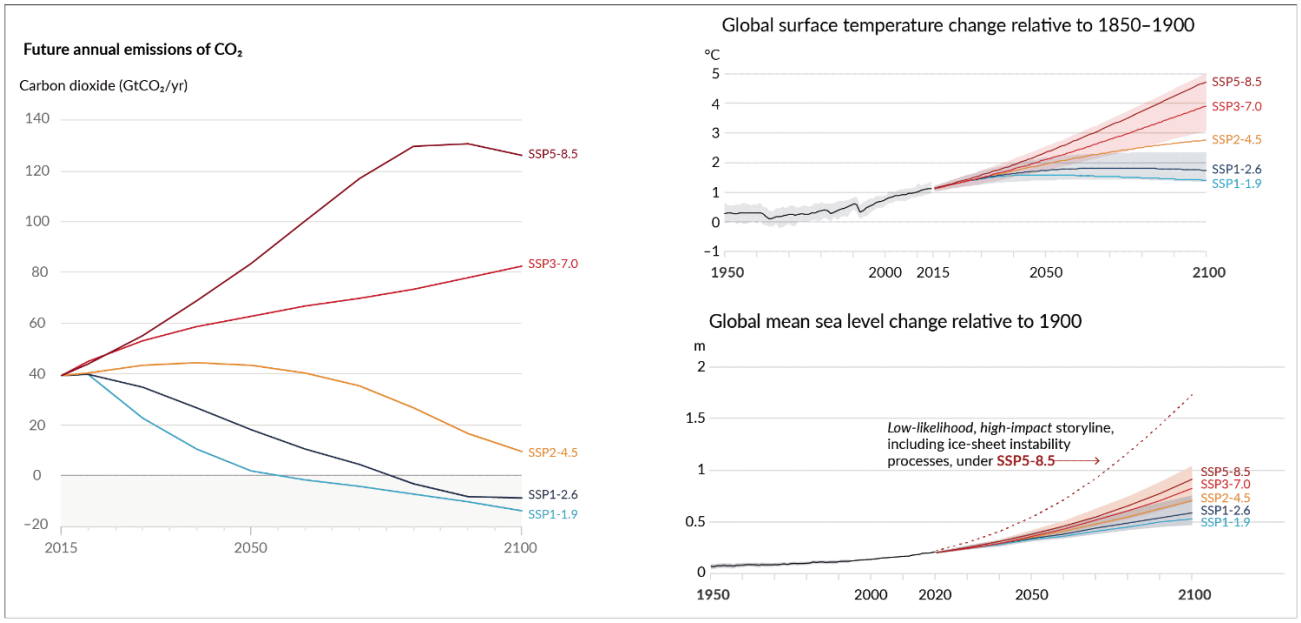


Figure A.2. SSPs scenario's future annual CO_2 emissions and implications to global warming and sea level (Source: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 553–672, doi:10.1017/9781009157896.006)

A description of the SSPs scenarios developed by the IPCC is provided in the table below

SSP	GHG emissions	Definition	Narrative description for SSP
SSP1	very low GHG emissions1.9	Sustainability-Taking the Green Road	**Low challenges to mitigation and adaptation:** *The world shifts gradually, but pervasively, toward a more sustainable path, emphasizing more inclusive development that respects perceived environmental boundaries. Management of the global commons slowly improves, educational and health investments accelerate the demographic transition, and the emphasis on economic growth shifts toward a broader emphasis on human well-being. Driven by an increasing commitment to achieving development goals, inequality is reduced both across and within countries. Consumption is oriented toward low material growth and lower resource and energy intensity.*
SSP2	Low GHG emissions 2.6	Middle of the Road	**Medium challenges to mitigation and adaptation:** *The world follows a path in which social, economic, and technological trends do not shift markedly from historical patterns. Development and income growth proceeds unevenly, with some countries making relatively good progress while others fall short of expectations. Global and national institutions work toward but make slow progress in achieving sustainable development goals. Environmental systems experience degradation, although there are some improvements and overall, the intensity of resource and energy use declines. Global population growth is moderate and levels off in the second half of the century. Income inequality persists or improves only slowly and challenges to reducing vulnerability to societal and environmental changes remain.*
SSP3	Intermediate GHG emissions 4.5	Regional Rivalry – A Rocky Road	**High challenges to mitigation and adaptation:** *A resurgent nationalism, concerns about competitiveness and security, and regional conflicts push countries to increasingly focus on domestic or, at most, regional issues. Policies shift over time to become increasingly oriented toward national and regional security issues. Countries focus on achieving energy and food security goals within their own regions at the expense of broader-based development. Investments in education and technological development decline. Economic development is slow, consumption is material-intensive, and inequalities persist or worsen over time. Population growth is low in*

			industrialized and high in developing countries. A low international priority for addressing environmental concerns leads to strong environmental degradation in some regions.

SSP	GHG emissions	Definition	Narrative description for SSP
SSP4	High GHG emissions 7.0	Inequality - A Road Divided	***Low challenges to mitigation, high challenges to adaptation****: Highly unequal investments in human capital, combined with increasing disparities in economic opportunity and political power, lead to increasing inequalities and stratification both across and within countries. Over time, a gap widens between an internationally-connected society that contributes to knowledge- and capital-intensive sectors of the global economy, and a fragmented collection of lower-income, poorly educated societies that work in a labor intensive, low-tech economy. Social cohesion degrades and conflict and unrest become increasingly common. Technology development is high in the high-tech economy and sectors. The globally connected energy sector diversifies, with investments in both carbon-intensive fuels like coal and unconventional oil, but also low-carbon energy sources. Environmental policies focus on local issues around middle- and high-income areas.*
SSP5	Very high GHG emissions 8.5	Fossil-fueled development-Taking the Highway	***High challenges to mitigation, low challenges to adaptation***: *This world places increasing faith in competitive markets, innovation, and participatory societies to produce rapid technological progress and development of human capital as the path to sustainable development. Global markets are increasingly integrated. There are also strong investments in health, education, and institutions to enhance human and social capital. At the same time, the push for economic and social development is coupled with the exploitation of abundant fossil fuel resources and the adoption of resource and energy intensive lifestyles around the world. All these factors lead to rapid growth of the global economy, while global population peaks and declines in the 21st century. Local environmental problems like air pollution are successfully managed. There is faith in the ability to effectively manage social and ecological systems, including by geo-engineering if necessary.*