



**GREEN
CLIMATE
FUND**

Meeting of the Board
9 – 13 November 2020
Virtual meeting
Provisional agenda item 11

GCF/B.27/02/Add.07

21 October 2020

Consideration of funding proposals - Addendum VII

Funding proposal package for FP147

Summary

This addendum contains the following six parts:

- a) A funding proposal titled "Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean";
- b) No-objection letter issued by the national designated authority(ies) or focal point(s);
- c) Secretariat's assessment;
- d) Independent Technical Advisory Panel's assessment;
- e) Response from the accredited entity to the independent Technical Advisory Panel's assessment; and
- f) Gender documentation.

Table of Contents

Funding proposal submitted by the accredited entity	3
No-objection letter issued by the national designated authority(ies) or focal point(s)	172
Secretariat's assessment	178
Independent Technical Advisory Panel's assessment	194
Response from the accredited entity to the independent Technical Advisory Panel's assessment	204
Gender documentation	206

Funding Proposal

Programme title:	<u>Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean</u>
Countries:	<u>Cook Islands, Niue, Palau, Republic of the Marshall Islands and Tuvalu</u>
Accredited Entity:	<u>United Nations Environment Programme</u>
Date of first submission:	<u>[8 November 2019]</u>
Date of current submission	<u>[15 October 2020]</u>
Version number	<u>[V13]</u>



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Contents

Section A	PROGRAMME SUMMARY
Section B	PROGRAMME INFORMATION
Section C	FINANCING INFORMATION
Section D	EXPECTED PERFORMANCE AGAINST INVESTMENT CRITERIA
Section E	LOGICAL FRAMEWORK
Section F	RISK ASSESSMENT AND MANAGEMENT
Section G	GCF POLICIES AND STANDARDS
Section H	ANNEXES

Note to Accredited Entities on the use of the funding proposal template

- Accredited Entities should provide summary information in the proposal with cross-reference to annexes such as feasibility studies, gender action plan, term sheet, etc.
- Accredited Entities should ensure that annexes provided are consistent with the details provided in the funding proposal. Updates to the funding proposal and/or annexes must be reflected in all relevant documents.
- The total number of pages for the funding proposal (excluding annexes) **should not exceed 60**. Proposals exceeding the prescribed length will not be assessed within the usual service standard time.
- The recommended font is Arial, size 11.
- Under the [GCF Information Disclosure Policy](#), project and programme funding proposals will be disclosed on the GCF website, simultaneous with the submission to the Board, subject to the redaction of any information that may not be disclosed pursuant to the IDP. Accredited Entities are asked to fill out information on disclosure in section G.4.

Please submit the completed proposal to:

fundingproposal@gcfund.org

Please use the following name convention for the file name:

“FP-[UNEP]-[PACIFIC]-[2019/08/21]”

A. PROJECT/PROGRAMME SUMMARY			
A.1. Project or programme	Programme	A.2. Public or private sector	Public
A.3. Request for Proposals (RFP)	<p>If the funding proposal is being submitted in response to a specific GCF Request for Proposals, indicate which RFP it is targeted for. Please note that there is a separate template for the Simplified Approval Process and REDD+.</p> <p>Not applicable</p>		
A.4. Result area(s)	<p>Check the applicable GCF result area(s) that the <u>overall</u> proposed project/programme targets. For each checked result area(s), indicate the estimated percentage of <u>GCF budget</u> devoted to it. The total of the percentages when summed should be 100%.</p> <p>Mitigation: Reduced emissions from:</p> <p><input type="checkbox"/> Energy access and power generation:</p> <p><input type="checkbox"/> Low-emission transport:</p> <p><input type="checkbox"/> Buildings, cities, industries and appliances:</p> <p><input type="checkbox"/> Forestry and land use:</p> <p>Adaptation: Increased resilience of:</p> <p><input checked="" type="checkbox"/> Most vulnerable people, communities and regions:</p> <p><input type="checkbox"/> Health and well-being, and food and water security:</p> <p><input type="checkbox"/> Infrastructure and built environment:</p> <p><input type="checkbox"/> Ecosystem and ecosystem services:</p>		<p>GCF contribution:</p> <p><u>Enter number</u>%</p> <p><u>Enter number</u>%</p> <p><u>Enter number</u>%</p> <p><u>Enter number</u>%</p> <p>100%</p> <p><u>Enter number</u>%</p> <p><u>Enter number</u>%</p> <p><u>Enter number</u>%</p>
	A.5. Expected mitigation impact	N/A	A.6. Expected adaptation impact
A.7. Total financing (GCF + co-finance)	49,933,658 USD	A.9. Project size	Small (Upto USD 50 million)
A.8. Total GCF funding requested	47,403,174 USD		
A.10. Financial instrument(s) requested for the GCF funding	<p>Mark all that apply and provide total amounts. The sum of all total amounts should be consistent with A.8.</p> <p><input checked="" type="checkbox"/> Grant \$47,403,174 <input type="checkbox"/> Equity <u>Enter number</u></p> <p><input type="checkbox"/> Loan <u>Enter number</u> <input type="checkbox"/> Results-based payment <u>Enter number</u></p> <p><input type="checkbox"/> Guarantee <u>Enter number</u></p>		
A.11. Implementation period	5 years	A.12. Total lifespan	10 years
A.13. Expected date of AE internal approval	1/9/2020	A.14. ESS category	C

A.15. Has this FP been submitted as a CN before?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	A.16. Has Readiness or PPF support been used to prepare this FP?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
A.17. Is this FP included in the entity work programme?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	A.18. Is this FP included in the country programme?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
A.19. Complementarity and coherence	<i>Does the project/programme complement other climate finance funding (e.g. GEF, AF, CIF, etc.)? If yes, please elaborate in section B.1.</i> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		
A.20. Executing Entity information	<p>Executing Entities:</p> <ul style="list-style-type: none"> • Cook Islands: Ministry of Finance and Economic Management (MFEM), Development Coordination Division – Government Owned • Niue: Project Management Coordinating Unit (PMCU) in the Central Agency for Finance and Planning within the Premier’s Office – Government Owned • Palau: Ministry of Finance, Bureau of Budget and Planning – Government Owned • Republic of the Marshall Islands: Ministry of Finance – Government Owned • Tuvalu – Ministry of Finance, Climate Change Department (CCD) – Government Owned • United Nations Environment Programme (UNEP) <p>Technical Partners and National service providers will be contracted to support national execution, as described in section B.4.</p>		
A.21. Executive summary (max. 750 words, approximately 1.5 pages)			
<ul style="list-style-type: none"> • As Small Island Developing States (SIDS) in the Pacific, the Cook Islands, Niue, Palau, the Republic of the Marshall Islands (RMI) and Tuvalu are at the forefront of climate change. They are increasingly under threat from common climate change challenges – rising mean temperatures, warming and rising seas, ocean acidification and deoxygenation, degradation of protective coral reefs, unpredictable and more extreme rainfall, more intense tropical cyclones, flooding and prolonged droughts.¹ For example, local sea level rise in Tuvalu was twice the global average ($\sim 3.90 \pm 0.4 \text{ mm y}^{-1}$) from 1971-2014.² The confluence of relative sea level rise, increases in extreme waves, tropical cyclones and storms, and changing rainfall patterns exacerbates extreme sea level events and coastal hazards.³ These climate change impacts increasingly threaten the ecosystems on which Pacific island populations rely for their livelihoods. • The high vulnerability to climate change impacts and climate-related hazards of the five Programme countries arises from their geography, the exposure of their populations and their lack of resilience to shocks. Their limited adaptation capacity is caused by structural constraints on their financial and human resources. Their vulnerability is compounded by socioeconomic factors, particularly the reliance of their small economies on very climate sensitive sectors such as subsistence farming, fisheries and tourism. The IPCC Special Report on Global Warming of 1.5°C affirms that SIDS are at disproportionately higher risk of adverse consequences due to global warming of 1.5°C, including increased climate-related risks to health, livelihoods, food security, water supply, human security and economic growth.⁴ Furthermore, 			

¹ IPCC, 2019. Special Report on the Ocean and Cryosphere in a Changing Climate.

² Kench, P.S. et al. 2018. Nature Communications. <https://www.nature.com/articles/s41467-018-02954-1.pdf>

³ IPCC, 2019. Special Report on the Ocean and Cryosphere in a Changing Climate.

⁴ IPCC, 2018. Special Report on Global Warming of 1.5°C.

the World Risk Index 2018 unequivocally states that Pacific island countries are unable to reduce their disaster risk without external support and notes that disaster risk – the risk that an extreme natural event will lead to disaster – is at its highest in Oceania.⁵ All five countries have assets, infrastructure and crops at risk of being damaged from natural disasters with total replacement costs of over USD 7.6 billion, with buildings at risk contributing the majority of this total (86.5%), infrastructure (13.2%) and cash crops (0.4%).^{6, 7} The main contributor to deaths and financial losses in the South Pacific region is tropical cyclones. Expected average annual losses (AAL) per capita (USD\$2019) for tropical cyclones alone in the five Programme countries are estimated at: 537 (Cook Islands), 2122 (Niue), 208 (Palau), 119 (RMI) and 336 (Tuvalu).⁸ Deaths caused by tropical cyclones are recorded⁹ but are believed to be underestimated. Loss, damage, deaths and disability-affected life years resulting from prolonged drought and other extreme climate events are not recorded but are expected to be significant.

- As the climate changes and climate extremes become more frequent or intense, the Cook Islands, Niue, Palau, RMI and Tuvalu require reliable, timely and understandable information and early warning on their local weather, climate and ocean environments; and science-based advice on adaptation planning for longer term climate change impacts. However, the combination of vast ocean areas, large numbers of dispersed islands, changing climatic conditions, capacity constraints and other barriers makes it very challenging for the five Programme countries to put in place comprehensive and sustained climate information and multi-hazard early warning services (MHEWS).
- As the Pacific Island Countries enter their cyclone, drought, heatwave or monsoon seasons, the potential for an “unprecedented double disaster” of the COVID-19 pandemic and climate hazards is increasing. The UNDRR Asia Pacific COVID-19 Brief emphasises “the need for countries to focus on a multi-hazard integrated disaster risk management approach that includes high levels of disaster preparedness and accelerated disaster risk reduction across sectors”.¹⁰ The dual challenge of climate change and a global pandemic highlights the urgency required to prioritise disaster risk management efforts and enhance multi-hazard early warning systems. The Global Ocean Observing System (GOOS) asserts that “Despite its significant impacts on the ocean observing system, the Covid-19 crisis can also be an opportunity for us to look at how to build greater resilience into the system.”¹¹ Enhancing climate and oceans observations in concurrence with disaster resilience building will be a major focus of the Programme.
- The countries’ National Meteorological and Hydrological Services (NMHSs) operate at WMO’s Basic–Category 1 level¹² – indicating that they can provide basic weather and climate services to their countries, but lack capacity for comprehensive climate and oceans observations, impact-based forecasting, early warning systems, and informing climate-resilient preparedness and response actions. Although efforts have been made to improve the quality of climate data collected through the current observation networks, there are still many gaps – particularly in relation to ocean areas and outer islands. Amongst others, this hampers the availability and use of forecasts for disaster risk reduction efforts. The Feasibility Study (Annex 2) provides detail on the staffing levels, qualifications and current capacity, and equipment status of NMHSs in the five Programme countries.
- The *Pacific Island Meteorological Strategy 2017–2026*¹³ summarised the constraints affecting the NMHSs of Pacific SIDS – poor infrastructure, staffing constraints, limited communication channels to

⁵ Bündnis Entwicklung Hilft and Ruhr University Bochum, 2018. WorldRiskReport 2018.

⁶ See Annex 3 – Economic Analysis

⁷ “Buildings” include residential, commercial, public and industrial properties. “Infrastructure” includes assets such as major ports, airports, power plants, bridges and roads. See Pacific Catastrophe Risk Assessment and Financing Initiative data and documents. Available from: <http://pcrafi.spc.int>.

⁸ Pacific Catastrophe Risk Assessment and Financing Initiative adjusted for 2019. <http://pcrafi.spc.int>

⁹ Numbers of deaths and other recorded impacts of tropical cyclones are provided in Annex 3a – Economic Analysis

¹⁰ UNDRR, 2020. UNDRR Asia Pacific COVID-19 Brief. Combating the Dual Challenge of COVID-19 and Climate-Related Disasters

¹¹ Global Ocean Observing System, 2020. Briefing Note: Covid-19’s impact on the ocean observing system and our ability to forecast weather and predict climate change

¹² Assessment of NMHS categorisation is based on the indicative descriptions provided in the following document: WMO, 2015. Capacity Development Strategy and Implementation Plan – Annex 5: Categorisation of NMHSs

¹³ SPREP, 2016. Pacific Islands Meteorological Strategy 2017-2026

communities and other user groups, and incomplete weather, climate, ocean and hydrology services. The barriers preventing effective climate and ocean information services and MHEWS in the five countries include: i) lack of legislative, regulatory and policy frameworks for climate services; ii) inadequate observation networks and limited climate and ocean sector-specific information; iii) limited understanding and use of climate and ocean information within each country; and iv) limited regional cooperation, knowledge management and training for climate services. Furthermore, national budgets do not reflect the current and potential value of climate services to disaster risk reduction and effective adaptation to climate change in different sectors. Lack of resources also impedes NMHSs from demonstrating that they can generate information products with commercial value.

- To address the aforementioned barriers, the proposed Programme will facilitate the development of integrated climate and ocean information services and people-centred MHEWS in Cook Islands, Niue, Palau, RMI and Tuvalu. This will be achieved through four inter-related components – the “Programme Results”:
1. **Strengthened delivery model for climate information services and MHEWS covering oceans and islands.** This will put in place the institutional frameworks, market analyses, financial policies and mainstreaming of climate risk knowledge to underpin a sustainable business delivery model for climate services.
 2. **Strengthened observations, monitoring, modelling and prediction of climate and its impacts on ocean areas and islands.** This will transform the five NMHSs from WMO Basic (Category 1) to Essential (Category 2) level; meet the surface-based standards of the Global Basic Observing Network (GBON); establish end-to-end Ocean Information Services; establish Quality Management Systems (QMSs); and support Impact-based Forecasting – with a focus on building in-country capacity for long-term sustainability.
 3. **Improved community preparedness, response capabilities and resilience to climate risks.** This will establish last-mile delivery of early warning and early action in island communities through enhanced warning communication, dissemination, and building preparedness and response capacities. It will also introduce Forecast-based Financing to facilitate the shift from traditional reactive responses to pre-event early action.
 4. **Enhanced regional knowledge management and cooperation for climate services and MHEWS.** This will optimise synergies among the Programme countries; establish an interactive ICT platform and harmonised data management; institute joint learning and training through WMO and other training centres; and foster networking and mentoring in support of Programme implementation.
- The Programme Results will address the five priority areas for action identified in the *Pacific Island Meteorological Strategy 2017-2026* as follows: i) Improved weather services and establishment of ocean weather services – *Results 1, 2 and 3*; ii) Disaster risk reduction – *Results 1, 2 and 3*; iii) Improved climate and hydrological services – *Results 2 and 4*; iv) Integrated observing and communication systems – *Results 2 and 4*; and v) Coordinated support for NMHSs and the Pacific Meteorological Council (PMC) – *Results 1 and 4*. The Programme proposes to contribute to the establishment of more advanced services by the five countries, including the development of customised climate products such as impact-based forecasting for use by island communities, disaster management actors and climate-sensitive sectors such as subsistence farming, fisheries and tourism. The Programme will also directly support Goals 1 and 3 of the Framework for Resilient Development in the Pacific and provide an enabling environment for Goal 2.
 - The Programme Results are based on the pillars of Global Framework for Climate Services (GFCS), a UN-wide initiative coordinated by the World Meteorological Organization (WMO). They are also fully aligned to the four elements of the checklist for Multi-Hazard Early Warning Systems (MHEWS) prepared by the partners of the International Network for MHEWS: i) Disaster Risk Knowledge; ii) Detection,

monitoring, analysis and forecasting of the hazards and possible consequences; iii) Warning dissemination and communication; and iv) Preparedness and response capabilities. Furthermore, the Programme will directly contribute to the attainment of selected targets and indicators of the Paris Agreement, Sustainable Development Goal (SDG) 13 on Climate Action and the Sendai Framework on Disaster Risk Reduction.

- The Programme interventions aim to shift the paradigm away from the current “business as usual”, characterised by the poorly coordinated use of insufficient climate data and information, towards a new paradigm in which accurate, timely and actionable climate information is used in climate-resilient policy, planning and response actions, and Forecast-based Financing (FbF) for early action is implemented to mitigate the impacts of climate-related hazards. The Programme will enable sectors and island communities at the “last mile” in the five Programme countries to adapt to increasing climate variability and change and to take early action based on reliable forecasts and the effective communication of timely warnings. The Programme will facilitate that i) Governments implement policies, plans and actions based on timely and credible climate information and risk analysis; ii) Integrated climate information and early warning systems are in place and sustained in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu; and iii) Communities adopt new climate-resilient livelihood practices by using improved climate information and risk knowledge. This transformation to increased resilience and enhanced livelihoods of the populations in the five Pacific SIDS to climate change threats is expected to reduce the damages and losses incurred through increased frequency and intensity of climate-induced disasters, such as tropical cyclones, by 15-30%.¹⁴
- At the request of the National Designated Authorities of the Cook Islands, Niue, Palau, RMI and Tuvalu, the United Nations Environment Programme (UNEP) will serve as the Accredited Entity (AE) for this Programme. Each country has also designated a national Executing Entity (EE), who will further sub-contract national service providers with expertise in climate services, early warning and disaster risk reduction. Implementation will be further supported by key Regional Technical Partners, including the Pacific Regional Environment Programme (SPREP); the Pacific Community (SPC); the Australian Bureau of Meteorology (BoM); the New Zealand National Institute of Water and Atmospheric Research (NIWA); the United States National Oceanic and Atmospheric Administration (NOAA); the University of Hawaii (UH); the International Federation of Red Cross and Red Crescent Societies (IFRC); APEC Climate Center (APCC); as well as UNEP.

This Programme has been developed as a direct response to requests from the partner countries and addresses global, regional and national frameworks, strategies, plans and priorities for adapting to the impacts of climate change, as emphasised by Pacific Leaders, most recently at the 50th Pacific Islands Forum in August 2019. The Kainaki II Declaration calls for “***the international community to immediately increase support and assistance for Pacific-led science-based initiatives intended to improve our understanding of risk and vulnerability, including through support for modelling and risk mapping capabilities, the development of methodologies for understanding, projecting and responding to climate change-related economic and infrastructure impacts, and capacity building support for evidence-based decision-making and project development***”.¹⁵ The Programme is fully aligned with the *Pacific Islands Meteorology Strategy 2017–2026* and was endorsed by the Pacific Meteorological Council (PMC), which fulfills a crucial convening and coordination role in the region, at its 5th biennial meeting in August 2019.

¹⁴ Giorgetti, A. (2018). Preliminary Cost-Benefit Analyses of Early Warning Systems for the Mitigation of Natural Disasters. Timor Leste, Papua New Guinea, Solomon Islands, Vanuatu and Fiji. Final Report prepared for WMO, February 2018; Subbiah, A., Bildan and L., Narasimhan, R. (2008). Background Paper on Assessment of the Economics of Early Warning Systems for Disaster Risk Reduction. World Bank Group for Disaster Reduction and Recovery.

¹⁵ Pacific Islands Forum, 2019. Kainaki II Declaration for Urgent Climate Change Action Now.

B. PROJECT/PROGRAMME INFORMATION

B.1. Climate context (max. 1000 words, approximately 2 pages)

Pacific Small Island Developing States (SIDS) are among the world's most vulnerable countries to climate change, particularly the many atoll countries whose highest elevation is two or three metres above mean sea level.¹⁶ The World Risk Index 2018 states that disaster risk—the risk that an extreme natural event will lead to a disaster—is at its highest in Oceania,¹⁷ calculating risk based on:

- Exposure to natural hazards such as cyclones, flooding, drought and sea-level rise;
- Vulnerability as dependent on infrastructure, nutrition, living conditions and economic circumstances;
- Coping capacities as dependent on governance, preparedness and early warning measures, access to health care, social and material security; and
- Adaptive capacities with respect to impending natural events, climate change and other challenges.

The Cook Islands, Niue, Palau, the Republic of the Marshall Islands (RMI) and Tuvalu are increasingly under threat from challenges common to SIDS—rising mean temperatures, warming and rising seas, ocean acidification and deoxygenation, degradation of sheltering coral reefs, unpredictable and more extreme rainfall, more intense tropical cyclones and longer droughts.¹⁸ As their land mass accounts for only around 2% of the entire Pacific region,¹⁹ the state of ocean ecosystems is especially critical to the wellbeing of island populations. Most island communities live close to coasts and are therefore subject to storm surges, river flooding and saltwater intrusion into freshwater resources and agricultural land, as well as tropical cyclones and severe droughts. They are remote from markets and have small populations and narrow resource bases. Their economies depend heavily on very climate sensitive sectors such as subsistence farming, fisheries and tourism. Traditional coping mechanisms are already being tested by long-term climatic changes – as the atmosphere and the sea absorb heat and CO₂ – and their adaptation capacity is limited by structural constraints on their financial and human resources. The pressures specific to each country are described in detail in the Feasibility Study (Annex 2).

Regional climate overview

The regional climate of the southern Pacific is influenced by three large-scale atmospheric features: the South Pacific Convergence Zone (SPCZ), the Inter Tropical Convergence Zone (ITCZ), and the Western Pacific Monsoon (WPM). These features represent expansive bands of large-scale wind convergence and high rainfall, which strongly influence intra-annual and inter-annual variability in rainfall, winds, tropical cyclone tracks, ocean currents, ocean nutrients and other environmental aspects.²⁰ The interplay between these climate drivers causes dramatic changes in weather in South Pacific islands, most obviously during El Niño and La Niña events.

In the South Pacific region (Cook Islands, Niue and Tuvalu), rainfall variability is mostly linked to the El Niño-Southern Oscillation (ENSO) or the Interdecadal Pacific Oscillation (IPO) and is directly attributable to shifts in the SPCZ. In the Pacific islands north of the equator (Palau and RMI), rainfall variability is linked to ENSO, the WPM and the ITCZ.²¹

¹⁶ UNEP, 2014. GEO Small Island Developing States Outlook

¹⁷ Hans-Joachim Heintze and others, 2018, WorldRiskReport 2018, Bündnis Entwicklung Hilft

¹⁸ IPCC, 2014 (https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap29_FINAL.pdf).

¹⁹ SPREP, 2012. Pacific Environment and Climate Change Outlook

²⁰ CSIRO, Australian Bureau of Meteorology and SPREP, 2015. Climate in the Pacific: A regional summary of new science and management tools

²¹ Australian Bureau of Meteorology, 2013. International Journal of Climatology. An updated assessment of trends and variability in total and extreme rainfall in the western Pacific

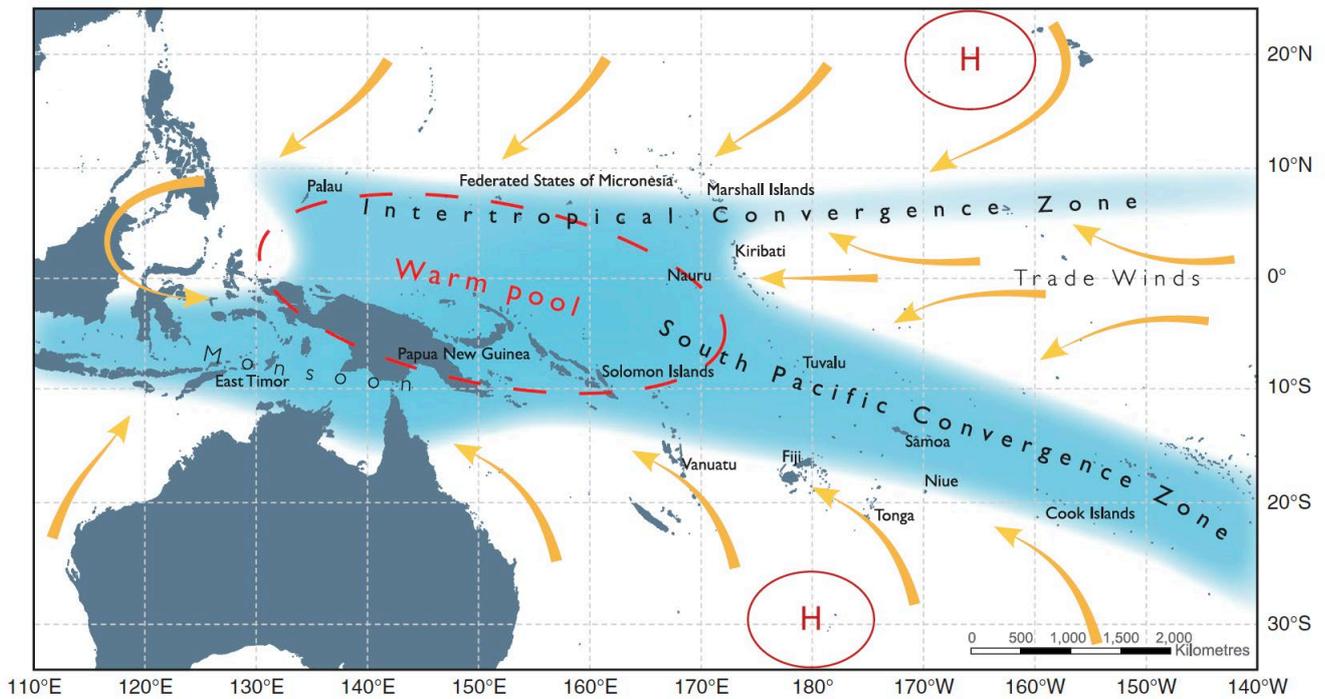


Figure 1. Natural climate drivers of the tropical Pacific. Map showing the average positions of the South Pacific Convergence Zone, Intertropical Convergence Zone and West Pacific Monsoon (all shaded blue) in the western tropical Pacific region in November to April. The yellow arrows show near-surface winds and the red dashed oval indicates the West Pacific Warm Pool. H represents the typical positions of moving high-pressure systems. (Source: PACCSAP)²²

The dominant cause of interannual climate variability in the Pacific is El Niño-Southern Oscillation (ENSO). ENSO is a natural climate cycle with two extreme phases: El Niño and La Niña. The extent and timing of the ENSO varies between countries and affects the year-to-year risk of droughts, floods, tropical cyclones, extreme sea levels and coral bleaching. El Niño and La Niña events have distinct impacts on rainfall and can cause large-scale shifts in rainfall patterns due to changes in sea-surface temperature and winds.²³

Table 1 provides a summary of the impacts of ENSO events in the five Programme countries.

Country	Region	El Niño	Extreme El Niño	La Niña
Cook Islands	North	Wet More frequent and intense cyclones	Wet More frequent and intense cyclones	Dry
	South	Dry More frequent and intense cyclones	Very dry More frequent and intense cyclones	Wet
Niue		Dry More frequent and intense cyclones	Very dry More frequent and intense cyclones	Wet
Palau		Dry Lower than normal sea level	Dry Lower than normal sea level	Wet Higher than normal sea level
Marshall Islands	North	Lower than normal sea level	Lower than normal sea level	No consistent impact on rainfall

²² Australian Bureau of Meteorology and CSIRO, 2011. Climate Change in the Pacific: Scientific Assessment and New Research, Volume 1: Regional

²³ CSIRO, Australian Bureau of Meteorology and SPREP, 2015. Climate in the Pacific: A regional summary of new science and management tools

		More intense cyclones	More intense cyclones	Higher than normal sea level
	South	Lower than normal sea level More intense cyclones	Very dry Lower than normal sea level More intense cyclones	Dry Higher than normal sea level
Tuvalu		Wet Lower than normal sea level	Wet Lower than normal sea level	Dry

Table 1. Summary of the impacts of El Niño and La Niña during November to April in each Programme country. 'El Niño' covers all the years of El Niño, and 'Extreme El Niño' includes only the years 1982/3 and 1997/8. (Source: PACCSAP and Kelman, I.)^{24, 25}

An extreme El Niño event is defined by unusually high rainfall over the eastern equatorial Pacific Ocean that exceeds a threshold of 5 mm d⁻¹. There are several additional important features of extreme El Niño events: eastward propagation of sea surface temperature (SST) anomalies; movement of the SPCZ by up to 1000 km towards the equator; and movement of the ITCZ towards the eastern equatorial Pacific Ocean. Extreme El Niño events occurred in 1982/83, 1997/98 and 2015/16; and severely disrupted global weather patterns²⁶ – with significant impacts on ecosystems, agriculture, tropical cyclones, drought, bushfires, floods and other extreme weather events.²⁷

The frequency of extreme El Niño events is projected to double to one event every 10 years under global warming in the period 1991 – 2090. The spatial pattern of associated rainfall is expected to remain similar, which suggests that, at a given location, past extreme El Niño impacts will repeat more frequently with global warming.²⁸ Future El Niño events are expected to be warmer than those experienced in the past, with associated changes in rainfall intensifying in the central-east equatorial Pacific and the western equatorial Pacific.²⁹

State of the climate

Temperature

At the regional level, annual mean temperature increased at a rate of 0.14 °C per decade in the period 1951 – 2015, with rates of warming the same for the December-February, March-May and September-November periods. A slower rate of warming (0.11 °C per decade) was observed for the June-August period. Furthermore, the rate of warming has increased in more recent years: 0.12 °C per decade over 1983 – 2015, compared with 0.09 °C per decade over 1951 – 1982.³⁰

²⁴ CSIRO, Australian Bureau of Meteorology and SPREP, 2015. Climate in the Pacific: A regional summary of new science and management tools

²⁵ Kelman, I. 2017. Environment, Development and Sustainability. Pacific island regional preparedness for El Niño

²⁶ Cai, W. *et al.* 2017. Geophysical Research Letters. Definition of Extreme El Niño and Its Impact on Projected Increase in Extreme El Niño Frequency

²⁷ Cai, W. *et al.* 2014. Nature Climate Change. Increasing frequency of extreme El Niño events due to greenhouse warming. DOI: 10.1038/NCLIMATE2100

²⁸ Cai, W. *et al.* 2014. Nature Climate Change. Increasing frequency of extreme El Niño events due to greenhouse warming. DOI: 10.1038/NCLIMATE2100

²⁹ CSIRO, Australian Bureau of Meteorology and SPREP, 2015. Climate in the Pacific: A regional summary of new science and management tools

³⁰ McGree, S. *et al.* 2019. Journal of Climate. Recent Changes in Mean and Extreme Temperature and Precipitation in the Western Pacific Islands

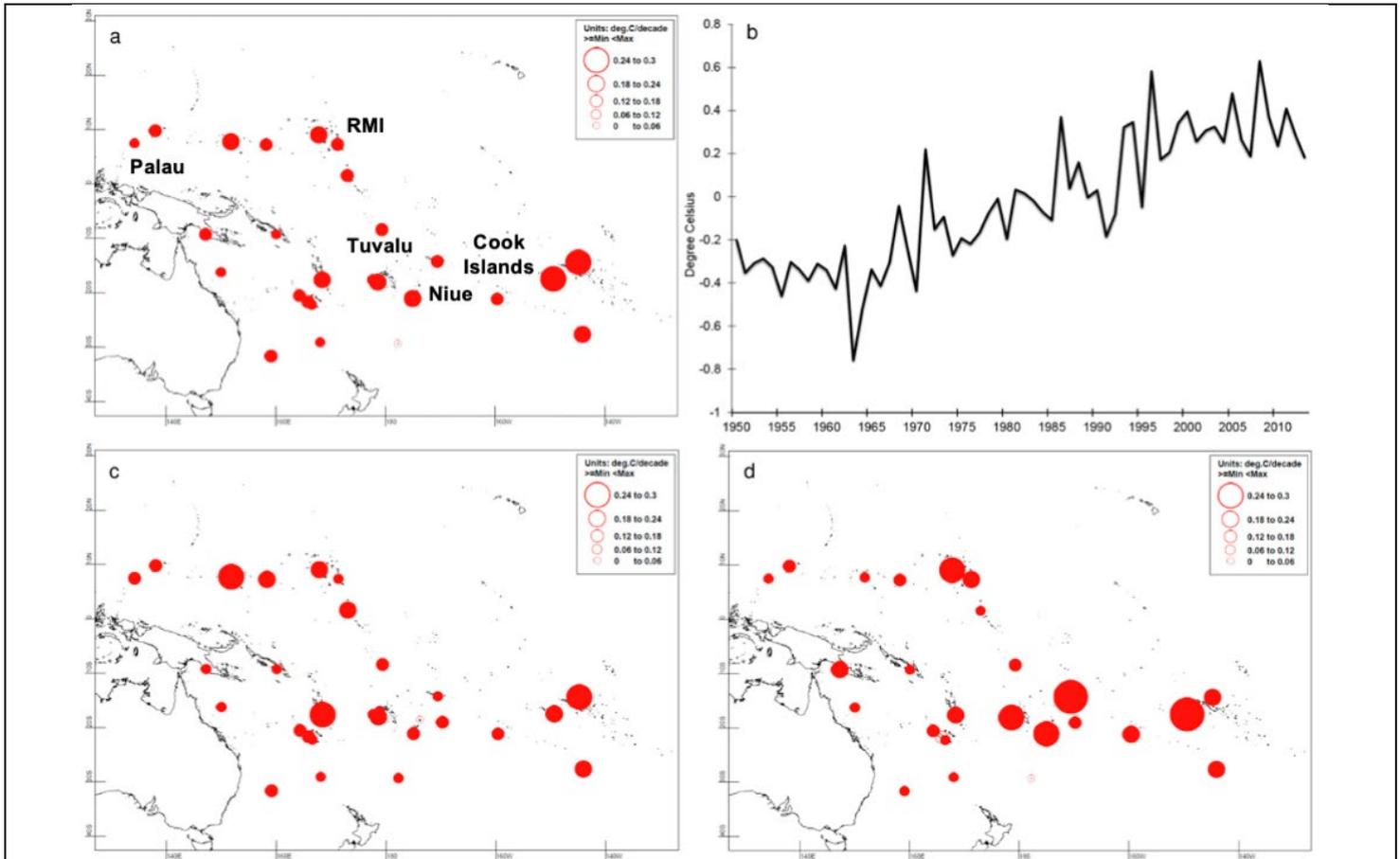


Figure 2. Trends in annual temperature over 1951 – 2015 for (a) mean temperature, (c) maximum temperature and (d) minimum temperature, along with (b) regional mean temperature anomalies relative to the 1971 – 2000 climatology. Solid circles represent trends significant at the 5% level. The size of the circle is proportional to the magnitude of the trend. (Source: McGree *et al.*, 2019 – adapted with the approximate locations of the Programme countries)

The annual number of warm nights and warm days has increased (2.28 % per decade and 2.07 % per decade, respectively) and the number of cold nights and cold days has decreased (1.76 % per decade and 1.70 % per decade, respectively). McGree *et al.* additionally calculated ET-SCI sector-specific indices for the regional annual warm-spell duration (WSD3) and cold-spell duration (CSD3), which indicated that WSD3 increased by 3.97 days per decade and CSD3 decreased by 3.20 days per decade.³¹

³¹ McGree, S. *et al.* 2019. Journal of Climate. Recent Changes in Mean and Extreme Temperature and Precipitation in the Western Pacific Islands

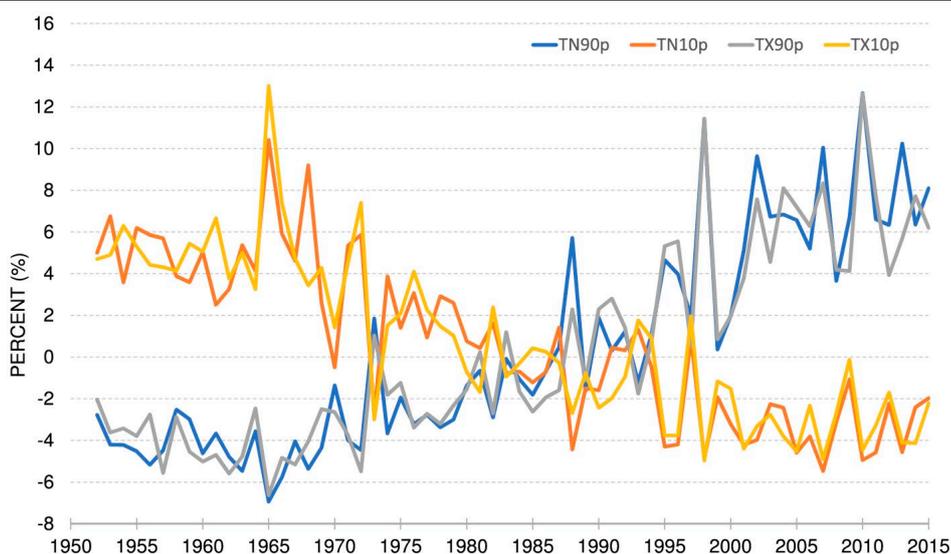


Figure 3. Regional frequency of warm nights (TN90p), cold nights (TN10p), warm days (TX90p) and cool days (TX10p) anomalies relative to the period 1971 – 2000. (Source: McGree et al., 2019)

The trends in annual extreme temperature indices calculated for each Programme country are summarised in Table 2. The indices are calculated using homogenised data for the period 1951 – 2015.³² Additional analyses and figures are provided in the Feasibility Study (Annex 2).

Extreme Temperature Indices	Cook Islands	Niue	Palau	Marshall Islands	Tuvalu
Highest maximum temperature, TXx (°C / decade)	0.28	0.10*	0.13	0.19	0.05*
Highest minimum temperature, TNx (°C / decade)	0.20	0.15*	0.10	0.14	0.18*
Lowest maximum temperature, TXn (°C / decade)	0.10	0.23*	0.20	0.06	0.12
Lowest minimum temperature, TNn (°C / decade)	0.30	0.07*	0.00	0.17	0.14*
User-defined hot days > 30 °C (days / decade)	6.28	4.72*	3.30	13.04	8.12*
User-defined hot nights > 26 °C (days / decade)	0.94	0.06	5.67	26.51	14.13
Cool days, TX10p (days / decade)	-1.15	-6.54*	-0.82	-0.89	-5.20*
Cool nights, TN10p (days / decade)	-1.97	-2.88*	-0.94	-2.26	-9.38*
Warm days, TX90p (days / decade)	1.76	4.03*	1.58	0.99	18.37*
Warm nights, TN90p (days / decade)	1.69	7.99*	4.07	5.24	8.53*
Warm spell duration, WSDI (days / decade)	0.00	5.49*	0.00	0.00	4.11*
Cold spell duration, CSDI	0.00	0.00	0.00	0.00	0.00

(days / decade)					
Cooling degree days, base 18 °C, CDDcoldn	25.27	-	38.96	56.78	-

Table 2. Linear trends (via Kendall's rank correlation tau method) in annual extreme temperature indices for the five Programme countries in the period 1951 - 2015. The trend values for each variable are shaded in pink (warming effect), with the largest values shaded darker. Bold italics indicate trends that are significant at the 5% level. Asterisks () indicate least squares trend. (Source: Pacific Climate Change Data Portal)*

The trends in annual extreme temperature indices, apart from the diurnal temperature range, all indicate a warming climate. Focussing on the statistically significant trends for the five Programme countries, the most noteworthy are summarised below:

- **Increase in daily maximum temperatures (TXx and/or TXn) in the Cook Islands, Palau and Tuvalu**, with the greatest increases (per decade) observed in Cook Islands (0.28 °C increase in highest maximum temperature) and Palau (0.20 °C increase in lowest maximum);
- **Increase in daily minimum temperatures (TNx and/or TNn) in the Cook Islands, Palau and Marshall Islands**, with the greatest increases (per decade) observed in Cook Islands (0.30 °C increase in lowest minimum temperature, and a 0.20 °C increase in highest minimum temperature);
- **Increase in the number of days greater than or equal to 30C in the Cook Islands, Palau and Marshall Islands**; with the greatest increase observed in the Marshall Islands – 13 days per decade.
- **Decrease in the number of cool days (maximum temperature < 10th percentile) in Cook Islands and Palau**;
- **Decrease in the number of cool nights (minimum temperature < 10th percentile) in the Marshall Islands, Cook Islands and Palau**;
- **Increase in the number of warm days (maximum temperature > 90th percentile) in the Marshall Islands, Cook Islands and Palau**;
- **Increase in the number of warm nights (minimum temperature > 90th percentile) in the Marshall Islands, Cook Islands and Palau**;
- **Increase in the number of cooling degree-days (mean temperature – 18) in the Marshall Islands, Cook Islands and Palau**; with the largest trends (per decade) being observed in the Marshall Islands (57 days) and Palau (39 days).

Rainfall

Annual rainfall trend analyses for 1981 – 2011 (Figure 4) indicate wetter conditions in the regions covering the Southern Cook Islands and Niue. In the North Pacific, it has become wetter west of 160°E (Palau). Northeast of the South Pacific Convergence Zone and in the central tropical Pacific east of about 160°E it has become drier (RMI and Tuvalu).³³

³² Australian Bureau of Meteorology, 2020. About Pacific Climate Change Data. Available at: <http://www.bom.gov.au/climate/pccsp/about-pi-climate-data.shtml>

³³ Australian Bureau of Meteorology, 2013. International Journal of Climatology. An updated assessment of trends and variability in total and extreme rainfall in the western Pacific

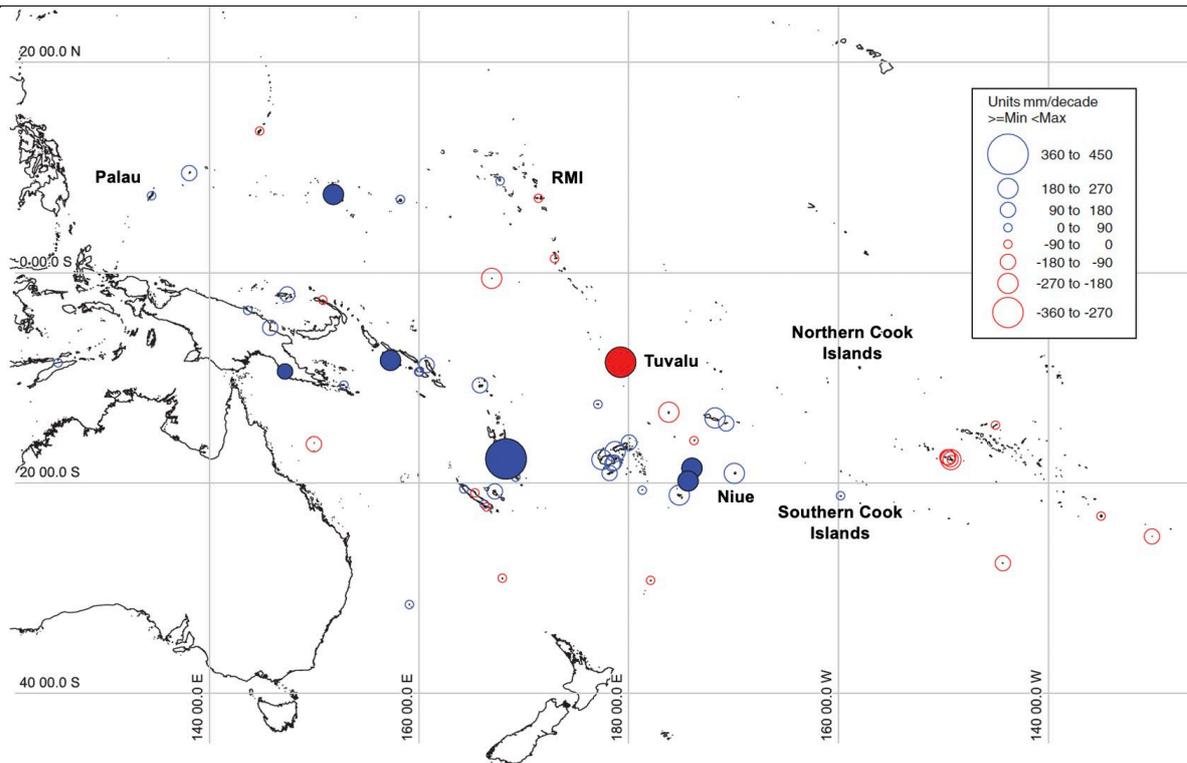


Figure 4. Trends in annual rainfall from 1981 – 2011. Blue circles represent positive trends and red circles represent negative trends. Solid circles represent trends significant at the 5% level. (Source: Australian Bureau of Meteorology)³⁴

The trends in annual extreme precipitation indices calculated for each Programme country are summarised in Table 3. The indices are calculated using homogenised data for the period 1951 – 2015.³⁵ Additional analyses and figures for the indices are provided in the Feasibility Study (Annex 2).

Extreme Precipitation Indices	Southern Cook Islands	Northern Cook Islands	Niue	Palau	Marshall Islands	Tuvalu
Max 1-day rainfall, Rx1day (mm / decade)	1.77	3.75	0.00	-3.07	-1.01	-0.82
Max 5-day rainfall, Rx5days (mm / decade)	-0.29	13.61	-0.71	-6.42	-1.89	-7.02
Simple daily intensity, SDII (mm / decade)	-0.11	-0.56	-0.01	-0.08	-0.22	0.05
Rain days ≥ 10 mm, R10 (days / decade)	-1.32	1.18	0.28	-0.77	-1.03	-1.52
Rain days ≥ 20 mm, R20 (days / decade)	-0.76	1.34	0.73	0.00	-1.29	-0.57
Consecutive dry days, CDD (days / decade)	0.36	-0.03	0.00	0.20	-0.45	0.16
Consecutive wet days, CWD	-0.25	0.30	-0.19	0.00	0.00	-0.15
Very wet days rainfall, R95p (mm / decade)	-28.08	46.28	-13.22	-27.57	-56.33	-21.82

³⁴ Australian Bureau of Meteorology, 2013. International Journal of Climatology. An updated assessment of trends and variability in total and extreme rainfall in the western Pacific. Adapted from Figure 3

³⁵ Australian Bureau of Meteorology, 2020. About Pacific Climate Change Data. Available at: <http://www.bom.gov.au/climate/pccsp/about-pi-climate-data.shtml>

Extremely wet day rainfall, R99p (mm / decade)	0.00	24.62	-4.37	-10.86	-0.42	-2.83
Annual total wet day rainfall, PRCPTOT (mm / decade)	-55.56	86.95	16.16	-27.27	-90.34	-58.24

Table 3. Linear trends (via Kendall's rank correlation Tau method) in annual extreme precipitation indices for the five Programme countries in the period 1951 – 2017. The trend values for each variable are shaded in blue (wetter) and yellow (drier), with the largest values shaded darker. Bold italics indicate trends that are significant at the 5% level. (Source: Pacific Climate Change Data Portal)

Although the vast majority of trends in extreme precipitation indices for the five Programme countries are **not** statistically significant at the 5% level, the general impression is one of drying climates at these tropical island locations. Penrhyn (Northern Cook Islands) is the exception, as several of its indices indicate increasing extreme rainfall consistent with a trend towards a wetter central Pacific

The only statistically significant trends were observed at **Majuro, Marshall Islands**, as summarised below:

- **Decrease in the number of consecutive dry days**, possibly indicating an increase in the occurrence of days with small rainfall totals;
- **Decrease in the total rainfall derived from very wet days (daily rainfall > 95th percentile)**, amounting to 56 mm per decade;
- **Decrease in the total wet day rainfall (daily rain ≥ 1 mm)**, of around 90 mm per decade.

The above analyses suggest that the Southern Cook Islands (data obtained from Rarotonga) is experiencing less frequent but more intense rainfall; Niue is experiencing more frequent but less intense rainfall; Palau and RMI are experiencing less frequent and less intense rainfall; and Tuvalu appears to generally be experiencing less frequent and less intense rainfall but trends are inconsistent.

A summary of trends in annual and seasonal extreme temperature and rainfall for the five Programme countries is provided below. Additional data and analyses are provided in the Feasibility Study (Annex 2).

Country	Annual Temperature	Annual Rainfall	Seasonal Temperature	Seasonal Rainfall
Southern Cook Islands	Most trends are statistically significant at the 5% level. Nearly all indicate increasing warm extremes and decreasing cool extremes. Most noteworthy: 0.28 °C per decade increase in TXx.	No significant trend in any of the indices. Most indices are smaller in magnitude than those of the Northern Cook Islands and show a tendency towards less extreme rainfall events. Most noteworthy: 28.08 mm per decade decrease in R95p.	Majority of trends are statistically significant, especially in MAM and SON. Nearly all indicate increasing warm extremes and decreasing cool extremes. Most noteworthy: 0.26 °C per decade increase in TXx during MAM and JJA.	Statistically significant increase in CDD during DJF. Drying generally indicated by most indices. Largest: 4.34 mm per decade decrease in Rx5day for MAM.
Northern Cook Islands	N/A	No significant trend in any of the indices. Most indices show a tendency towards more extreme rainfall events. Most noteworthy: 86.95 mm per decade increase in PRCPTOT.	N/A	No significant trend in any of the indices. Small increases in Rx1day and Rx5days in DJF and SON balanced by small decreases in MAM and JJA. Largest: 0.85 mm per decade increase in Rx5day for DJF.
Niue	Statistical significance not available. Nearly all trends (least squares) indicate increasing warm extremes and decreasing cool extremes. Most	No significant trend in any of the indices. A mix of positive and negative values, with a slight majority indicating less extreme rainfall events.	Majority of trends are statistically significant, especially in SON. Nearly all indicate increasing warm extremes and decreasing cool extremes.	No significant trend in any of the indices. A mix of results – some drier, some wetter. Largest: 6.57 mm per decade decrease in Rx5day for SON.

	noteworthy: 8 days per decade increase in TN90p.	Overall, the weakest values of any of the countries. Most noteworthy: 13.22 mm per decade decrease in R95p.	Most noteworthy: 6 days per decade increase in TXge30 during SON.	
Palau	Most trends are statistically significant at the 5% level. Nearly all indicate increasing warm extremes and decreasing cool extremes. Most noteworthy: 39 days per decade increase in CDDcoldn.	No significant trend in any of the indices. Most indices show a tendency towards less extreme rainfall events. Most noteworthy: 27.57 mm per decade decrease in R95p.	Majority of trends are statistically significant, especially in SON. Nearly all indicate increasing warm extremes and decreasing cool extremes. Most noteworthy: 0.21 °C per decade increase in TXx during SON.	No significant trend in any of the indices. Drying generally indicated by most indices. Largest: 4.21 mm per decade decrease in Rx5day for MAM.
Marshall Islands	Most trends are statistically significant at the 5% level. Nearly all indicate increasing warm extremes and decreasing cool extremes. Most noteworthy: 13 days per decade increase in TXge30.	Significant downward trend in CDD, R95p, PRCPTOT. Nearly all indices show a tendency towards less extreme rainfall events. Most noteworthy: 90.34 mm per decade decrease in PRCPTOT.	Majority of trends are statistically significant, especially in SON. All indicate increasing warm extremes and decreasing cool extremes. Most noteworthy: 0.20 °C per decade increase in TNx during DJF.	Statistically significant decrease in CWD during MAM. Drying generally indicated by a majority of indices. Largest: 3.95 mm per decade decrease in Rx5day for JJA.
Tuvalu	Statistical significance not available. All trends (least squares) indicate increasing warm extremes and decreasing cool extremes. Most noteworthy: 18 days per decade increase in TX90p.	No significant trend in any of the indices. Most indices show a tendency towards less extreme rainfall events. Most noteworthy: 58.24 mm per decade decrease in PRCPTOT.	Majority of trends are statistically significant, especially in SON. All indicate increasing warm extremes and decreasing cool extremes. Most noteworthy: 0.27 °C per decade increase in TXx during JJA.	Statistically significant increase in CDD during DJF. Drying generally indicated by a majority of indices. Largest: 4.68 mm per decade increase in Rx5day for MAM.

Table 4. Summary of linear trends (via Kendall's rank correlation Tau method) in extreme temperature and rainfall indices, both annually and seasonally, at Rarotonga (Southern Cook Is.), Penrhyn (Northern Cook Is.), Alofi-Hanan Airport (Niue), Koror (Palau), Majuro (Marshall Is.) and Funafuti (Tuvalu), in the period 1951 – 2015.

Sea level

Sea level varies spatially across the Pacific by up to one metre: along the equator, the sea level in the west is about 0.5 m higher than the sea level in the east. Year-to-year sea level can vary by more than 20 cm, which is mainly due to ENSO. During El Niño events, weakened trade winds reduce sea level in the western tropical Pacific and increase sea level in the east. During La Niña, strengthened trade winds cause higher than normal sea levels in the west, and lower than normal levels in the east. Pacific islands within about 10° of the equator – including the northern Cook Islands, Palau, southern RMI and Tuvalu – are most significantly affected by sea-level variations related to ENSO events.

The IPCC Fifth Assessment Report notes that “Rates of sea level rise over broad regions can be several times larger or smaller than the global mean sea level rise for periods of several decades, due to fluctuations in ocean circulation. Since 1993, the regional rates for the Western Pacific are up to three times larger than the global mean, while those for much of the Eastern Pacific are near zero or negative.”³⁶

The regional distribution of sea level rise is important because it is the regional or local sea level change and local land movement that most directly affects populations and the environment. Impacts to populations from extreme change in sea level can consist of the effect of surges, swell, high tides and wind waves. From 1993 to 2009, both the altimeter and in-situ data indicate a higher than global average rate of rise in the western Pacific

³⁶ IPCC, 2013. Climate Change 2013: The Physical Science Basis

but, because of the strong influence of ENSO and decadal variability on sea level in the region, this higher rate of rise may not necessarily be representative of a longer time span.³⁷

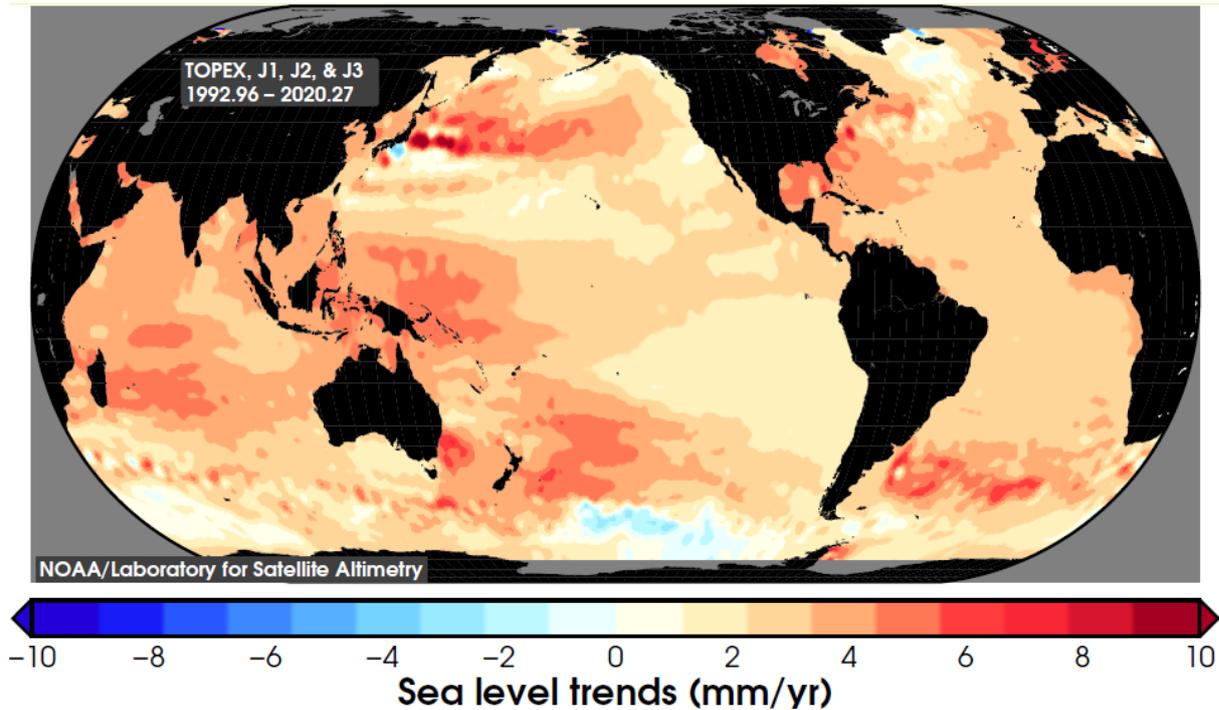


Figure 5. Estimates of sea-level rise based on measurements from satellite radar altimeters. The local trends were estimated using data from TOPEX/Poseidon (T/P), Jason-1, Jason-2 and Jason-3, which have monitored the same ground track since 1992. (Source: NOAA)³⁸

Over a longer time period, Church *et al.* studied the tide gauge records in the tropical Pacific region and found that the average rate of relative sea-level rise (relative to land) – and corrected for glacial isostatic adjustment and atmospheric pressure effects – was 2.0 mm/year between 1950 and 2001. The best estimate of relative sea-level rise was obtained for Funafuti (Tuvalu) at 2 ± 1 mm/year. For Majuro (RMI), the relative reconstructed trend was 2.3 mm/year.³⁹

Sea surface temperature

Sea-surface temperatures in the tropical Pacific have generally warmed since 1950, which has been partly attributed to anthropogenic global warming. However, temperature variations associated with Interdecadal Pacific Oscillation (IPO) / Pacific Decadal Oscillation (PDO) also substantially influence the background trend.⁴⁰ The West Pacific Warm Pool has considerably expanded over recent decades, with the area of water with temperatures exceeding 29.5 °C having increased by 400 – 600 %.⁴¹ The extent to which shifts in IPO/PDO indices are predictable on decadal timescales is the subject of ongoing research.

³⁷ Australian Bureau of Meteorology and CSIRO, 2011. Climate Change in the Pacific: Scientific Assessment and New Research, Volume 1: Regional

³⁸ NOAA, 2020. Sea level rise maps. Available at: https://www.star.nesdis.noaa.gov/socd/lisa/SeaLevelRise/LSA_SLR_maps.php

³⁹ Church, J.A. *et al.* 2006. Global and Planetary Change. Sea-level rise at tropical Pacific and Indian Ocean islands

⁴⁰ Australian Bureau of Meteorology and CSIRO, 2011. Climate Change in the Pacific: Scientific Assessment and New Research, Volume 1: Regional

⁴¹ Cravatte, S. *et al.* 2009. Climate Dynamics. Observed freshening and warming of the Western Pacific Warm Pool

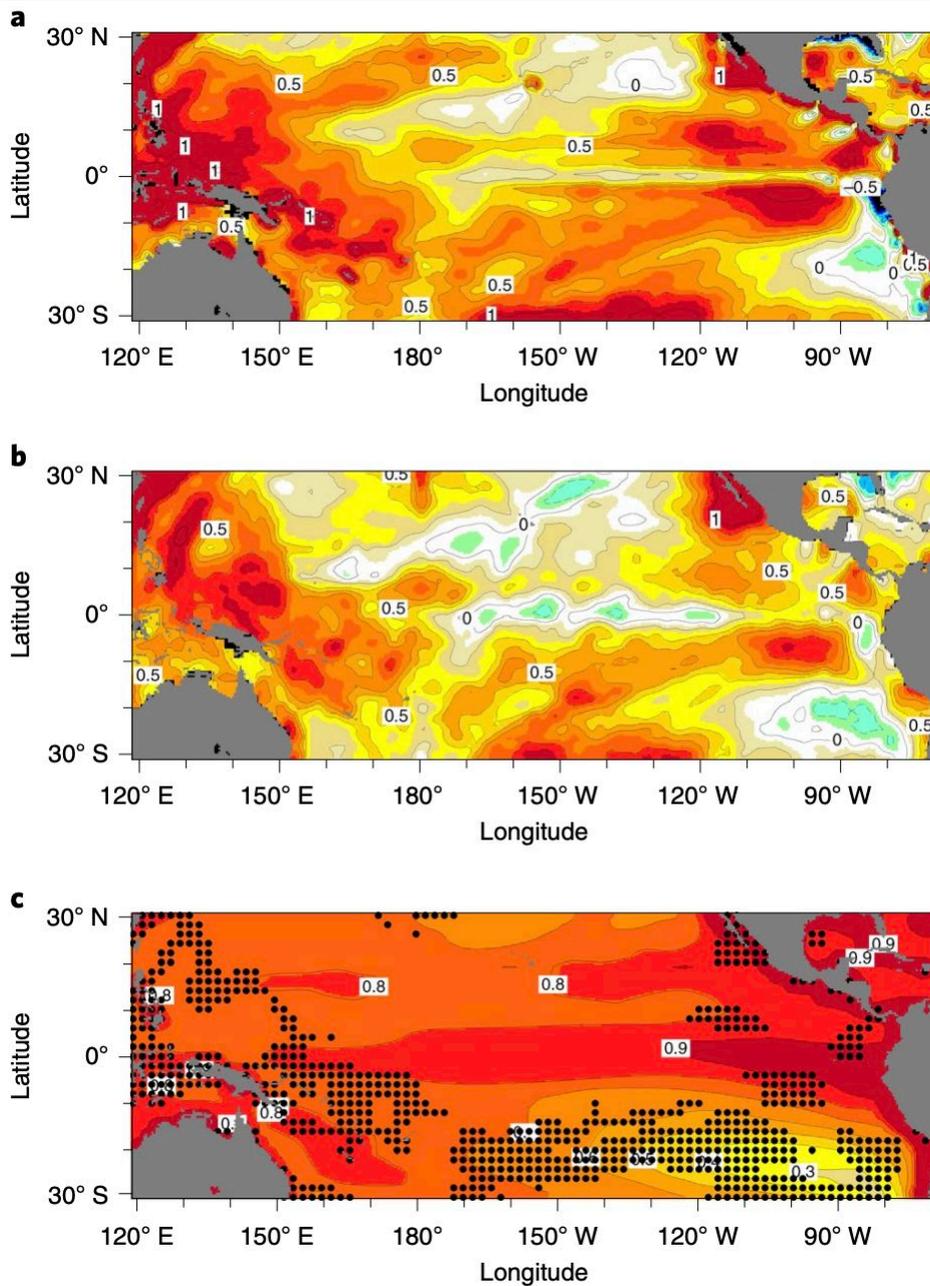


Figure 6. Observed changes in SST (K) from 1958 – 2017 according to ECMWF/ORAS4 reanalysis (a); HadIIST analysis (b); and the multi-model mean of 40 historical and RCP8.5 CMIP5 models. (Source: Seager et al. 2019)⁴²

Ocean acidification

Ocean acidification is measured based on the ocean aragonite saturation state. Aragonite is the most common form of calcium carbonate found in tropical reefs and is used to build marine shells and skeletons – including for coral. Increasing ocean acidification leads to decreasing aragonite saturation. The best conditions for coral to grow is at an aragonite saturation state above 4; below 3, the conditions to grow coral are critically limited.⁴³

⁴² Seager, R. et al. 2019. Nature Climate Change. Strengthening tropical Pacific zonal sea surface temperature gradient consistent with rising greenhouse gases

⁴³ CSIRO, Australian Bureau of Meteorology and SPREP, 2015. Climate in the Pacific: A regional summary of new science and management tools

The IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (2019) reported that, since the start of the industrial era (around 1750), oceanic uptake of carbon dioxide has resulted in acidification of the ocean. The pH of ocean surface water has decreased by 0.1 (*high confidence*), corresponding to a 26% increase in acidity.⁴⁴ Over this period, aragonite saturation has decreased from 4.2 to 3.8 across the Pacific island region.⁴⁵

Based on data collected in the Pacific region as part of the Joint Global Ocean Flux Study / World Ocean Circulation Experiment CO₂ survey, estimates have been made of ocean aragonite saturation state. In the pre-industrial era, “saturation state values were above 4 throughout most of the sub-tropical and tropical Pacific Island region”. By the mid 1990s, “the uptake of anthropogenic CO₂ had resulted in a widespread decline in the aragonite saturation state, with values slightly above 4 only found in the region of the South Equatorial Current and in the western Pacific”. Ocean aragonite saturation state has continued to decline, with only the surface waters of the South Equatorial Current – around Cook Islands, Niue and Tuvalu – with aragonite saturation states at or slightly above values of 4.⁴⁶

High impact events

Tropical cyclones

The Programme countries are situated in the area of the Pacific regularly subject to tropical storms.⁴⁷ Tropical cyclones are the most significant extreme events in much of the Pacific, and often cause heavy rain, strong winds, storm surges and large waves.⁴⁸ ENSO plays a significant role in influencing tropical cyclone risk throughout the tropical Pacific. During the La Niña phase, cyclones occur with greater frequency in the western Pacific, close to Australia, while the region of greatest cyclone occurrence is found further east during the El Niño phase.⁴⁹

There are no significant trends in the overall number of tropical cyclones, or in the intensity of tropical cyclones, in the South Pacific Ocean over the period 1981 – 2007. However, during the El Niño phase, cyclones occurred with greater frequency in Cook Islands, RMI and Tuvalu.⁵⁰ An updated analysis through to the 2010–11 season showed a “slight decrease in the total number of cyclones, with little change in the numbers of the most intense”; however, the record is too short to determine if the decrease is the result of a trend or due to natural variability. It should be noted that “the absence of overall intensity trends for the south-west Pacific does not discount the possibility of local trends”.⁵¹

Between 1820 and 2006, the Cook Islands witnessed 143 tropical cyclones;⁵² between 1945 and 2013, Palau experienced 68 typhoons;⁵³ and between 1969 and 2010, 63 tropical cyclones passed within 400 km of Niue.⁵⁴ The Marshall Islands are less affected by tropical cyclones, but are subject to major storms once every 4-7 years, with the northern islands being hit more frequently than the southern islands.⁵⁵ Tuvalu has been hit by 13 major typhoons since 1972; one of the most recent was the 2015 Tropical Cyclone Pam, which reached

⁴⁴ IPCC, 2019. *Special Report on the Ocean and Cryosphere in a Changing Climate*.

⁴⁵ CSIRO, Australian Bureau of Meteorology and SPREP, 2015. *Climate in the Pacific: A regional summary of new science and management tools*

⁴⁶ Australian Bureau of Meteorology and CSIRO, 2011. *Climate Change in the Pacific: Scientific Assessment and New Research, Volume 1: Regional*

⁴⁷ <https://earthobservatory.nasa.gov/images/7079/historic-tropical-cyclone-tracks>

⁴⁸ CSIRO, Australian Bureau of Meteorology and SPREP, 2015. *Climate in the Pacific: A regional summary of new science and management tools*

⁴⁹ Australian Bureau of Meteorology and CSIRO, 2011, *Climate Change in the Pacific: Scientific Assessment and New Research, Volume 1: Regional*.

⁵⁰ Australian Bureau of Meteorology and CSIRO, 2014. *Climate Variability, Extremes and Change in the Western Tropical Pacific: New Science and Updated Country Reports*

⁵¹ CSIRO, Australian Bureau of Meteorology and SPREP, 2015. *Climate in the Pacific: A regional summary of new science and management tools*

⁵² [https://bioone.org/journals/Pacific-Science/volume-62/issue-4/1534-6188\(2008\)62\[443:HTCAAJ\]2.0.CO;2/Historical-Tropical-Cyclone-Activity-and-Impacts-in-the-Cook-Islands1/10.2984/1534-6188\(2008\)62\[443:HTCAAJ\]2.0.CO;2.full](https://bioone.org/journals/Pacific-Science/volume-62/issue-4/1534-6188(2008)62[443:HTCAAJ]2.0.CO;2/Historical-Tropical-Cyclone-Activity-and-Impacts-in-the-Cook-Islands1/10.2984/1534-6188(2008)62[443:HTCAAJ]2.0.CO;2.full)

⁵³ <https://coralreefpalau.org/wp-content/uploads/2017/05/CRRF-Palau-Typhoon-History-2014-1.pdf>

⁵⁴ http://world.350.org/pacific/files/2014/01/12_PCCSP_Niue_8pp.pdf

⁵⁵ <https://www.pacificrisa.org/places/republic-of-the-marshall-islands/>

category 5: 45% of Tuvalu's population was displaced⁵⁶ and the cost of losses and damage equated to more than 25% of GDP.⁵⁷ The table below provides details of historical severe tropical cyclone events that reached Category 4 or 5 intensity on the Australian tropical cyclone intensity scale and affected one or more of the five Programme countries. These data show that Cook Islands appears to be most affected by Category 4 or 5 severe tropical cyclones, followed by Niue and Tuvalu.

Name	Dates as a Category 4 / 5	Duration	Sustained wind speeds	Land areas affected	Damage (USD)	Deaths
Val	4 – 17 December, 1991	14 days	165 km/h (105 mph)	Tuvalu, Samoan Islands	330 million	16
Joni	3 – 13 December, 1992	11 days	165 km/h (105 mph)	Tuvalu, Fiji	1.6 million	1
Gavin	3 – 12 March, 1997	10 days	185 km/h (115 mph)	Tuvalu, Fiji, Wallis and Futuna	18.3 million	18
Dovi	8 – 9 February, 2003	18 hours	205 km/h (125 mph)	Niue, Cook Islands	Minimal	None
Heta	5 – 6 January, 2004	1 day, 12 hours	215 km/h (130 mph)	Samoan Islands, Niue, Tonga, Wallis and Futuna	225 million	3
Meena	6 February, 2005	18 hours	215 km/h (130 mph)	Cook Islands	20 million	None
Olaf	6 – 7 February, 2005	12 hours	215 km/h (130 mph)	Samoan Islands, Cook Islands	10 million	None
Nancy	10 – 17 February, 2005	8 days	175 km/h (110 mph)	Cook Islands	Severe	None
Percy	1 – 3 March, 2005	1 day, 12 hours	230 km/h (145 mph)	Tokelau, Samoan Islands, Cook Islands	25 million	None
Oli	29 January – 7 February, 2010	10 days	185 km/h (115 mph)	Cook Islands, French Polynesia	70 million	1
Pam	12 – 14 March, 2015	2 days, 12 hours	250 km/h (155 mph)	Fiji, Kiribati, Solomon Islands, Tuvalu, Vanuatu, New Caledonia, New Zealand	360 million	16
Ula	26 December, 2015 – 12 January, 2016	18 days	185 km/h (115 mph)	Tuvalu, Samoan Islands, Tonga, Fiji, Vanuatu, New Caledonia	Unknown	1
Winston	18 – 21 February, 2016	2 days, 18 hours	280 km/h (175 mph)	Vanuatu, Fiji, Tonga, Niue	1.4 billion	44
Gita	13 – 14 February, 2018	11 hours	205 km/h (125 mph)	Solomon Islands, Vanuatu, Fiji, Niue, Wallis and Futuna, Samoan Islands, Tonga	221 million	2

⁵⁶ https://en.wikipedia.org/wiki/Cyclone_Pam#cite_note-rnzi-52

⁵⁷ <https://dfat.gov.au/about-us/publications/Pages/australias-commitment-to-climate-change-action-in-tuvalu.aspx>

Table 5. Category 4 (unshaded) and 5 (pink) South Pacific severe tropical cyclones that affected land areas of the five Programme countries in the past 30 years. (Source: Wikipedia^{58, 59})

Drought

Drought is a recurrent extreme climate event in the Pacific islands; and “there is a perception among Pacific island residents that the frequency and magnitude of drought has increased, particularly in the last couple of decades”. McGree *et al.* corroborated this perception in reporting that the drought frequency, duration and magnitude for the Pacific islands were greater during 1981 – 2010 than during 1951 – 1980. The trend is non-linear; and Interdecadal Pacific Oscillation (IPO) and ENSO were the predominant drivers of drought over the period 1951 – 2010. A strong lagged relationship in the year after the El Niño onset was found for locations southwest of the SPCZ and north of the ITCZ, which includes all five Programme countries.⁶⁰

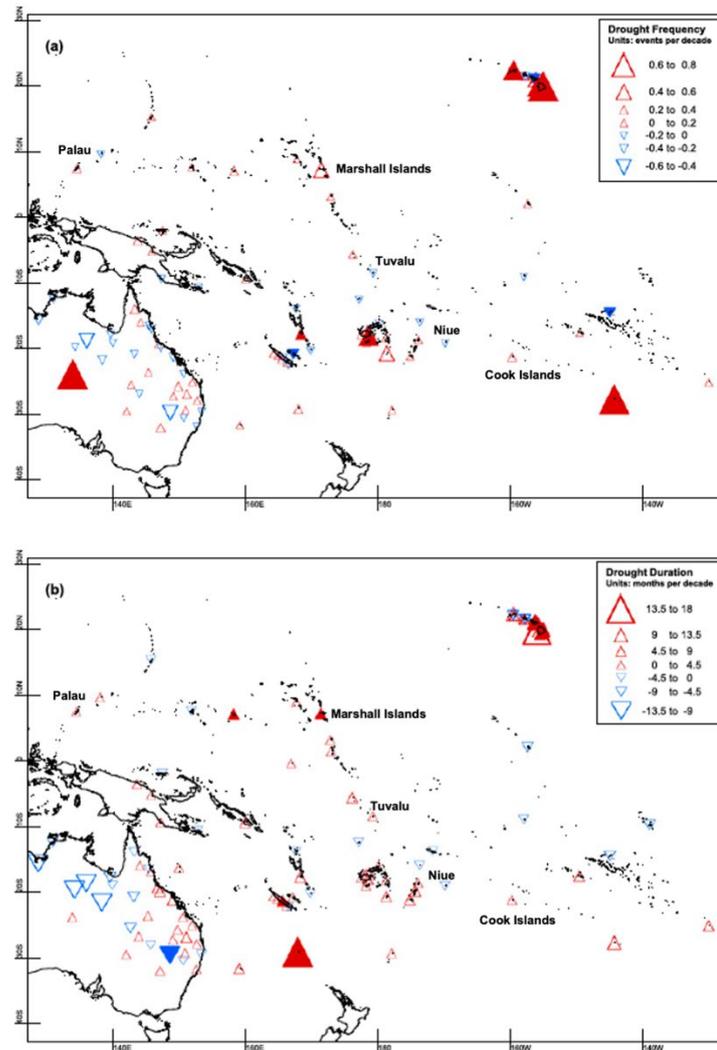


Figure 7. Trends in drought frequency (a) and total drought duration (b) for the period 1951 – 2010. Filled triangles represent trends significant at the 95% level. (Source: McGree *et al.*)

⁵⁸ Wikipedia, 2020. List of Category 4 South Pacific severe tropical cyclones. Available at: https://en.wikipedia.org/wiki/List_of_Category_4_South_Pacific_severe_tropical_cyclones

⁵⁹ Wikipedia, 2020. List of Category 5 South Pacific severe tropical cyclones. Available at: https://en.wikipedia.org/wiki/List_of_Category_5_South_Pacific_severe_tropical_cyclones

⁶⁰ McGree, S. *et al.* 2016. Journal of Climate. Trends and Variability in Droughts in the Pacific Islands and Northeast Australia

Climate-related losses and damage

Damage costs of climate change are significant for SIDS in general and for the Programme countries in particular. The Cook Islands, Niue, Palau and RMI are in the top 20 countries experiencing the highest average annual losses from natural disasters as a percentage of GDP.⁶¹ The main recorded contributor to deaths and financial losses in the Pacific region is tropical cyclones.⁶² However, it should be noted that data on both cyclones and other causes of death and damage are patchy and incomplete. Climate studies show that predicted higher ocean temperatures will lead to more intense tropical cyclones, with increased wind speed and rainfall.^{63,64}

All five Programme countries have assets, infrastructure and crops at risk of being damaged from natural disasters with total replacement costs of over USD\$7.6 billion.⁶⁵ Buildings at risk contribute the majority of this total (86.5%),⁶⁶ infrastructure such as major ports, airports, power plants, bridges and roads (13.2%) and cash crops (0.4%).⁶⁷ For example, in Palau, most residential dwellings, tourist accommodation and supporting infrastructure such as power, telecommunications, sewers and water lines are within 30 m of the high water line and are therefore particularly vulnerable to climate change impacts.⁶⁸ In Tuvalu, the King Tides in 2013 resulted in substantial damage to the government building, airport and utilities infrastructure. In addition, the lagoon area of Funafuti is particularly threatened from tropical cyclones and storm surges and it is in Funafuti that most of Tuvalu's critical infrastructure is located.⁶⁹

Expected average annual losses (AAL) per capita (USD\$2019) for tropical cyclones alone in the five Programme countries are estimated at: 537 (Cook Islands), 2122 (Niue), 208 (Palau), 119 (RMI) and 336 (Tuvalu).⁷⁰ Some historical data is available on the deaths and financial damage caused by climate-related disasters in the Pacific region starting from 1831,⁷¹ although it most likely underestimates deaths and financial losses, especially in earlier years. Estimated deaths and losses caused by climate-related hazards provided on the UNDRR DesInventar platform are summarised in the table below, with the caveat that the data has significant gaps. For example, few countries quantify or record deaths and subsistence crop losses caused by drought or its long-term impacts on human health, despite these being significant.

In 2016, widespread drought across the Pacific region caused states of emergency to be declared in Palau and RMI (and the Federated States of Micronesia). Disruptions to agriculture, tourism and industrial production caused severe economic losses. In Palau, all 21,000 residents were affected and particularly those in remote outer islands where 3-4 % of the population depends entirely on rainwater.⁷² In RMI, the estimated economic impact for the 2016 financial year (FY) was approximately USD 4.9 million, including USD 2.9 million in gross production losses in the agriculture, education and industrial sectors. The agricultural sector was the most severely impacted by the drought and suffered a decline of USD 1.77 million in gross production, which corresponds to a 12% drop from normal production levels. The economic effects were equivalent to 3.4% of GDP for FY 2015.⁷³ Estimated values for economic losses caused by the 2016 drought events were not

⁶¹ World Bank, 2013. Acting on Climate Change & Disaster Risk for the Pacific.

⁶² See Annex 3 – Economic Analysis

⁶³ Kang, N. and Elsner, J.B. 2015. Nature Climate Change. Trade-off between intensity and frequency of global tropical cyclones.

⁶⁴ Patricola, C.M. and Wehner, M.F. 2018. Nature. Anthropogenic influences on major tropical cyclone events.

⁶⁵ See Annex 3 – Economic Analysis

⁶⁶ "Buildings" include residential, commercial, public and industrial properties. See Pacific Catastrophe Risk Assessment and Financing Initiative data and documents. Available from: <http://pcrafi.spc.int>.

⁶⁷ See Annex 3 – Economic Analysis

⁶⁸ UNFCCC, 2013. Palau Second National Communication

⁶⁹ UNFCCC, 2015. Tuvalu Second National Communication

⁷⁰ Pacific Catastrophe Risk Assessment and Financing Initiative adjusted for 2019. <http://pcrafi.spc.int>

⁷¹ DesInventar Data

⁷² EEAS, 2018. PRO-Resilience Action 2016, Palau. Available at: https://eeas.europa.eu/delegations/fiji_de/47210/PRO-Resilience%20Action%202016,%20Palau

⁷³ Republic of the Marshall Islands, 2015. Post Disaster Needs Assessment of the 2015-2016 Drought

quantified. However, at the end of 2016, the EU mobilised € 4.5 million from the European Development Fund (EDF) to support the three worst affected countries to build resilience for future El Niño events.⁷⁴

Country	Deaths caused by Tropical Cyclones	Losses caused by Tropical Cyclones (USD)	Losses caused by Floods (USD)	Losses caused by Drought (USD)	Losses caused by Storm Surges (USD)
Cook Islands	79	174,828,456	50,000	0	0
Marshall Islands	13	322,800,000	2,010,000	0	500,000
Niue	24	62,422,910	0	0	0
Palau	16	15,000,000	0	0	0
Tuvalu	24	117,663,000	0	15,000,000	0

Table 6. Estimated deaths and losses caused by climate-related hazards. (Source: UNDRR DesInventar)

Climate change scenarios and impacts

Climate change impacts already observed include variations in air and ocean temperatures, ocean chemistry, rainfall, wind strength and direction, sea levels and wave climate, and in particular, extremes such as tropical cyclones, droughts, and distant storm swell events.⁷⁵ Over the past several decades, the Pacific region has experienced increases in annual mean temperatures, variability of rainfall patterns, and intensity of rainfall events. Extreme weather events have also increased in frequency and intensity⁷⁶ and most climate change projection models indicate an increase in the proportion of more intense storms by the late 21st century.⁷⁷

The key predicted climate change impacts affecting the five Programme countries are detailed below.⁷⁸

Increasing temperature: The degree of projected warming over the Pacific region is about 70% as large as the magnitude of global average warming for all emissions scenarios due to the fact that the oceans have been warming, and are projected to warm into the future, at a lower rate than land areas.

Annual average air and sea surface temperature are projected to continue to increase for all tropical Pacific countries. By 2050, warming under the very low emissions scenario is projected to plateau at around +0.5 to 1.0 °C but under the very high emissions scenario, warming is projected to be around +1.0 to 2.0 °C. By 2090, the projected warming ranges from: +0.5 to 1.0 °C for the very low emissions scenario to +2.0 to 4.0 °C for the very high emissions scenario. Extreme temperatures that occur once every 20 years on average are projected to increase approximately in line with average temperatures.⁷⁹ Therefore, it is very likely that temperatures, including the frequency and magnitude of extreme high temperatures, will continue to increase through the 21st century.⁸⁰

⁷⁴ European Union External Action, 2017. EU and SPC agreement supports FSM, Marshall Islands and Palau to build resilience to El Niño. Available at: https://eeas.europa.eu/headquarters/headquarters-homepage/30142/eu-and-spc-agreement-supports-fsm-marshall-islands-and-palau-build-resilience-el-ni%C3%B1o_km

⁷⁵ IPCC, 2014. Fifth Assessment Report – AR5 Climate Change 2014: Impacts, Adaptation and Vulnerability

⁷⁶ The Economics of Climate Change in the Pacific, Asian Development Bank 2013

⁷⁷ Government of Australia, PACCSAP Volume 1: Regional, 2011.

⁷⁸ IPCC, 2013. Climate Change 2013: The Physical Science Basis. Chapter 14.

⁷⁸ Government of Australia, 2011, PACCSAP Volume 1: Regional.

⁷⁸ Wu, X. et al. 2015. Environment International. Impact of climate change on human infectious diseases: Empirical evidence and human adaptation.

⁷⁸ United Nations Conference on Trade and Development, 2014. Small island developing States: Challenges in transport and trade logistics. Available from: http://unctad.org/meetings/en/SessionalDocuments/ci_mem7d8_en.pdf

⁷⁸ WHO, 2015. Human health and climate change in Pacific island countries.

⁷⁸ IPCC, 2013. Climate Change 2013: The Physical Science Basis. Chapter 14.

⁷⁸ Government of Australia, 2011, PACCSAP Volume 1: Regional.

⁷⁸ IPCC, 2013. Climate Change 2013: The Physical Science Basis. Chapter 14.

⁷⁸ Government of Australia, 2011, PACCSAP Volume 1: Regional.

⁷⁹ CSIRO, Australian Bureau of Meteorology and SPREP, 2015. Climate in the Pacific: A regional summary of new science and management tools

⁸⁰ IPCC, 2013. Climate Change 2013: The Physical Science Basis

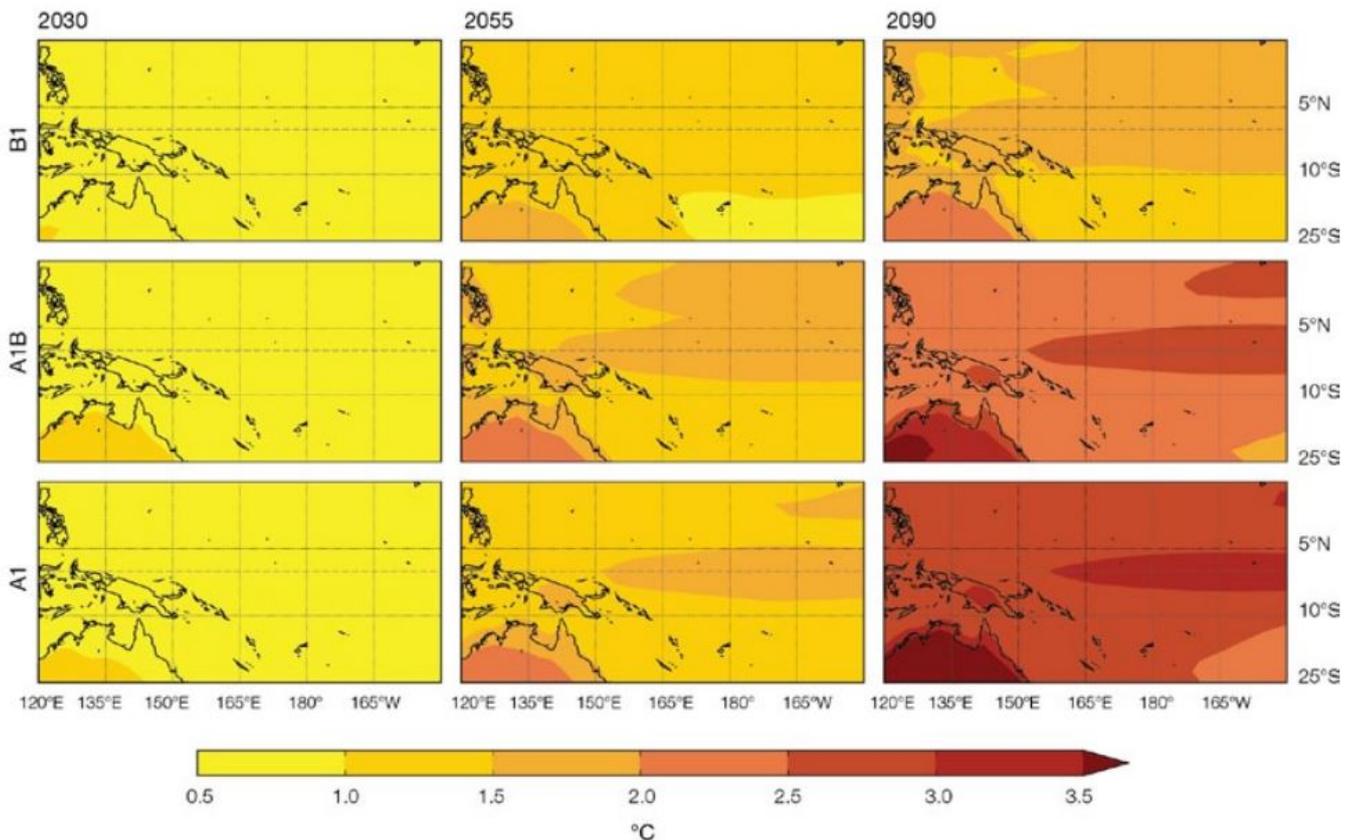


Figure 8. Projected multi-model mean changes in annual mean surface air temperature for 2030, 2055 and 2090, relative to 1990, under the B1 (low), A1B (medium) and A2 (high) emissions scenarios. All models agree on the direction of change in all locations. (Source: Australian BoM and CSIRO, 2011)

Regional temperature projections for all RCP scenarios are provided in the Feasibility Study (Annex 2).

Changing rainfall patterns: Average annual rainfall is projected to increase in most areas of the western tropical Pacific as surface temperatures increase. From November – April, rainfall is projected to increase along the equator, in the north-east near RMI, and in the middle of the SPCZ region (southern Cook Islands, Niue and Tuvalu). For Niue, the seasonal rainfall cycle is projected to intensify – with a decrease in dry season rainfall and an increase in wet season rainfall. Rainfall decreases are projected at the north-eastern edge of the SPCZ near the northern Cook Islands. In the north-western and near-equatorial regions – including Palau and RMI – rainfall during all seasons is projected to increase.^{81, 82}

⁸¹ CSIRO, Australian Bureau of Meteorology and SPREP, 2015. Climate in the Pacific: A regional summary of new science and management tools

⁸² IPCC, 2013. Climate Change 2013: The Physical Science Basis

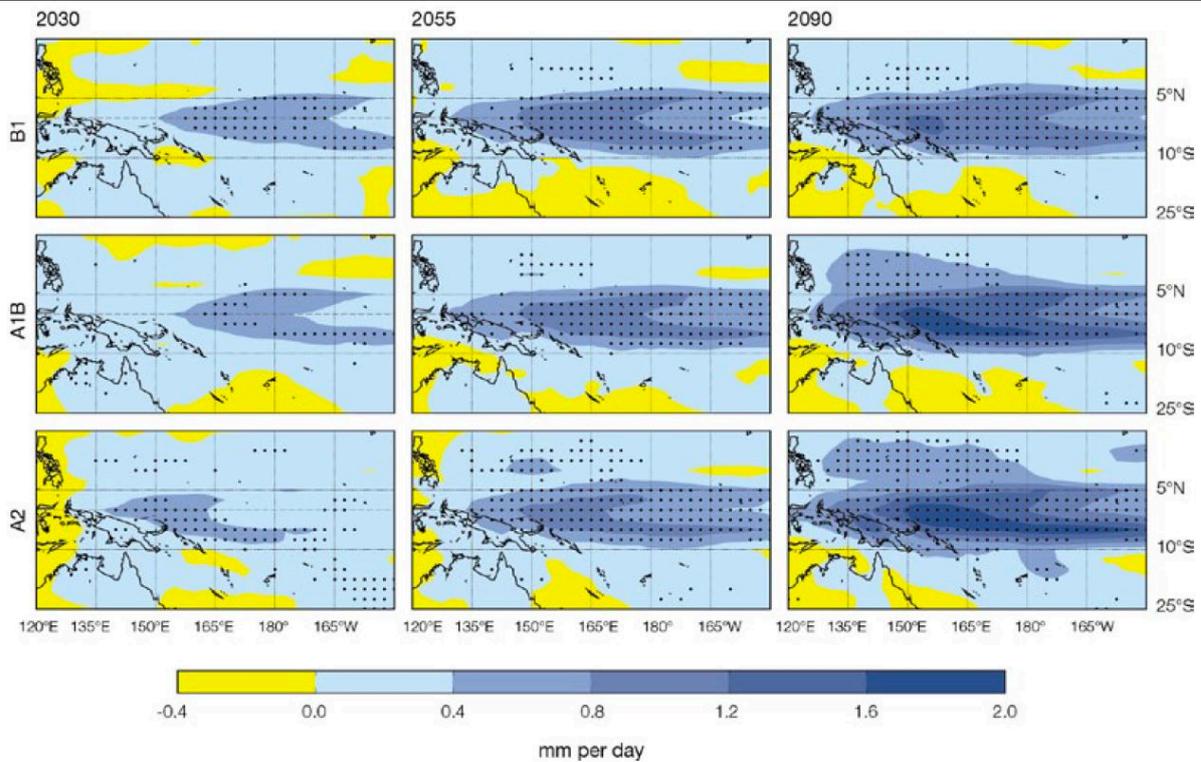


Figure 9. Projected multi-model mean changes in annual rainfall (mm per day) for 2030, 2055 and 2090, relative to 1990, under the B1 (low), A1B (medium) and A2 (high) emissions scenarios. Regions where at least 80% of the models agree on the direction of change are stippled. (Source: Australian BoM and CSIRO, 2011)

Intensification of the ITCZ and SPCZ is *likely* to result in more frequent extreme rainfall days in all Pacific island regions.⁸³ By 2090, under the very low emissions scenario, extreme rainfall events that currently occur once every 20 years on average are projected to occur once every 7 to 10 years by 2090. Under the very high emissions scenario, they are projected to occur once every 4 to 6 years. In addition, extreme rainfall is projected to increase even in regions where average rainfall is projected to decrease. It should be noted that these projections do not include the contribution from tropical cyclones.

⁸³ IPCC, 2013. Climate Change 2013: The Physical Science Basis

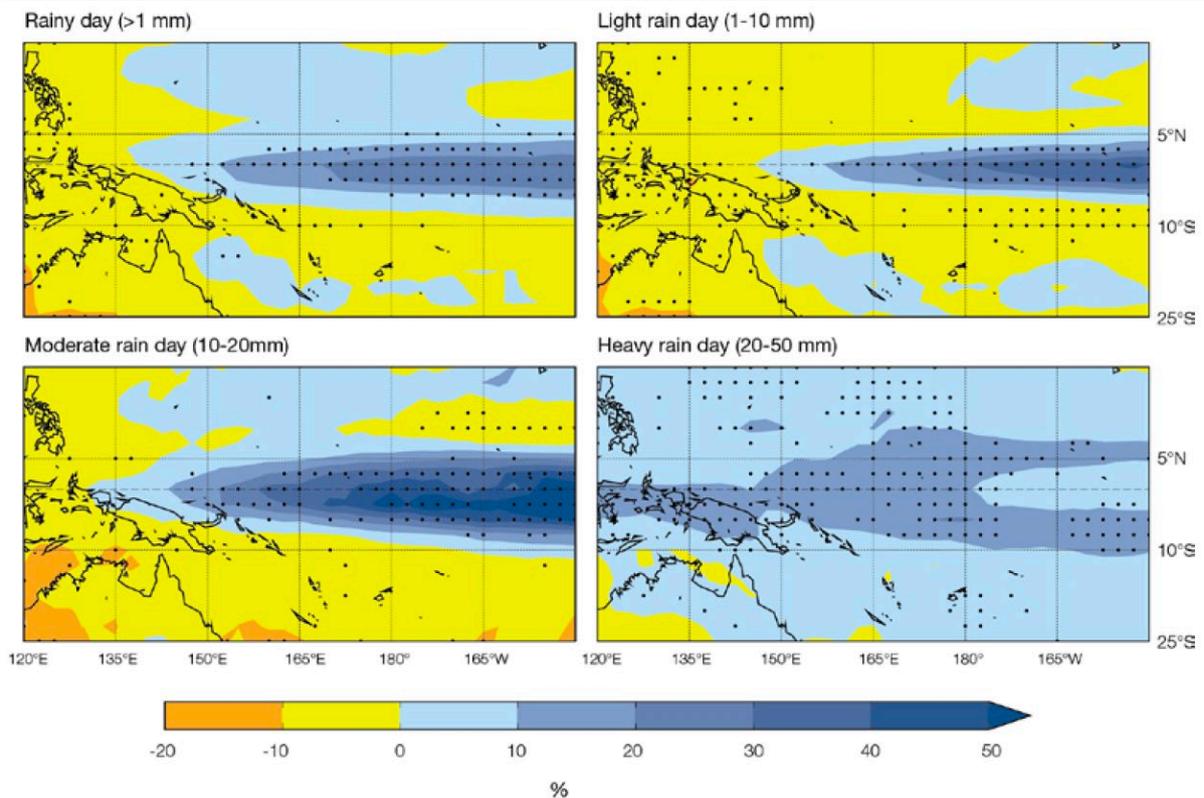


Figure 10. Projected multi-model mean changes in the number of rainy (> 1 mm), light rain (1 – 10 mm), moderate rain (10 – 20 mm) and heavy rain (20 – 50 mm) days between 1990 and 2090 for the A2 (high) emissions scenario. Regions where at least 80% of models agree on the direction of change are stippled. (Source: Australian BoM and CSIRO)

Regional rainfall projections for all RCP scenarios are provided in the Feasibility Study (Annex 2).

Rising sea level: The IPCC Fifth Assessment Report (AR5) states that global mean sea level will continue to rise in the 21st century and will *likely* be in the range of 0.26 – 0.82 m by 2100, depending on different emissions scenarios. However, sea-level rise will not be uniform and “many regions are *likely* to experience regional sea level changes that differ substantially from the global mean”.⁸⁴

Sea-level rise in the western tropical Pacific is projected to be slightly above the global average. Uncertainty in projected contributions from ice sheets in Greenland and Antarctica could contribute an additional 0.1 – 0.2 m.⁸⁵ Low confidence in projections of changes in the behaviour of ENSO – which influences sea level in the tropical Pacific – contributes further uncertainty.⁸⁶ Figures for the observed and projected relative sea level change near the five Programme countries are provided in the Feasibility Study (Annex 2).

Higher swells from distant storms are already causing coastal inundation, salting arable land, killing trees and rendering freshwater lenses unusable.⁸⁷ Extreme sea level events are becoming more severe and frequent, driven primarily by the underlying increase in mean sea level;⁸⁸ but also by a combination of tides; seasonal and longer-term fluctuations; and short-term climate variability factors, such as storm surge and ocean waves.⁸⁹ In its 2019 Special Report on the Ocean and Cryosphere in a Changing Climate, the IPCC highlights that significant

⁸⁴ IPCC, 2013. Climate Change 2013: The Physical Science Basis

⁸⁵ Australian Bureau of Meteorology and CSIRO, 2011, Climate Change in the Pacific: Scientific Assessment and New Research, Volume 1: Regional – Executive Summary

⁸⁶ IPCC, 2012. Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation

⁸⁷ Government of Australia, PACCSAP Volume 1: Regional, 2011.

⁸⁸ Woodworth, P.L. et al. 2011. Surveys in Geophysics. Evidence for Century-Timescale Acceleration in Mean Sea Levels and for Recent Changes in Extreme Sea Levels.

⁸⁹ Government of Australia, 2011, PACCSAP Volume 1: Regional Overview

impacts to coastal morphology, ecosystems and dependent human communities are detectable today and disproportionately higher risks are expected over the course of the 21st century. Without adequate adaptation measures, there is increasing concern that some island nations may become uninhabitable due to rising sea levels and climate change, including the five small, low-lying island states covered by this Programme.⁹⁰

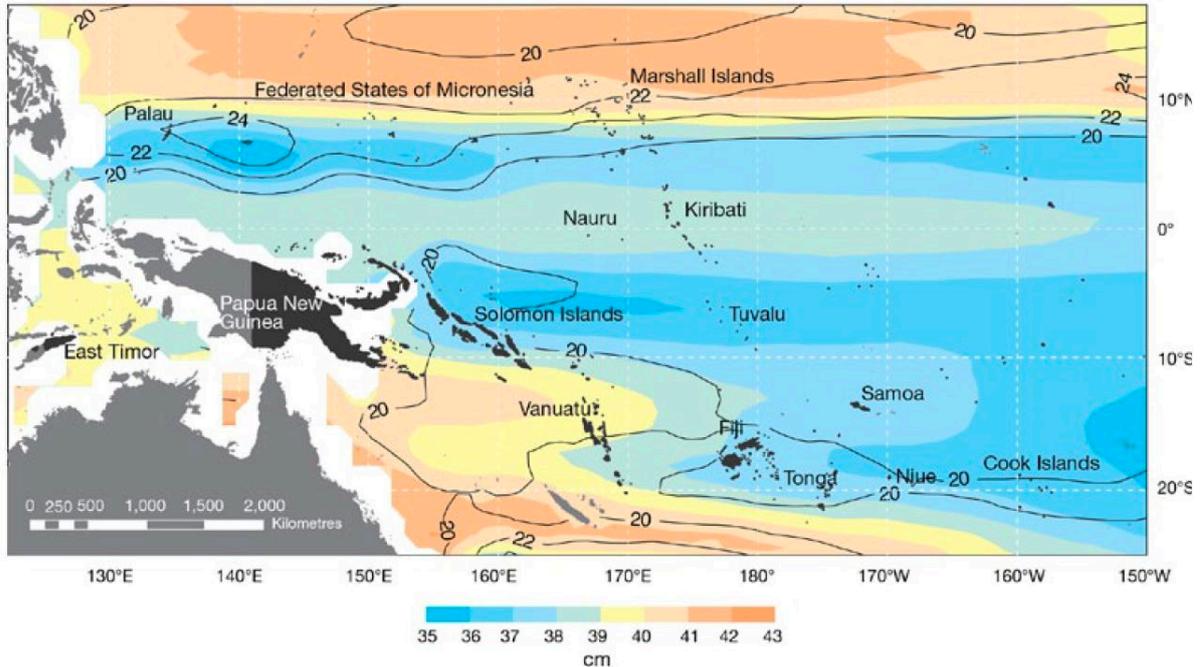


Figure 11. Sea-level projections (in cm) for the A1B (medium) emissions scenario in the Pacific island region for 2081 – 2100 relative to 1981 – 2000. Contours indicate the uncertainty. (Source: Australian BoM and CSIRO, 2011)

Increasing sea surface temperature: In the Pacific region, sea-surface temperatures are projected to increase by $1.4 \pm 0.7^\circ\text{C}$, $2.2 \pm 0.8^\circ\text{C}$ and $2.6 \pm 0.6^\circ\text{C}$ between 1990 and 2090 for the B1 (low), A1B (medium) and A2 (high) scenarios respectively. A maximum warming is projected in the central equatorial Pacific, with the least warming projected in the south-eastern Pacific. The West Pacific Warm Pool provides the energy to sustain western Pacific convection and tropical atmospheric circulation; and is an important factor in ENSO variability. The Warm Pool – defined as temperatures above 29°C – is projected to significantly increase in size, with the edge of the pool moving thousands of kilometres to the east over the next few decades.⁹¹

The key impacts of rising sea-surface temperatures currently being observed and projected to continue include coral bleaching, exacerbation of marine diseases, shifts in the ranges and population abundances of fish and other marine species, and the timing of periodic life cycle events.⁹² Coral death and bleaching threaten marine biodiversity; diminish the attractiveness of reefs to tourists; reduce fish supplies for local communities; and affect the ranges of the pelagic fish from which island nations derive valuable licensing incomes. Increasing sea surface temperature can also exacerbate tropical cyclone intensity.

⁹⁰ IPCC, 2019, Special Report on the Ocean and Cryosphere in a Changing Climate.

⁹¹ Australian Bureau of Meteorology and CSIRO, 2011. Climate Change in the Pacific: Scientific Assessment and New Research, Volume 1: Regional.

⁹² NOAA, 2015. Climate Change Issue Profile: Sea surface temperature

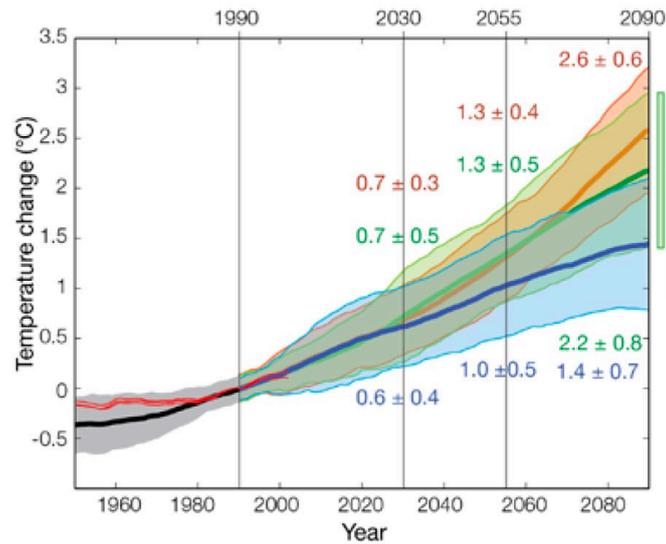


Figure 12. Evolution of multi-model average sea-surface temperatures (°C) for the Pacific region for 1950-1990 (black) three post-1990 scenarios (B1-green, A1B-blue and A2-red). (Source: Australian BoM and CSIRO, 2011)

Ocean acidification and deoxygenation: The projected increase in atmospheric CO₂ concentration is expected to exacerbate ocean acidification, which can severely disrupt the health and sustainability of all carbonate organisms in marine ecosystems, especially coral reefs. In its 2019 Special Report on the Ocean and Cryosphere in a Changing Climate, the IPCC reported that “it is *virtually certain* that the future surface open ocean will experience pH drops of either 0.036-0.042 (RCP2.6) or 0.287-0.291 (RCP8.5) pH units by 2081 – 2100, relative to 2006 – 2015”. The Pacific Ocean will experience some of the greatest changes in pH due to its lower buffer capacity and upwelling systems.⁹³ Under the RCP8.5 scenario, the tropical Pacific pH is projected to decrease by 0.15 units from the period 1986 – 2005 into the 2040 – 2060 period, with dramatic changes to aragonite saturation also projected.

Projected changes in the tropical Pacific Ocean aragonite saturation state were also estimated under the low, medium and high emissions scenarios (B1, A1B and A2, respectively). The results indicated that:

- Magnitude and rate of ocean acidification is proportional to atmospheric CO₂ concentration;
- Aragonite saturation state until 2050 is largely independent of emissions scenarios, which predict similar atmospheric CO₂ concentration;
- Aragonite saturation state from 2051 – 2100 will decline in the entire Pacific island region, with the greatest changes observed under the highest emissions scenario;
- The lowest aragonite saturation state values will occur in the eastern equatorial Pacific, to the east of 160 °W, and the highest values will occur in the South Equatorial Current region, approximately between 5°S and 20°S (Cook Islands and Tuvalu).⁹⁴

⁹³ IPCC, 2019. Special Report on the Ocean and Cryosphere in a Changing Climate

⁹⁴ Australian Bureau of Meteorology and CSIRO, 2011. Climate Change in the Pacific: Scientific Assessment and New Research, Volume 1: Regional

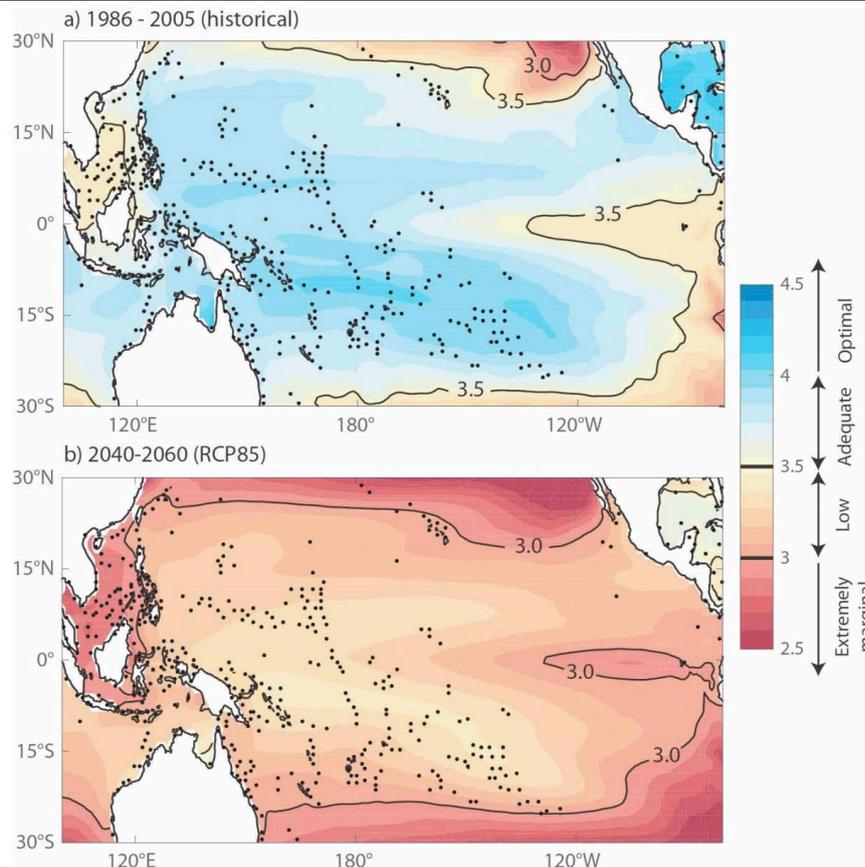


Figure 13. Aragonite saturation state for the periods (a) 1986 – 2005 (based on the multi-model median from the CMIP5 historical simulations) and (b) 2040 – 2060 (based on RCP8.5 simulations). Contour lines of 3 and 3.5 are superimposed. Black dots indicate the location of coral reefs. (Source: SPREP, 2015)⁹⁵

Aragonite saturation state can be influenced by the ocean carbonate chemistry, ocean salinity and ocean temperature. Increased sea surface temperature can worsen the aragonite saturation state, leading to coral bleaching. In parallel to warming, oxygen concentrations have decreased in coastal waters and in the open ocean thermocline in many ocean regions since the 1960s, with a likely expansion of tropical oxygen minimum zones in recent decades.⁹⁶

Tropical cyclones and storms: Across the Pacific region, tropical cyclones are projected to be less frequent but more severe.⁹⁷ The IPCC AR5 report also projects that the Pacific Islands will experience “more extreme precipitation associated with tropical cyclones”, with an increase in tropical cyclone rainfall rate of ~5 – 20% projected by the late 21st century.⁹⁸ At the sub-regional level, climate models project a non-significant decrease in the future frequency of cyclones in the south-west Pacific; and a non-significant increase in the future frequency of cyclones in the northern Pacific. Climate projections do indicate a shift in tropical cyclone intensity, with “relatively fewer cyclones with medium intensity, and increased frequencies of both weaker and very intense cyclones”. Furthermore, “a slight reduction in the overall frequency combined with an increased proportion of the most intense cyclones means that most locations in the Pacific will have a higher chance of experiencing severe winds.”⁹⁹ The vulnerability of coastal regions to tropical cyclone induced storm surge is expected to

⁹⁵ SPREP, 2015. Pacific Islands Ocean Acidification Vulnerability Assessment

⁹⁶ IPCC (2013). Climate Change 2013: The Physical Science Basis. Chapter 14

⁹⁷ CSIRO, Australian Bureau of Meteorology and SPREP, 2015. Climate in the Pacific: A regional summary of new science and management tools

⁹⁸ Chand *et al.* 2020. A Review of South Pacific Tropical Cyclones: Impacts of Natural Climate Variability and Climate Change

⁹⁹ CSIRO, Australian Bureau of Meteorology and SPREP, 2015. Climate in the Pacific: A regional summary of new science and management tools

increase with climate change-related sea level rise, with population growth and coastal developments increasing the exposure of populations and assets to coastal risks. Essential infrastructure—ports, hospitals, power supplies, water storage, roads, sanitation systems, cyclone shelters—are already vulnerable and are expected to become more so, particularly from increasingly violent, record-breaking cyclones.¹⁰⁰

Drought: An increase in drought is projected at the eastern edge of the SPCZ – including the northern Cook Islands. Projected changes in the average frequency, intensity and duration of drought reflect changes in average rainfall as well as changes in rainfall variability, which is affected by ENSO. Consequently, the results are less certain than for other variables.¹⁰¹

Country-specific climate projections

Historical and simulated mean surface temperature and mean annual precipitation plots are provided below.¹⁰² Values for the projected changes in the annual and seasonal mean climate for the five Programme countries under four emissions scenarios are provided in Appendix 2 of the Feasibility Study (Annex 2).

Further warming is expected over all countries with *very high confidence*. The temperature on extremely hot days is projected to increase by about the same as average temperature. Under all RCPs, the warming is up to 1.0 °C by 2030 in Cook Islands, Palau and Tuvalu; and up to 1.1 °C by 2030 in Niue and RMI. However, there is a growing difference in warming between each RCP after 2030:

- In the Northern **Cook Islands** by 2090, a warming of 2.0 – 3.8 °C is projected for RCP8.5 (very high emissions) while a warming of 0.5 – 1.2 °C is projected for RCP2.6 (very low emissions);
- In **Niue** by 2090, a warming of 1.7 – 4.2 °C is projected for RCP8.5 while a warming of 0.2 – 1.1 °C is projected for RCP2.6;
- In **Palau** by 2090, a warming of 2.1 – 4.0 °C is projected for RCP8.5 while a warming of 0.4 – 1.2 °C is projected for RCP2.6;
- In northern **RMI** by 2090, a warming of 2.2 – 4.2 °C is projected for RCP8.5 while a warming of 0.5 – 1.2 °C is projected for RCP2.6;
- In **Tuvalu** by 2090, a warming of 2.0 – 4.0 °C is projected for RCP8.5 while a warming of 0.4 – 1.3 °C is projected for RCP2.6.¹⁰³

¹⁰⁰ IPCC, 2014. Climate Change 2014: Synthesis Report

¹⁰¹ CSIRO, Australian Bureau of Meteorology and SPREP, 2015. Climate in the Pacific: A regional summary of new science and management tools

¹⁰² <https://www.pacificclimatefutures.net/en/climate-futures/future-climate/>

¹⁰³ Australian Bureau of Meteorology and CSIRO, 2014. Climate Variability, Extremes and Change in the Western Tropical Pacific: New Science and Updated Country Reports

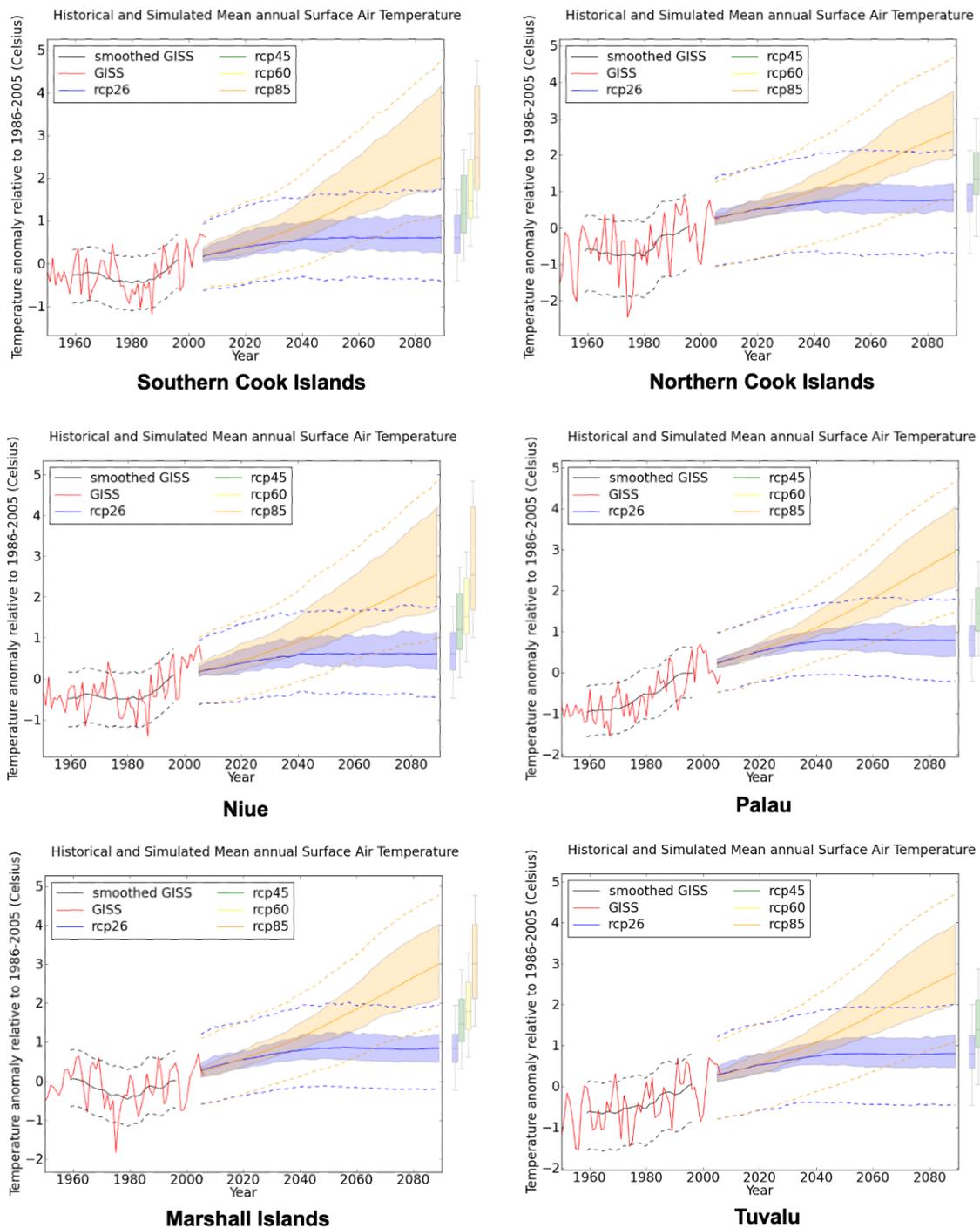


Figure 14. Historical and simulated mean annual surface air temperature in the five Programme countries. The graph shows the anomaly (from the base period 1986 – 2005) in surface air temperature from observations (the GISS dataset, in red) from the CMIP5 models under the very high (RCP8.5, in orange) and very low (RCP2.6, in purple) emissions scenarios. The solid orange and purple lines show the smoothed (20-year running average) multi-model mean anomaly in surface air temperature, while shading represents the spread of model values (5 – 95th percentile). The dashed lines show the 5 – 95th percentile of the observed interannual variability for the observed period (in black) and added to the projections as a visible guide (in orange and purple). This indicates that future surface air temperature could be above or below the projected long-term averages due to interannual variability. The ranges of projections for a 20-year period centred on 2090 are shown by the bars on the right for RCP8.5, 6.0, 4.5 and 2.6. (Source: PACCSAP)

In the Southern Cook Islands and Niue, mean annual rainfall increased between 1979 and 2006 but this is not projected to continue in the future, which suggests that the recent increase may be due to natural variability rather than as a result of global warming. The year-to-year variability in rainfall is much larger than the projected change for all Programme countries, even in the highest emission scenario by 2090. Therefore, the effect of climate change on average rainfall may not be obvious in the short or medium term due to natural variability. However, there is *high confidence* that the frequency and intensity of extreme rainfall events will increase in all five countries, as described below:¹⁰⁴

- **Cook Islands:** Long-term average rainfall is projected by most models to stay approximately the same; although, the Northern Cook Islands may get drier in the May – October season under the high emission scenario. The influence of topography on the local climate may cause variation between the Northern and Southern Cook Islands.
- **Niue:** Annual mean rainfall is projected to increase or decrease according to different CMIP5 models, although the model average indicates a slight increase for the high emission scenario by 2100. There is greater model agreement for a slight increase in November – April rainfall and little change in May – October rainfall.
- **Palau:** Long-term average rainfall is projected by almost all models to increase. Most models project an increase in May – October rainfall, with little change for November – April rainfall. There will still be wet and dry years and decades due to natural variability, but the long-term average is expected to be wetter.
- **RMI:** Long-term average rainfall is projected by almost all models to increase, with most models projecting an increase in rainfall in both the wet and dry seasons. There will still be wet and dry years and decades due to natural variability, but the long-term average is expected to be wetter.
- **Tuvalu:** Annual mean rainfall is projected to increase or decrease according to different CMIP5 models, although the model average is near zero. Tuvalu is located between a region where rainfall is projected to increase to the north, and a region of little change or slight decrease in the south. Consequently, there is large spread in model projections for both the November – April and May – October seasons.¹⁰⁵

¹⁰⁴ Australian Bureau of Meteorology and CSIRO, 2014. Climate Variability, Extremes and Change in the Western Tropical Pacific: New Science and Updated Country Reports

¹⁰⁵ Australian Bureau of Meteorology and CSIRO, 2014. Climate Variability, Extremes and Change in the Western Tropical Pacific: New Science and Updated Country Reports

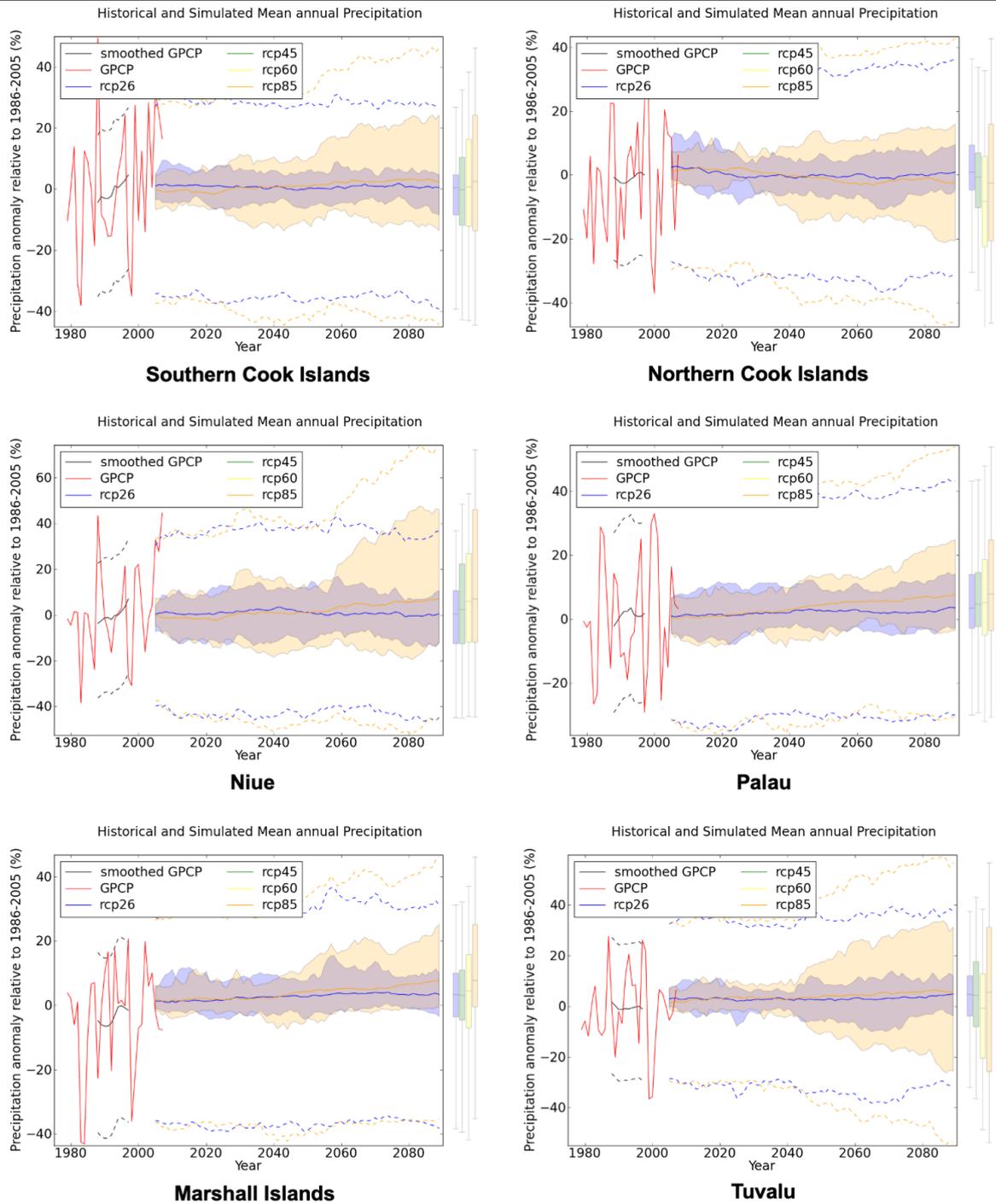


Figure 15. Historical and simulated annual average rainfall time series for the region surrounding the five Programme countries. The graph shows the anomaly (from the base period 1986 – 2005) in surface air temperature from observations (the GISS dataset, in red) from the CMIP5 models under the very high (RCP8.5, in orange) and very low (RCP2.6, in purple) emissions scenarios. The solid orange and purple lines show the smoothed (20-year running average) multi-model mean anomaly in rainfall, while shading represents the spread of model values (5 – 95th percentile). The dashed lines show the 5 – 95th percentile of the observed interannual variability for the observed period (in black) and added to the projections as a visible guide (in orange and purple). This indicates that future rainfall could be above or below the projected long-term averages due to interannual variability. The ranges of projections for a 20-year period centred on 2090 are shown by the bars on the right for RCP8.5, 6.0, 4.5 and 2.6. (Source: PACCSAP)

Potential impacts of annual temperature and rainfall change

The potential high impact climate futures based on the RCP4.5 scenario to 2050 are shown below.

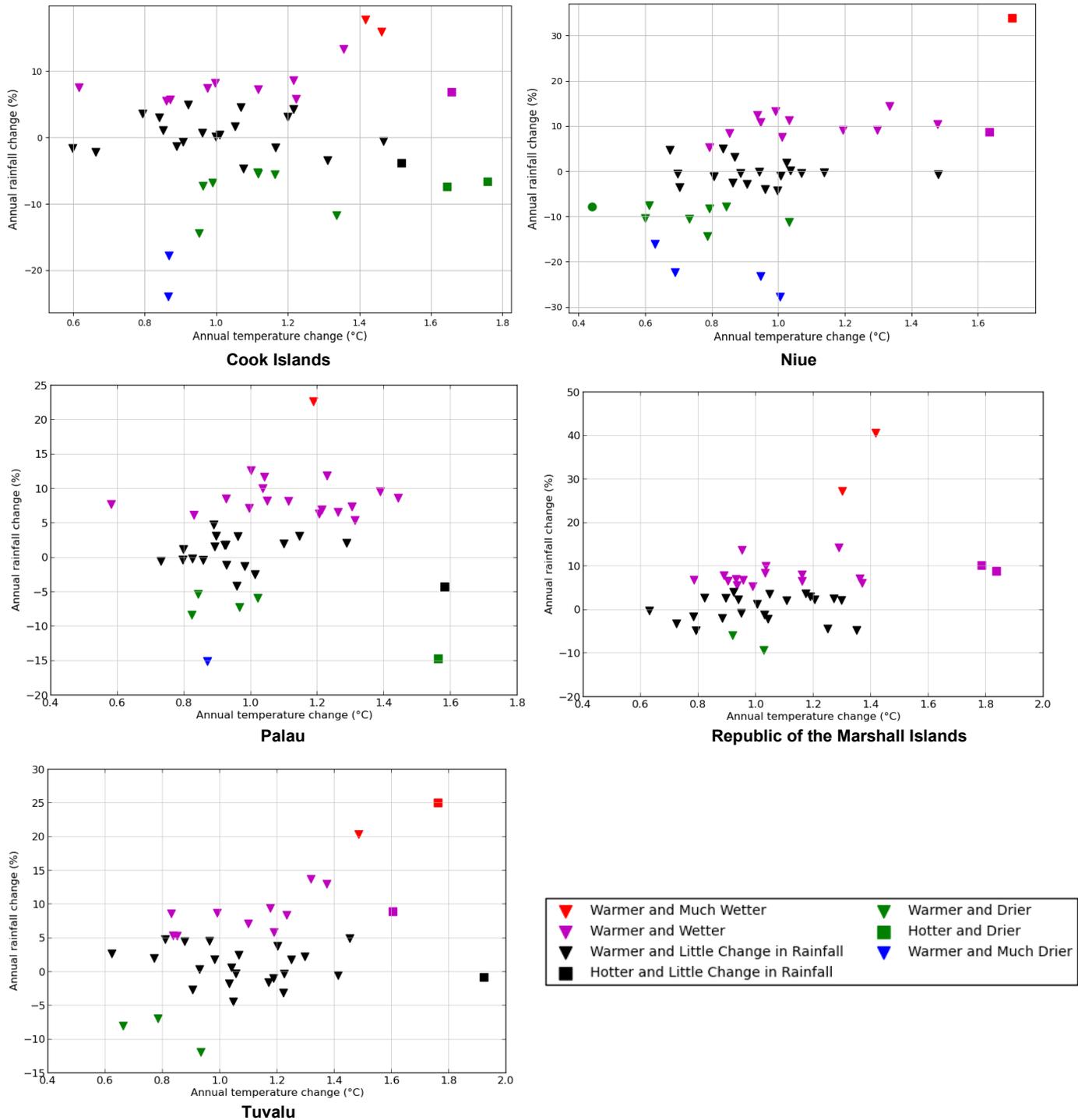


Figure 16. Potential impacts of annual temperature and rainfall change under the RCP4.5 scenario to 2050

The potential high impact climate futures for the Programme countries are as follows:

- **Cook Islands:** “Warmer and Much Wetter” with annual mean temperature increases of 1.4 °C and annual mean rainfall increases of 17 % relative to 1980-1999. “Warmer and Much Drier” with annual mean temperature increases of 0.9 °C and annual mean rainfall decreases of 21 % relative to 1980-1999.
- **Niue:** “Hotter and Much Wetter” with annual mean temperature increases of 1.7 °C and annual mean rainfall increases of 34 % relative to 1980-1999. “Warmer and Much Drier” with annual mean temperature increases of 0.8 °C and annual mean rainfall decreases of 22 % relative to 1980-1999.
- **Palau:** “Warmer and Much Wetter” with annual mean temperature increases of 1.2 °C and annual mean rainfall increases of 18 % relative to 1980-1999. “Warmer and Much Drier” with annual mean temperature increases of 0.9 °C and annual mean rainfall decreases of 18 % relative to 1980-1999.
- **RMI:** “Warmer and Much Wetter” with annual mean temperature increases of 1.3 °C and annual mean rainfall increases of 23 % relative to 1980-1999. “Warmer and Drier” with annual mean temperature increases of 1.3 °C and annual mean rainfall decreases of 7 % relative to 1980-1999.
- **Tuvalu:** “Hotter and Much Wetter” with annual mean temperature increases of 1.8 °C and annual mean rainfall increases of 25 % relative to 1980-1999. “Warmer and Drier” with annual mean temperature increases of 0.9 °C and annual mean rainfall decreases of 9 % relative to 1980-1999.

Sector-specific impacts of climate change

Decision makers across all sectors in the Pacific island region are faced with addressing the impacts of climate variability and climate change – rising temperatures, changing rainfall frequency and intensity, ocean warming and acidification, and sea-level rise – as outlined in the above sections. Pollution and overuse of natural resources, such as overfishing and intensive land and water use, and unsustainable development and mining are degrading Pacific island ecosystems and compound the impacts of climate change.

This section analyses the sector-specific impacts of climate change on key sectors in the Pacific – agriculture and food security, disaster risk management, energy, health, water, fisheries and tourism – which have also been identified as priority sectors in the Pacific Roadmap for Strengthened Climate Services 2017 – 2026.¹⁰⁶ Given that literature on sectoral impacts in individual Pacific island countries is highly limited in availability, the analysis is presented from a regional perspective. Information specific to the five Programme countries is included, where available. Further analyses are provided in the Feasibility Study (Annex 2).

Agriculture and Food Security

In the five Programme countries, food crops are predominantly grown for subsistence purposes; however, most households are unable to meet their food needs through their own production and rely in part on markets. Staple food crops grown in the Pacific islands include bananas, breadfruit, cassava, coconuts, sweet potato, taro and yams. Wheat flour and rice are important staples that are almost entirely imported. Cacao, coconut, coffee, palm oil and sugar are the main export crops.¹⁰⁷ Traditionally, Pacific island communities grew multiple crops, which conferred some resilience to climate change as not all crops were affected by specific hazards. However, increasing production of monocultural export crops has reduced the diversity of local production and decrease resilience of food supply in the face of climate hazards.¹⁰⁸

Climate change is adversely impacting on agriculture and food security in Pacific island countries in several ways: affecting both the ability to produce food and the ability to import food. Interannual climate variability has a large influence on agricultural production; and longer-term systematic changes in the climate introduce an

¹⁰⁶ SPREP, 2016. Pacific Roadmap for Strengthened Climate Services 2017 - 2026

¹⁰⁷ Bell, J. *et al.* 2016. Climate change and Pacific Island food systems

¹⁰⁸ Barnett, J. 2011. Regional Environmental Change. Dangerous climate change in the Pacific Islands: food production and food security

additional complicating factor. For coastal communities, food production is compromised by the “effects of erosion, increased contamination of groundwater and estuaries by saltwater incursion, cyclones and storm surges, heat stress and drought”.¹⁰⁹ Sea-level rise is a direct threat to taro cultivation – the main agricultural activity on the islands of Palau – which are critical for socio-economic development, as well as important to cultural and religious obligations. At present, once saltwater seeps into or displaces fresh water in their taro patches, farmers abandon the taro plots and move inland or shift to other crops. Deforestation is increasing as people clear steeper slopes to plant. This creates further issues such as erosion, silting of waterways, and destruction of biodiversity in the downstream marine population.¹¹⁰ In Tuvalu, saline intrusion is enhanced by soil porosity and destroys pulaka crops (swamp taro – the country’s main carbohydrate staple) and decreases fruit tree yields of coconut, banana and breadfruit.

Tropical cyclones can cause significant losses in agricultural production, with the potential to destroy tree and horticultural crops for several years after each occurrence. For example, in 2005, Pukapuka (Cook Islands) was completely inundated by wave surges associated with cyclones and strong winds, resulting in loss of agricultural land that took three years to recover.¹¹¹ High wind speeds are a significant threat to tree crops such as bananas, breadfruit, coconuts and mangoes.

Increases in extreme weather events such as drought and floods are likely to have greater impact than temperatures changes in the short-to-medium term (2030 – 2050), with devastating effects on agricultural productivity – including grain, horticultural, forestry and livestock production. Key export crops such as pawpaw and taro are highly sensitive to variations in rainfall patterns.¹¹² Crops such as sweet potato are sensitive to waterlogging and sugar cane is affected by floods. High temperatures affect the formation of sweet potato and yam; and increase the risk of pests and diseases.¹¹³

Furthermore, the impact of extreme climate events on critical infrastructure undermines both subsistence and commercial agriculture. Damage to equipment for processing and storing food can threaten the effective supply of food; and damages to roads, rails and vehicles can disrupt the supply of goods to markets, which in turn undermines the livelihoods of rural farmers.¹¹⁴

The impact of future climate change on agriculture has serious implications for food security in the five Programme countries. Increasing food imports will be required to meet basic caloric needs and the price of imports will rise in real terms, which will cause significant strain on household incomes. Food insecurity will increase unless supplementary sources of income can be found.¹¹⁵

Energy

Pacific island countries are heavily dependent on fossil fuels to meet local energy demands; and the cost of energy is among the highest in the world – as much as 200-300% compared to other regions¹¹⁶ – predominantly due to high fuel transportation costs. Consequently, Pacific SIDS are highly vulnerable to oil price shocks and thus energy insecurity.¹¹⁷

The generation and use of energy resources are highly important to development in the Pacific. Fossil fuel dependence impedes adaptation capacity: increasing demand for foreign exchange for imports – forex spending on imports may constitute over 50% of total export earnings. Developing self-sufficiency in energy production using renewable energy sources can enable import savings to be redirected to adaptation investments and

¹⁰⁹ Barnett, J. 2011. Regional Environmental Change. Dangerous climate change in the Pacific Islands: food production and food security

¹¹⁰ SPREP, 2009. Palau PACC Country Brief

¹¹¹ FAO, 2008. An Assessment of the Impact of Climate Change on Agriculture and Food Security in the Pacific. A Case Study in the Cook Islands

¹¹² UNFCCC, 2011. Cook Islands Second National Communication

¹¹³ Bell, J. *et al.* 2016. Climate change and Pacific Island food systems

¹¹⁴ Barnett, J. 2011. Regional Environmental Change. Dangerous climate change in the Pacific Islands: food production and food security

¹¹⁵ SPC, 2016. Vulnerability of Pacific Island agriculture and forestry to climate change

¹¹⁶ UNEP, UN DESA and FAO, 2012. SIDS-Focused Green Economy: An Analysis of Challenges and Opportunities

¹¹⁷ Wolf, F. *et al.* 2016. Energy Policy. Energy access and security strategies in Small Island Developing States

sustainable development.¹¹⁸ Furthermore, although greenhouse gas (GHG) emissions from SIDS are minute on the global scale, reducing GHG emissions in the Pacific is important for two reasons: i) Every GHG reduction counts; and ii) Reducing emissions demonstrates feasibility to larger emitters and increases the credibility and moral leverage of SIDS in global climate change negotiations.¹¹⁹

In 2012, the Cook Islands, Niue and Tuvalu set the target of 100% renewable energy by 2020.¹²⁰ The Niue Strategic Energy Road Map 2015 – 2025 subsequently revised the target as 80% renewable energy generation by 2025.¹²¹ Palau intends to generate 45% of its energy from renewable sources by 2025.¹²² RMI aims to have 100% renewable energy by 2050.¹²³

Energy production – including the efficiency of production – is highly sensitive to meteorological and climate events. The efficiency and effectiveness of renewable energy systems in particular must take into account local climatic conditions during both their design and operation. For example, information on solar radiation and wind fields is required for the development of solar and wind power; and hydrometeorological information at the catchment domain is needed for hydropower systems. Therefore, partnerships and stakeholder engagement between NMHSs and the energy sector to apply weather and climate information are critical to developing efficient and effective energy systems.¹²⁴

Health

Climate change has significant and diverse impacts on human health: i) primary or direct effects – e.g. injuries and deaths caused by extreme weather events such as cyclones; ii) secondary or indirect effects – e.g. the increasing geographic range of, and population exposed to, vectors that spread disease; and iii) tertiary, diffuse and/or delayed effects – e.g. disruptions to health and social services.

Pacific island countries are some of the most vulnerable in the world to the health impacts of climate change. This vulnerability is on account of their exposure to changing weather patterns, the associated health risks, and their limited capacities to manage and adapt in the face of climate risks. The figure below shows the climate change and health impact pathways relevant to the Pacific island countries.¹²⁵

¹¹⁸ World Bank, 2014. WB-UN High Level Dialogue on Advancing Sustainable Development in Small Island Developing States. SIDS – Towards a Sustainable Energy Future. Available at: <https://www.worldbank.org/content/dam/Worldbank/SIDS%20Towards%20Sustainable%20Energy%20Future.pdf>

¹¹⁹ Betzold, C., 2016. Renewable and Sustainable Energy Reviews. Fuelling the Pacific: Aid for renewable energy across Pacific Island countries

¹²⁰ Mitigation Partnership, 2015. 100% Renewable Energy Targets in the Pacific Islands. Available at: https://www.transparency-partnership.net/system/files/migrated_document_files/2012ongoingrenewableenergy_pacificislands.pdf

¹²¹ Government of Niue, 2015. Niue Strategic Energy Road Map 2015 – 2025

¹²² Government of Palau, 2015. Intended Nationally Determined Contribution (NDC)

¹²³ Government of RMI, 2018. Marshall Islands Electricity Roadmap

¹²⁴ SPREP, 2017. Pacific Roadmap for Strengthened Climate Services 2017 – 2026

¹²⁵ McIver, L. *et al.* 2016. Environmental Health Perspectives. Health Impacts of Climate Change in Pacific Island Countries: A Regional Assessment of Vulnerabilities and Adaptation Priorities

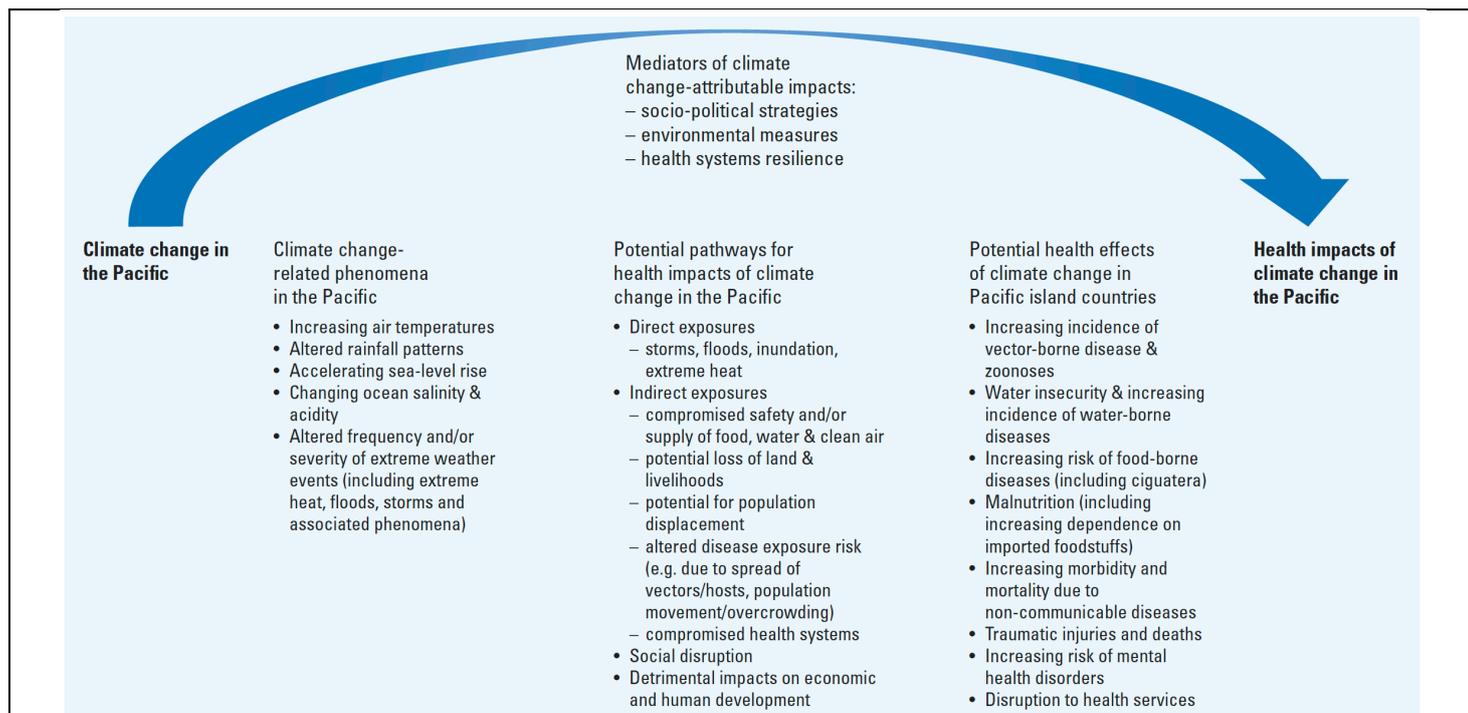


Figure 17. Climate change and health impact pathways relevant to Pacific island countries. (Source: McIver, L. et al.)

Dengue fever, malaria, diarrheal disease, leptospirosis, typhoid fever, respiratory infections, obstructive airways disease and malnutrition are considered to be highly climate-sensitive diseases.¹²⁶ However, the Pacific region has additional climate-related health risks of concern, which have not been documented to the same extent elsewhere in the world, including noncommunicable diseases (NCDs), mental and/or psychosocial health disorders and ciguatera.¹²⁷ The rates of NCDs in Pacific island countries are among the highest in the world;¹²⁸ thus, the potential for climate change to act as an additional risk factor for NCDs – due to exacerbating food insecurity and poor nutrition – is of significant concern. In addition, communities in the Pacific region are already being subject to climate-induced forced migration and displacement – both internal and external – which may result in considerable physical and psychosocial health consequences.¹²⁹

Water

At the regional level, the Pacific island countries have the lowest access to improved drinking water in the world and the second lowest sanitation coverage.¹³⁰ However, there is significant variation in coverage both between countries and within countries; and regional statistics thus hide the impressive performance of individual countries. Improved drinking water coverage is at least 95% Cook Islands, Niue, RMI and Tuvalu (no data was available for Palau). Geographic and economic isolation, and limited human and physical resources, present significant challenges to improving water, sanitation and hygiene in Pacific island countries. The disparity between urban and rural drinking water and sanitation coverage is particularly evident in RMI. The Marshall Islands has the largest number of inhabited islands or atolls (24) of the five Programme countries, spread across

¹²⁶ Woodward, A. et al. 2014. Lancet. Climate change and health: on the latest IPCC report

¹²⁷ McIver, L. et al. 2016. Environmental Health Perspectives. Health Impacts of Climate Change in Pacific Island Countries: A Regional Assessment of Vulnerabilities and Adaptation Priorities

¹²⁸ Mannava, P., 2015. Asia Pacific Journal of Public Health. Health systems and noncommunicable diseases in the Asia-Pacific region: a review of the published literature

¹²⁹ McIver, L. et al. 2016. Environmental Health Perspectives. Health Impacts of Climate Change in Pacific Island Countries: A Regional Assessment of Vulnerabilities and Adaptation Priorities

¹³⁰ Global Change Institute and the School of Public Health, The University of Queensland, 2019. Water, Sanitation and Hygiene in the Pacific: The need to meet SDG 6

an EEZ of 2.1 million km², and small rural communities are often too remote – and thus expensive – to equip with improved water and sanitation.¹³¹

In the Pacific island region, water is the primary means through which climate variability, climate change and natural hazards influence livelihoods and wellbeing.¹³² Direct impacts on water resources can occur via increased intensity of rainfall and flash floods leading to contamination of water supplies impacting on water quality; reduced safety of groundwater due to slower recharge and saltwater intrusion from reduced freshwater flow; and changes in seasonality and timing of precipitation. Indirect impacts on water resources may result from pressures on ecosystems and biodiversity and subsequent changes (e.g. changes in species abundance and desertification); demographic changes due to forced displacement; changes to agricultural ecosystems and potential food insecurity; contamination of water resources due to changes to run-off and sedimentation; and sea-level rise.¹³³

All five Programme countries are highly dependent on rainfall as the main freshwater source, with particular vulnerability in the low-lying islands (Niue, RMI and Tuvalu) that have no significant surface and/or groundwater resources. In the moderate-sized volcanic island of Rarotonga (Cook Islands), water resources are generally adequate to meet demand, but significant management challenges remain due to high seasonal variability. In Palau, despite its small resident population, water consumption is relatively high due to a growing tourism industry and limited infrastructure for water management. In addition, the agriculture sector depends solely on regular rainfall as few irrigation systems are in place.¹³⁴ In Tuvalu, groundwater must be used for washing clothes, bathing and flushing toilets during times of drought. Rapid population growth is increasing demand for already constrained water resources, thus exacerbating the issue.¹³⁵

More intense ENSO events will impact on water supply and island economies.¹³⁶ For example, the El Niño event in 1997/98 was one of the most pronounced drought periods in RMI – bringing only 8% of normal rainfall in a four-month period – and led the Government of RMI to declare the entire archipelago a disaster area. Droughts are especially damaging in the atolls lacking sufficient rainwater harvesting and storage capacity, as is the case in most of the outer atolls of the dry northern region.¹³⁷ Climate change is likely to make access to freshwater, already in limited supply, a very serious issue.¹³⁸ The strong La Niña event that followed in 1998 – 2000 led to acute water shortages in many Pacific island countries – with partial shutdown of the tourism industry required in some extreme cases.¹³⁹

Fisheries and Aquaculture

The Pacific island region is heavily dependent on oceanic and coastal fisheries for food security, livelihoods, revenue, employment and development. Fish intake is high and is estimated to account for 50 – 90% of animal protein intake in rural areas, and 40 – 80 % in urban areas. Most of the fish eaten by rural communities comes from subsistence fisheries, with little or no cost to the consumer.¹⁴⁰ The contribution of fishing to GDP ranges from 1.0 % (Cook Islands) to 29.5 % (Marshall Islands), as estimated by SPC in 2016.¹⁴¹

Climate change is expected to have significant impacts on coastal and oceanic habitats, the fish and invertebrates that they support, and consequently, the productivity of fisheries and aquaculture. Increasing

¹³¹ Hadwen, W.L., 2015. Journal of Water, Sanitation and Hygiene for Development. Putting WASH in the water cycle: climate change, water resources and the future of water, sanitation and hygiene challenges in Pacific Island Countries

¹³² WHO, 2016. Sanitation, Drinking-Water and Health in Pacific Island Countries. 2015 Update and Future Outlook

¹³³ Hadwen, W.L., 2015. Journal of Water, Sanitation and Hygiene for Development. Putting WASH in the water cycle: climate change, water resources and the future of water, sanitation and hygiene challenges in Pacific Island Countries

¹³⁴ UNFCCC, 2013. Palau Second National Communication

¹³⁵ UNFCCC, 2015. Tuvalu Second National Communication

¹³⁶ UNFCCC, 2011. Cook Islands Second National Communication

¹³⁷ USGS Scientific Investigations Report 2005-5098. Effects of the 1998 Drought on the Freshwater Lens in the Laura Area, Majuro Atoll, Republic of the Marshall Islands

¹³⁸ Mellgard P, 2015, Available at <https://www.huffingtonpost.com.au/entry/marshall-islands-climate-change_n_56796928e4b06fa6887ea12c> [August 2019]

¹³⁹ IPCC, 2007. Fourth Assessment Report

¹⁴⁰ Hanich, Q. *et al.* 2018. Marine Policy. Small-scale fisheries under climate change in the Pacific Islands region

¹⁴¹ SPC, 2016. Fisheries in the Economies of Pacific Island Countries and Territories

temporal and spatial variability in fish abundance may result from degradation of reefs and mangroves, and changing water turbidity, salinity and temperature. In particular, decreased productivity of demersal fish and invertebrates – which constitute the greatest percentage of total catch in Palau, RMI and Tuvalu – and a more eastward distribution of some tuna species, are expected to present the greatest threat to the use of fisheries resources by Pacific island communities and economies. Invertebrates such as pearl oysters and shrimp, which are important aquaculture commodities, will be affected by increasing ocean temperatures and acidification. Increasing variability in fish abundance will differentially affect nutrition and incomes across the five Programme countries. In particular, coastal fisheries may not meet the food security needs of Niue and Tuvalu due to limited productivity and inadequate national distribution networks.^{142, 143}

The Western and Central Pacific Ocean has the largest tuna fishery in the world.¹⁴⁴ In 2017, fishing license fees in Tuvalu accounted for 50 % of total government revenue.¹⁴⁵ The predicted increase in frequency or severity of ENSO events due to climate change may affect the amount of fish caught in the EEZs of the Pacific island countries, with resultant impacts on revenue earned from access fees paid by distant water fishing nations. “Climate change may also cause an extension of the present range of tuna to higher latitudes, a decrease in net productivity, increase variability in the catches and so decrease catch per unit of effort with subsequent impacts on the costs of production and prices, and potentially increase pressure on the most valuable species of bigeye and yellowfin in an attempt to offset increasing costs.”¹⁴⁶

Furthermore, climate change-related increases in storm damages may adversely affect fisheries development due to damage to and loss of fishing vessels, boat launching facilities, fuel facilities, and fish storage and processing facilities. For example, in 2004, damages caused by Cyclone Heta caused subsistence fishing in Niue to cease for several weeks.¹⁴⁷

Reef ecosystems

The tropical Pacific region is home to around a quarter of the world’s reefs,¹⁴⁸ with RMI among the top ten richest countries in reef resources in the world. Coral reefs are one of the main attractions of the Pacific region’s tourism industry. Pacific reefs sustain fisheries and marine ecosystems and act as a natural protection against coastal erosion – maintaining beach and coastal land levels against eroding forces of storms and sea level rise.

Coral reefs are highly vulnerable to climate variability. Increases in sea surface temperature result in coral bleaching, which occurs when water temperature rises 1.8 – 3.6 °C above the warmest normal summer temperatures. This induces coral stress, which causes corals to expel their colourful algae and turn white. Prolonged and intense coral bleaching can lead to coral death. The projected changes in severe coral bleaching risk in the EEZs of the five Programme countries are detailed in the Feasibility Study (Annex 2). Overall, there is a decrease in the time between two periods of elevated risk and an increase in the duration of the elevated risk as sea surface temperature (SST) increases.¹⁴⁹ When bleaching occurs, coral reef recovery is dependent on the severity and extent of the bleaching event. Long-term viability of coral reef ecosystems is threatened once the frequency of severe bleaching events rises above more than once every five years.¹⁵⁰ The projections indicate that the Palau EEZ will have the highest coral bleaching risk of the five countries as SST rises.

¹⁴² Commonwealth Marine Economies Programme, 2018. Science Review. Effects of Climate Change on Fish and Shellfish Relevant to Pacific Islands, and the Coastal Fisheries they Support

¹⁴³ Barnett, J., 2011. Regional Environmental Change. Dangerous climate change in the Pacific Islands: food production and food security

¹⁴⁴ Allain, V. *et al.* 2016. Overview of tuna fisheries, stock status and management framework in the Western and Central Pacific Ocean
Island Fisheries in the Pacific: The challenges of governance and sustainability. Available at:
<https://books.openedition.org/pacific/423?lang=en>

¹⁴⁵ IMF, 2018. Tuvalu International Monetary Fund Country Report No. 18/209

¹⁴⁶ Barnett, J., 2011. Regional Environmental Change. Dangerous climate change in the Pacific Islands: food production and food security

¹⁴⁷ Barnett, J., 2011. Regional Environmental Change. Dangerous climate change in the Pacific Islands: food production and food security

¹⁴⁸ WRI, 2011. Reefs at Risk Revisited: Pacific

¹⁴⁹ Australian Bureau of Meteorology and CSIRO, 2014. Climate Variability, Extremes and Change in the Western Tropical Pacific: New Science and Updated Country Reports

¹⁵⁰ Donner, S., 2009. PLOS ONE. Coping with Commitment: Projected Thermal Stress on Coral Reefs under Different Future Scenarios

Warming sea surface temperatures increase the incidence of toxic algae that grows on Pacific reefs. In Niue, as in the rest of the South Pacific, ciguatera poisoning is associated with coral bleaching and rates of infection were reported to increase in Niue in the years following Cyclone Heta in 2004. Furthermore, increasing ocean acidification can further exacerbate coral degradation due to reduced carbonate available for reefs to build their calcium carbonate skeletons.¹⁵¹

Mass coral bleaching has already occurred in the Pacific and more frequent and severe episodes of bleaching are expected to occur. In 2014 – 2017, the world experienced its longest, most widespread and most severe global bleaching event on record.¹⁵² In some areas of the Marshall Islands, up to 100% of the coral died due to spikes in sea surface temperature.¹⁵³ Analysis by the Asian Development Bank estimated that the Pacific coral area in 2000 was around 80% of what would have been in the absence of thermal stress; and that increasing thermal stress will reduce Pacific coral area to 55% in 2050 and 20% in 2100 – from 88% in the base year (1995). By 2100, coral reef cover is projected to be less than 1%. This will have major implications for the tourism, fisheries and coral mining industries, and loss of areas of significant importance to maintaining marine biodiversity.¹⁵⁴

Furthermore, coral reefs are threatened by unsustainable development practices. In Tuvalu, sand, calcareous algae and shells, and coral are essential to the underlying structure of its islands. Urban development, habitat fragmentation, dredging and extraction of coastal aggregates have led to the destruction of coral reef systems.¹⁵⁵

Mangroves

Mangroves act as a natural defence against coastal erosion, and filter sediment to maintain the health of reefs and fish stocks. In Palau, communities are reliant on mangroves for food, medicine, building materials and firewood. Changes in precipitation patterns, higher temperatures, sea level rise and intensification of extreme climate events can negatively impact on mangrove ecosystems. For example, periods of intense precipitation and drought affect the growth and distribution of mangroves, which will be exacerbated by high temperatures.¹⁵⁶

Tourism

Tourism is a major economic driver in the Pacific region; particularly in the Cook Islands and Palau, where it accounts for a majority of GDP.¹⁵⁷ In Cook Islands, tourism is estimated to account for around 82% of GDP;¹⁵⁸ in Palau, the service sector – including direct tourism contributions – accounts for more than 80% of GDP and employs three-quarters of the work force.¹⁵⁹ Niue is working towards being one of the world's leading destinations for sustainable tourism and launched its Responsible Tourism Policy in September 2017.¹⁶⁰ The Government of RMI is attempting to develop its tourism industry; however, this is a challenge due to the high cost of access to the islands.¹⁶¹ In Tuvalu, tourism is proposed to have the highest growth potential of any

¹⁵¹ ADB, 2013. The Economics of Climate Change in the Pacific

¹⁵² Couch, C.S. *et al.* 2017. PLOS. Mass coral bleaching due to unprecedented marine heatwave in Papahānaumokuākea Marine National Monument (Northwestern Hawaiian Islands)

¹⁵³ The Guardian, 2014. Major coral bleaching in Pacific may become worst die-off in 20 years, say experts. Available at: <https://www.theguardian.com/environment/2014/dec/19/major-coral-bleaching-pacific-may-worst-20-years>

¹⁵⁴ ADB, 2013. The Economics of Climate Change in the Pacific

¹⁵⁵ UNFCCC, 2015. Tuvalu Second National Communication

¹⁵⁶ UNFCCC, 2013. Palau Second National Communication

¹⁵⁷ ADB, 2013. The Economics of Climate Change in the Pacific

¹⁵⁸ SPC, 2020. Statistics for Development Division. Economic and Social Impact Indicators. Gross Tourism Receipts % of GDP – 2018. Available at: <https://sdd.spc.int/news/2020/04/29/economic-and-social-impact-covid-19-pandemic-pacific-island-economies>

¹⁵⁹ Global Tenders, 2020. Economy and Business Opportunities for Palau. Available at: <https://www.globaltenders.com/economy-of-palau.php>

¹⁶⁰ TRC Tourism, 2019. Niue Working Towards Being One of the World's Leading Sustainable Tourism Destinations. Available at: <https://www.trctourism.com/niue-working-towards-becoming-one-of-the-worlds-leading-sustainable-tourism-destinations/>

¹⁶¹ Import-Export Solutions, 2020. Marshall Islands: Country Risk. Available at: <https://import-export.societegenerale.fr/en/country/marshall-islands/economy-country-risk>

industry. Long-standing recommendations for development of the tourism sector are stated in its National Tourism Development Strategy 2015-2019.¹⁶²

The inter-relationship between climate and tourism in the Pacific is complex and multi-faceted – climate is both a resource to be exploited for economic development, as well as a limiting factor that poses significant risks to both the industry and to tourists.¹⁶³ Climate change can impact the tourism industry “by changing the attractiveness of the climate of tourism destinations, by reducing the value of attractions at destinations, and by altering the relative climate of the home countries of tourists.”¹⁶⁴ Climate change can also directly impact on environmental resources that serve as tourist attractions in Pacific island countries. Widespread resource degradation such as beach erosion and coral bleaching is likely to negatively affect the perception of destination attractiveness.¹⁶⁵ A study commissioned by the Asian Development Bank predicted that global warming will lessen the Pacific island region as a tourism attraction; and reduce tourism revenues by around 30% for the Pacific region as a whole, under all climate scenarios.¹⁶⁶

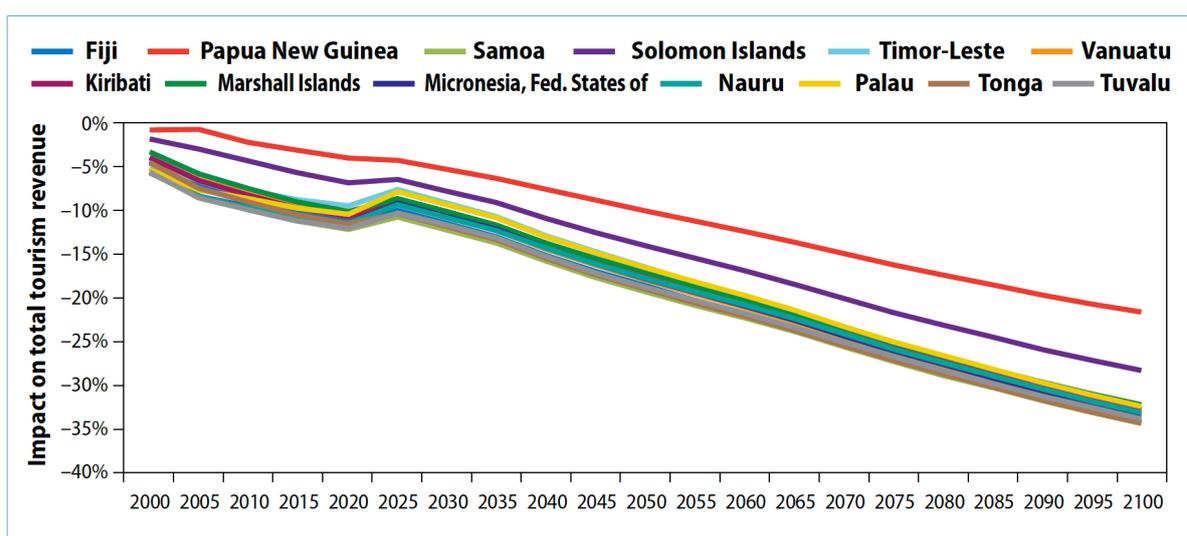


Figure 18. Impact of climate change on national tourism revenue under the A1 scenario. (Source: ADB)

Interconnectivity between the COVID-19 pandemic and climate change

As of 12 June 2020, there were 312 reported cases and seven deaths attributed to COVID-19 across the Pacific island region. None of the five Programme countries have yet been affected; however, a State of Emergency was declared in Cook Islands, Palau, RMI and Tuvalu.¹⁶⁷ UNDRR has highlighted that as Pacific island countries enter their cyclone, drought, heatwaves or monsoon seasons, the potential for an ‘unprecedented double disaster’ is increasing.¹⁶⁸

COVID-19 represents a significant challenge for the Pacific island region, on account of several risk factors:

- Limited access to quality health services due to lack of infrastructure, equipment and qualified personnel;
- Lack of laboratory equipment needed to analyse tests on site, which impedes the identification of cases;

¹⁶² Government of Tuvalu, 2016. Te Kakeega III. National Strategy for Sustainable Development 2016 – 2020

¹⁶³ Pacific Meteorological Council, 2016. Pacific Roadmap for Strengthened Climate Services 2017 - 2026

¹⁶⁴ ADB, 2013. The Economics of Climate Change in the Pacific

¹⁶⁵ Wong, P. *et al.* 2014. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Low-Lying Areas

¹⁶⁶ ADB, 2013. The Economics of Climate Change in the Pacific

¹⁶⁷ WHO, 2020. COVID-19 Joint External Situation report 19 – Western Pacific

¹⁶⁸ UNDRR, 2020. UNDRR Asia Pacific COVID-19 Brief. Combating the dual challenge of COVID-19 and climate-related disasters

- Tourism increases movement of people to and from the islands (although restrictive measures have been put in place); and
- Restrictions to tourism present a risk to local economies.¹⁶⁹

In April 2020, the Secretary General of the Pacific Islands Forum emphasised that “climate change induced disasters can exacerbate the COVID-19 crisis” in Pacific SIDS, as exemplified by Cyclone Harold in the Solomon Islands, Vanuatu, Fiji and Tonga.¹⁷⁰ In the aftermath of Cyclone Harold, challenges to disaster relief efforts included the need to quarantine critical humanitarian aid supplies resulting in delays to distribution; limited rescue efforts due to the rescue helicopter pilot being in coronavirus quarantine; delayed recovery support in outer islands due to domestic travel restrictions; and limited budget allocations to address cyclones as scarce resources are transferred to address the urgent needs presented by the pandemic.¹⁷¹

The Pacific Community (SPC) has reported that the expected sharp decline in tourist arrivals due to COVID-19 restrictions will hit hard on Pacific island economies that rely heavily on tourism for growth and development – including Cook Islands, Niue and Palau. Similar earnings and job losses can be expected in emerging and nascent tourism destinations, such as RMI and Tuvalu. Weaker demand for tourism link industries such as transport and food may further impede growth and development recovery for many months, and into 2021. The potential economic losses from tourism sector declines are outlined in the table below.¹⁷²

Potential Economic Losses from Tourism Sector Declines						
Economy	Best case		Moderate case		Worst case	
	Estimated economic losses		Estimated economic losses		Estimated economic losses	
	% of GDP	USD	% of GDP	USD	% of GDP	USD
Cook Islands	4.61	21.3 million	10.00	46.3 million	16.03	74.2 million
Niue	3.48	1.7 million	6.23	3.5 million	12.94	7.2 million
Palau	4.61	10.3 million	5.43	12.1 million	7.08	15.8 million
RMI	0.49	2.1 million	0.61	2.6 million	0.82	3.5 million
Tuvalu	0.84	1.0 million	1.16	1.5 million	1.58	1.6 million

Table 7. Potential economic losses from tourism sector declines under three scenarios. (Source: SPC)

Under the Moderate Case Scenario – with a 70% decline in tourism outbound and receipts – Cook Islands is expected to incur the highest GDP contribution loss of all 14 Pacific island countries. Under the Worst Case Scenario – with a 90% decline in tourism outbound and receipts – Cook Islands, followed by Niue, are expected to incur the highest GDP contribution losses in the Pacific island region.

The COVID-19 pandemic highlights how risks rise significantly with compounding extreme events, with social and economic impacts escalating across all areas of life. Despite the decrease in greenhouse gas emissions as a result of the pandemic, SIDS continue to be affected by existing climate change impacts and must address these simultaneously to responding to the pandemic.¹⁷³ UNDRR has emphasised the need to “focus on a multi-hazard integrated disaster risk management approach that includes high levels of disaster preparedness and

¹⁶⁹ SPC, 2020. COVID-19: Pacific Community Updates. Regional Challenges. Available at: <https://www.spc.int/updates/blog/2020/06/covid-19-pacific-community-updates>

¹⁷⁰ Pacific Islands Forum Secretariat, 2020. COVID-19 and Climate Change: We Must Rise to Both Crises. Available at: <https://www.forumsec.org/2020/04/17/covid-19-and-climate-change-we-must-rise-to-both-crises/>

¹⁷¹ Climate Analytics, 2020. Coronavirus crisis underscores small islands’ climate vulnerability. Available at: <https://www.climatechangenews.com/2020/04/17/coronavirus-crisis-underscores-small-islands-climate-vulnerability/>

¹⁷² SPC, 2020. Statistics for Development Division. Economic and Social Impact Indicators. Available at: <https://sdd.spc.int/news/2020/04/29/economic-and-social-impact-covid-19-pandemic-pacific-island-economies>

¹⁷³ Climate Analytics, 2020. Coronavirus crisis underscores small islands’ climate vulnerability. Available at: <https://www.climatechangenews.com/2020/04/17/coronavirus-crisis-underscores-small-islands-climate-vulnerability/>

accelerated disaster risk reduction across sectors” as a priority action to enhance the resilience of Pacific SIDS to the dual challenge of pandemics and climate-related hazards.¹⁷⁴

Baseline climate information services

As their climate becomes more chaotic and unpredictable,¹⁷⁵ the impact of these changes in the Cook Islands, Niue, Palau, RMI and Tuvalu is magnified by a lack of data and therefore of information, and by uncertainty about how to prepare for or respond to highly variable climate conditions, and whose advice to use.

Each of the five countries has a WMO Category 1 (Basic level) National Meteorological and Hydrological Service (NMHS), which provides local weather forecasts and seasonal (3 to 9 month) climate projections of probable rainfall across growing seasons. The Cook Islands, Niue and Tuvalu are government funded and use forecasts generated by the Fiji Meteorological Service in its role as the Regional Specialised Meteorological Centre, and Palau and RMI Weather Services receive forecasts from NOAA who also supports them financially.¹⁷⁶

The NMHSs in all five countries are currently able to generate basic climate observations, and conduct data management and interaction with users of their national data and the forecasts that they receive. However, the quality of forecasts (and information products generated from them) is limited by the unavailability of good data from terrestrial and sea surface observation points over a wide geographical area.

Lack of data from their vast ocean areas and widely dispersed outer islands, changing climatic conditions, capacity constraints and lack of coordination among responsible agencies also make it difficult for Pacific SIDS to put in place comprehensive and sustained climate information and multi-hazard early warning systems (MHEWS). None of the five Programme countries has access to adequate ocean data and none have sufficient climate services staff able to work directly with climate-sensitive sector agencies or communities. Issues common to all NMHSs of Pacific SIDS identified in the *Pacific Island Meteorological Strategy 2017–2026*¹⁷⁷ are summarised below. However, it should be noted that the circumstances of the five very small countries in this Programme differ from those of larger Pacific island nations.

- **Weather Services:** Many NMHSs in the region operate with poor infrastructure and with staffing constraints. Communication to communities and other user groups requires strengthening. In addition to training in technical areas, NMHSs require public financial management and IT training.¹⁷⁸
 - This applies particularly to very small SIDS, whose forecasts are generated using low-resolution data from too few observation points.
 - Communication of weather services will benefit from several Programme activities, including the development of accessible language and visual presentation, and the improvement of communication technology and coverage. (*Results 2 and 3*)
 - Financial management training, including on options for securing long-term financing of climate services, will strengthen the capacity of NMHSs to negotiate more secure base appropriation as the value of their services is demonstrated through this Programme. (*Result 4*)

¹⁷⁴ UNDRR, 2020. UNDRR Asia Pacific COVID-19 Brief. Combating the dual challenge of COVID-19 and climate-related disasters

¹⁷⁵ The frequency of extreme El Niño events is projected to double in the period 1991 – 2090 (Cai *et al.* 2014. DOI: 10.1038/nclimate2100) and changes are projected in the spatial pattern of interannual ENSO-driven variability, particularly with regards to changes in the intensity or location of rainfall during El Niño (Power *et al.* 2013. DOI: 10.1038/nature12580). ENSO plays a significant role in influencing tropical cyclone risk throughout the tropical Pacific (Australian BoM and CSIRO, 2011. Climate Change in the Pacific: Scientific Assessment and New Research) and is a dominant driver of drought (McGree *et al.* 2016. DOI: 10.1175/jcli-d-16-0332.1). Whilst increased frequency of ENSO events is projected, “long-lead predictions of El Niño and La Niña are still lacking” (Petrova *et al.* 2020. DOI: 10.1175/jcli-d-18-0877.1). Therefore, although extreme El Niño events and related impacts are increasing in frequency, the exact timing of such events cannot be reliably predicted.

¹⁷⁶ Services are provided by the US National Ocean and Atmospheric Agency’s Pacific Weather Service Headquarters in Hawaii

¹⁷⁷ SPREP, 2012. Pacific Islands Meteorological Strategy 2017-2026: Sustaining Weather, Climate, Water and Ocean Services in Pacific Island Countries and Territories

¹⁷⁸ This particularly applies to very small Pacific countries such as the five in this proposed Programme.

- ICT-focused technical training will facilitate NMHSs to introduce innovative and cost-saving methods and systems for enhanced observations, monitoring and prediction. (*Result 4*)
- **Climate Services:** As qualified collectors and analysers of national and local climate data, NMHSs have a thorough understanding of climate processes and change and of the practical implications for their countries. NMHSs need to enhance work with other national agencies responsible for adaptation planning, aid coordination, disaster preparedness and risk reduction, and to international advocacy and negotiation. The value of their expertise and local knowledge should be reflected in the allocation of funding for climate change data collection and analysis and adaptation planning.
 - This applies to the five Programme countries and is a major focus of the Programme. The development of agreements among the national agencies involved in hazard identification and prediction, disaster risk reduction strategies, dissemination and communication of advice on extreme events, and response actions are essential to reducing the impacts of climate change.
 - Improved or new legislation, where requested, and strategic plans that formalise roles, responsibilities and coordination mechanisms with national agencies, such as disaster management organisations and public broadcasters, will be developed through Result 1.
- **Ocean Services:** In many Pacific island countries, there is no official purveyor of ocean information, and enquiries are directed to the NMHS. The Pacific Islands Meteorological Strategy has identified ocean services as a long-term goal. Technical skills for ocean services are a priority.
 - NMHSs report high demand for ocean climate information services. In the absence of observation equipment only low-resolution data is available and it cannot be verified by in-situ observations. This has implications for climate and weather prediction both locally and globally and limits the ability of Pacific SIDS to provide reliable and timely early warnings. The Programme will establish end-to-end ocean information services and targeted early warning systems. (*Results 2 and 3*)
- **Hydrology:** To support the needs of NMHSs for drought and flood forecasting, priority needs include data management and sharing, technical support, downscaling modelling on water resource uses, and integration of climate science in water resource planning.¹⁷⁹
 - The Programme proposes to invest in proactive data sharing and management at national level through the existing regional GEF-funded “Inform” project.¹⁸⁰ Lessons learnt from previous projects will inform approaches to drought forecasting and management.

An overview of the status of Human Resources NMHSs compiled by WMO indicates that Pacific NMHSs face serious needs for capacity strengthening in all professional areas, but in particular of Meteorologists, Climatologists and Meteorological Technicians¹⁸¹ as follows:

¹⁷⁹ SPREP, 2016, Pacific Island Meteorological Strategy 2017-2026.

¹⁸⁰ <https://www.sprep.org/inform>

¹⁸¹ https://library.wmo.int/doc_num.php?explnum_id=4184

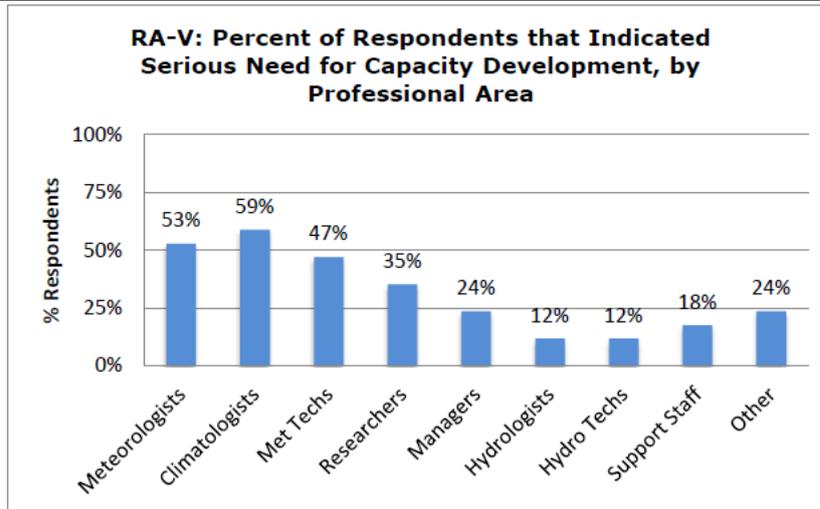


Figure 19. RA-V NMHS capacity development needs by professional area (Source: WMO)

Regional Specialised Meteorological Centres (RSMC) are responsible for the distribution of official information, advisories and warnings for one or more specific weather types such as severe weather, tropical cyclones or hurricanes in a defined geographical area of responsibility, as part of the World Meteorological Organization's (WMO's) World Weather Watch.¹⁸² In the Pacific, the Fiji Meteorological Service (FMS) operates as a RSMC and is responsible for issuing advisories on tropical cyclones in the broad area south of the equator, extending from the east coast of Australia to French Polynesia and beyond. However, due to existing arrangements between Fiji and other centres (Wellington, NZMet and Brisbane, BoM) in the Southwest Pacific, Fiji's primary area of responsibility now covers from the equator to 25° south and 160° east to 120° west. RSMC Nadi (Fiji)–Tropical Cyclone Centre names and tracks all tropical cyclones in this area and issues regular tropical cyclone and other warning and advisory services for marine and public interest and safety. It also provides weather forecasts for Cook Islands, Niue and Tuvalu. FMS has been providing this service free of charge since its inception as an RSMC in 1995. For the two northern Pacific countries, as part of NOAA, Guam National Weather Service (NWS) Office provides weather forecasts and tropical cyclone watches, warnings and advisories for Micronesia, which includes Palau and RMI. All five of the countries' NMHSs then disseminate the forecasts and provide local support and guidance to their communities. Guam NWS forecasts are based on the forecast issued by the Joint Typhoon Warning Center (JTWC).¹⁸³ The JTWC is responsible for the issuing of tropical cyclone warnings in the North-West Pacific Ocean, South Pacific Ocean, and Indian Ocean for all branches of the U.S. Department of Defence and other U.S. government agencies.

The JTWC uses NASA satellite data such as the Tropical Rainfall Measuring Mission's (TRMM) Microwave Imager (TMI) and its precipitation radar, Aqua's Advanced Microwave Scanning Radiometer (AMSR-E), the CloudSat cloud radar, and the Moderate Resolution Imaging Spectroradiometer (MODIS) onboard both of NASA's Aqua and Terra satellites. Fiji RSMC uses data from Japan's Himawari satellite. Himawari-8 and -9 are geostationary weather satellites operated by the Japan Meteorological Agency (JMA).

The GFCS categorises NMHS climate services as Basic to Advanced (Figure 14). The climate services in the five participating countries can be categorised mostly as Basic (Category 1). The NMHSs in the Programme countries currently perform the first five functions at various levels and have some capacity in seasonal forecasting and climate monitoring. The proposed Programme interventions will enable them to develop capacity in specialised and customised climate products and climate application tools and establish themselves as Essential (Category 2) services. Further details regarding the current status of climate services provided by NMHSs in each of the five countries are provided in the Feasibility Study (Annex 2).

¹⁸² <http://severeweather.wmo.int/rsmcs.html>

¹⁸³ <https://www.metoc.navy.mil/jtwc/jtwc.html>

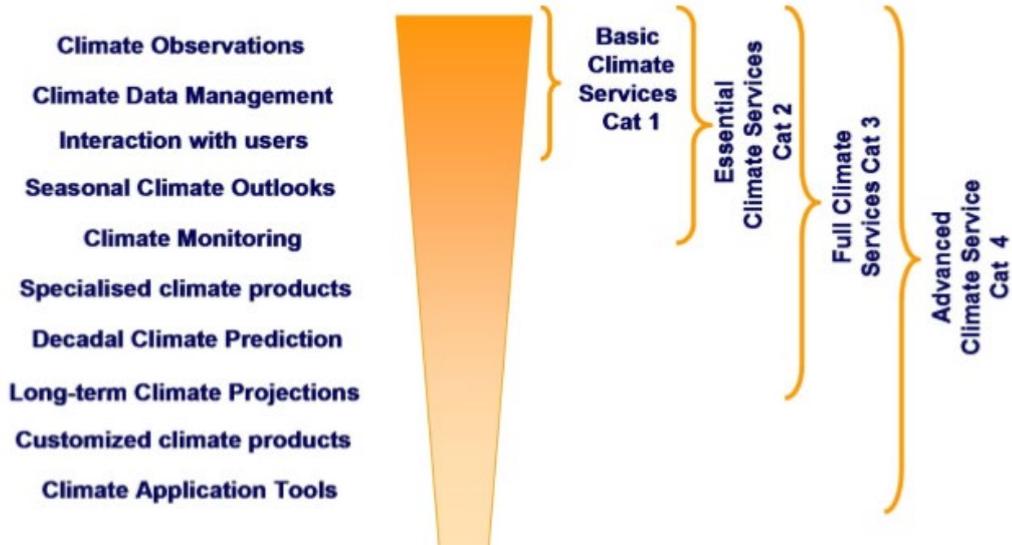


Figure 20. Types of climate products and services by category of national climate service provider¹⁸⁴

While the staff of NMHSs in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu have many competencies and are committed to providing climate and weather services, they are constrained by the limits of the human, financial and technical resources available to them.¹⁸⁵ These factors limit the use of climate information for early response actions, decision-making, planning, policies and behavioural change. Dispersed Pacific island communities, such as in Cook Islands, Palau, RMI, and Tuvalu, are particularly vulnerable due to a lack of awareness of existing climate data and information as a result of inadequate communications systems with remote outer islands. These countries have a number of outlying islands with weak communication and transport networks. Consequently, these communities often lack access to and understanding of actionable climate information, which is needed for initiating timely responses or enhancing their resilience.

Disaster risk management in the Pacific

In 2016, the Pacific Islands Forum Leaders endorsed the Framework for Resilient Development in the Pacific: An Integrated Approach to Address Climate Change and Disaster Risk Management (FRDP). The Pacific Resilience Partnership (PRP) was established in 2017 to bring together climate change and disaster risk management communities and other partners (e.g. government representatives, relevant sectors and private sector and civil society stakeholders) to support and facilitate effective implementation of the FRDP across the Pacific region. The FRDP provides high level voluntary strategic guidance on how to enhance resilience to climate change and disasters based on three inter-related Goals: i) Strengthened integrated adaptation and risk reduction; ii) Low-carbon development; and iii) Strengthened disaster preparedness, response and recovery.¹⁸⁶ The Programme will adopt a regional integrated approach to directly address Goals 1 and 3 of the Framework, and will create an enabling environment to support Goal 2.

At the national level, disaster risk management (DRM) is organised as shown in the table below:

Country	Institutional arrangements for DRM	National policy / framework / plan for DRM
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¹⁸⁴ <http://gfcs.wmo.int>

¹⁸⁵ SPREP, Pacific Roadmap for Strengthened Climate Services 2017–2026.

¹⁸⁶ SPC, SPREP, PIFS, UNDP, UNISDR and USP. 2016. Framework for Resilient Development in the Pacific: An Integrated Approach to Address Climate Change and Disaster Risk Management (FRDP) 2017-2030

Cook Islands	Emergency Management Cook Islands (EMCI) coordinates all DRM activities and provides policy advice to the National Disaster Risk Management Council (NDRMC), which is chaired by the Prime Minister. The National Disaster Risk and Climate Change Platform was formed in 2011 and comprises government, non-government and civil society organisation representatives. The Platform stakeholders meet quarterly to share information and discuss current and future climate change and disaster management related projects and initiatives in Cook Islands. ¹⁸⁷	Second Joint National Action Plan (JNAP II) for Climate Change and DRM 2016-2020
Niue	The National Disaster Council (NDC) is responsible for day-to-day coordination for hazards, with the Police undertaking much of the required work – including risk reduction and awareness raising. In times of disaster, the Chief of Police provides leadership in overall response, relief and initial recovery. ¹⁸⁸	Joint National Action Plan (JNAP) for Climate Change Adaptation and Disaster Risk Management 2012-2015
Palau	The National Emergency Management Office (NEMO) is responsible for the coordination and implementation of preparedness, response and immediate relief actions. NEMO is also responsible for day-to-day disaster risk management activities and stakeholder engagement. The National Disaster Coordinator (NDC) is the coordinator of NEMO and assumes overall control and coordination responsibilities of the National Emergency Committee (NEC). The NEC operates from the National Emergency Operations Center (NEOC) as required in times of disaster. ¹⁸⁹	Palau Climate Change Policy for Climate and Disaster Resilient Low Emissions Development 2015 National Disaster Risk Management Framework (NDRMF) 2010
Marshall Islands	The National Disaster Committee (NDC) is the principal body responsible for DRM policy, strategic action and monitoring in RMI. The Secretariat for the NDC is the National Disaster Management Office (NDMO), which is the coordination centre for day-to-day DRM activities and in times of disaster. At the outer island / atoll level, the implementation of national DRM arrangements are the responsibilities of the Outer Island / Atoll Disaster Risk Management Committees. ¹⁹⁰	The National Disaster Risk Management Arrangements (NDRMA) 2017 Joint National Action Plan (JNAP) for Climate Change Adaptation and Disaster Risk Management 2014-2018
Tuvalu	The National Disaster Committee (NDC) is coordinated by the National Disaster Management Office (NDMO), which is housed in the Office of the Prime Minister. The NDC is responsible for coordinating all activities related to disaster management programming, policy development and implementation. The Island Disaster Committees (IDCs) act as a bridge between the NDC and outer island communities during disasters and are responsible for the coordination of disaster management and public education programmes in their respective islands. ¹⁹¹ The NSAP recommends that the National Climate Change Advisory Committee and NDC should merge for the purpose of coordinating and driving implementation of the NSAP. ¹⁹²	National Strategic Action Plan (NSAP) for Climate Change and Disaster Risk Management 2012-2016 Tuvalu Climate Change Policy (<i>Te Kaniva</i>) 2012-2021

¹⁸⁷ Cook Islands, 2016. The Cook Islands Second Joint National Action Plan 2016-2020

¹⁸⁸ Niue, 2012. Joint National Action Plan for Disaster Risk Management and Climate Change

¹⁸⁹ Center for Excellence in Disaster Management and Humanitarian Assistance, 2020. Palau Disaster Management Reference Handbook

¹⁹⁰ Republic of the Marshall Islands, 2017. National Disaster Risk Management Arrangements

¹⁹¹ Tuvalu, 1997. National Disaster Risk Management Plan

¹⁹² Tuvalu, 2012. Tuvalu National Strategic Action Plan for Climate Change and Disaster Risk Management 2012-2016

Table 8. Overview of disaster risk management (DRM) arrangements in the five Programme countries

Financing for climate services and disaster risk management

Many Pacific island countries face significant fiscal challenges to addressing climate change. The cost of adaptation measures required to address climate threats far exceeds many of the countries' financial capacities. External finance is therefore essential to the Pacific islands as means of supplementing government expenditures through the national budget process.¹⁹³ The national budgeting and financial arrangements for spending on climate change and disaster risk management for the five countries are detailed below:

- Cook Islands:** The estimated climate change spending for the financial period 2016/17 – 2019/20 was 16% of total appropriation within the national budget. 7% was covered by the Government of Cook Islands, 6% by development partners and 3% by borrowings (loans). Total climate change finance equates to 9% of GDP.¹⁹⁴ The Cook Islands Disaster Emergency Trust Fund was initiated with a transfer of NZD 200,000 from the Government Reserve Trust Fund in the 2011/12 financial year. The Fund is limited to emergency response and early recovery activities and is not intended for longer-term recovery.¹⁹⁵ As of November 2016, the Fund had a balance of NZD 1.5 million (approximately USD 900,000).¹⁹⁶
- Niue:** There is no national budget allocation for climate change programming in Niue. Through the GCF Readiness and Preparatory Support programme, SPREP is building the capacity of Niue to manage and streamline climate finance.¹⁹⁷ Disaster risk management is not budgeted for explicitly and Niue does not have national or sectoral contingency funds for disaster response (except for Niue Power Board, which has funds for emergency responses).¹⁹⁸ The JNAP estimates that the total cost for implementation is NZD 2,117,255 (approximately USD 1.3 million), with NZD 268,037 (approximately USD 160,000) coming from in-kind contributions made by the Government of Niue and partners (such as SPC/SOPAC and SPREP).¹⁹⁹
- Palau:** There is no national budget allocation for climate change programming in Palau. There is also no dedicated budget to finance post-disaster needs, resulting in reallocation of funds from development priorities for disaster relief efforts. The Palau Climate Change Policy 2015 estimates that the cost to implement the first 5-year Action Plan across government and sectors is around USD 500 million. This includes USD 393 million for climate change adaptation measures and USD 40.8 million for disaster risk management. The Action Plan includes establishment of a USD 25 million disaster contingency fund and a USD 11 million National Disaster Recovery Fund and Insurance Program, neither of which is in place.^{200, 201}
- Marshall Islands:** There is no national budget allocation for climate change programming in RMI, with funding provided by donors and therefore off-budget.²⁰² However, in May 2019, a climate finance management workshop for key ministries and development partners was held in collaboration with the NDC Partnership. The aim of the workshop was to explore the setup of a national climate finance mechanism to support the Government in managing and leveraging climate change-related funds,

¹⁹³ Stockholm Environment Institute, 2017. Climate finance in the Pacific: An overview of flows to the region's Small Island Developing States

¹⁹⁴ Cook Islands, 2019. GCF Country Programme

¹⁹⁵ Government of Cook Islands, 2011. Policy Governing the Establishment and Operation of the Cook Islands Disaster Emergency Trust Fund (CI DE-TF)

¹⁹⁶ ADB, 2016. Proposed Policy-Based Loan Disaster Resilience Program (Cook Islands)

¹⁹⁷ SPREP, 2017. Readiness Proposal - Niue

¹⁹⁸ Niue Police Force, 2012. National progress report on the implementation of the Hyogo Framework for Action (2011-2013) - Interim

¹⁹⁹ Niue, 2012. Niue's Joint National Action Plan for Disaster Risk Management and Climate Change

²⁰⁰ ADB, 2018. Proposed Policy-Based Loan Republic of Palau: Disaster Resilience Program

²⁰¹ Palau, 2015. Palau Climate Change Policy

²⁰² Global Climate Change Alliance: Pacific Small Island States (GCCA: PSIS) Project, 2013. Review of mainstreaming of climate change into national plans and policies: Republic of the Marshall Islands

strategic projects for mitigation, adaptation and resilience, and strengthened internal systems for climate action. The meeting resulted in agreement on a “Climate Finance Action Plan”²⁰³ for strengthening climate financing in RMI.²⁰⁴ A Contingency Fund of USD 200,000 is resourced annually by the Government of RMI and can be accessed for any emergency, including natural disasters. The Disaster Assistance Emergency Fund (DAEF) is resourced annually by the Governments of RMI and the U.S. RMI must contribute a minimum of USD 200,000 to be matched by the U.S. Government. In 2016, a Disaster Response Fund was established to allocate USD 2 million from the general budget for emergencies.²⁰⁵ The DAEF is reserved only for disaster response. Disaster risk reduction is funded through ad-hoc projects and initiatives.²⁰⁶

- **Tuvalu:** The Tuvalu Climate Change and Disaster Survival Fund – the “Tuvalu Survival Fund” (TSF) – was established in 2016 to support adaptation and mitigation actions to respond to climate change impacts and disaster risks.²⁰⁷ Contributions to the TSF are made from the national budget, with 10% of GDP allocated in 2016 (although no contribution was made in 2017 due to a fiscal deficit).²⁰⁸ A transfer of USD 2,166,667 to the TSF was forecast for 2018.²⁰⁹ The financial cost of implementing the NSAP over the period 2012 – 2016 was estimated to be AUD 6,338,004 (approximately USD 4 million), to be sourced entirely from development partners.²¹⁰

Lessons from other projects and programs

There are several projects addressing aspects of climate information management in Pacific countries. For example, the **Pacific Climate Change Science Programme (PCCSP)**²¹¹ generated the most detailed scientific assessments and projections of climate change to date for 14 Pacific SIDS. Its 2011 reports and 2015 updates are used in this proposal. The GEF-funded “**Inform**” project implemented by UNEP and executed by SPREP, which is streamlining existing environmental data by putting in place a series of data repositories and tools,²¹² will be used by this Programme to manage each country’s national climate data. All five Programme countries are active participants in the second phase of Australia’s **Climate and Ocean Support Program in the Pacific (COSPPac)** Program, which, with New Zealand’s National Institute of Weather and Atmospheric Research (NIWA) and the US’s National Oceanic and Atmospheric Administration (NOAA), has been involved in the design of this Programme to ensure the long-term complementarity of their inputs.²¹³

The **Global Climate Change Alliance: Pacific Small Island States (GCCA: PSSI)** project is an EU-funded initiative to assist nine smaller Pacific island states (including the five Programme countries) to adapt to climate change that was implemented by the Pacific Community (SPC) from July 2011 – November 2016. The project consisted of on-ground climate change activities, supported by technical assistance, capacity building and regional collaboration. The overall assessment was that the project was highly effective and successful in increasing the capacity of participating countries to adapt to climate change. The Final Evaluation Report identified a number of best practices and lessons learned, including: i) Project incorporated on-ground adaptation projects complemented by climate change mainstreaming and capacity building; ii) Recruitment of competent national coordinators fosters national ownership and was a key success factor for most projects; iii)

²⁰³ RMI, 2019. Climate Finance Action Plan. Available at: <https://www.dropbox.com/s/1e6ker0nnfe42cf/RMI%20Climate%20Finance%20Action%20Plan%20-%20Final%20Draft%20-%20May%202019.docx?dl=0>

²⁰⁴ NDC Partnership, 2019. Press Release: Marshall Islands Takes Next Steps on National Climate Finance Mechanism. Available at: <https://ndcpartnership.org/news/marshall-islands-takes-next-steps-national-climate-finance-mechanism>

²⁰⁵ Government of RMI and Pacific Humanitarian Team, 2017. Republic of the Marshall Islands Country Preparedness Package

²⁰⁶ Center for Excellence in Disaster Management & Humanitarian Assistance, 2019. Republic of the Marshall Islands Disaster Management Reference Handbook

²⁰⁷ Tuvalu, 2015. Climate Change and Disaster Survival Fund Act 2015

²⁰⁸ IMF, 2018. Tuvalu: 2018 Article IV Consultation – Press Release; Staff Report; and Statement by the Executive Director for Tuvalu

²⁰⁹ Tuvalu, 2019. National Budget 2019

²¹⁰ Tuvalu, 2012. Tuvalu National Strategic Action Plan for Climate Change and Disaster Risk Management 2012-2016

²¹¹ Pacific Climate Change Science Programme (<https://www.pacificclimatechangescience.org/>)

²¹² <http://www.sprep.org/inform/home>

²¹³ Comprehensive lists of related projects, completed, being implemented and planned with each country are provided in Annex 2

Embedding senior staff in other regional organisations (e.g. SPREP) fosters regional collaboration and enhances efficiency; iv) Regional and national level training helped build country capacity across common and country-specific needs to support both project delivery and ongoing climate change adaptation; and v) Funding of ‘South-South’ exchange initiatives fosters a regionally-led approach to knowledge sharing. The assessment also highlighted that significant challenges to implementing projects within the Pacific region included transport logistics (unreliable, infrequent and expensive inter and intra-country transport) and both capacity and capability constraints across the government and private sector. SPC identified a general “rule of thumb” to multiply the overall cost and time for outer island projects by two (compared to main islands) when detailed budgets and timelines are not available. These best practices and lessons learnt will be taken into account throughout the Programme development and implementation cycle.

The **Republic of Korea-Pacific Islands Climate Prediction (ROK-PI CliPS)**²¹⁴ project, implemented by the APEC Climate Center (APCC) and SPREP in 2014-2017, has built a regional mechanism to provide locally tailored seasonal climate prediction information and training on downscaled climate predictions in the 14 Pacific island countries. The project developed and launched the CLIK-P and PICASO forecast tools tailored for the Pacific. CLIK-P is a web-based dynamical multi-model ensemble (MME) prediction tool optimised for the Pacific region. PICASO is a hybrid statistical-dynamical seasonal forecast software based on the MME data housed in CLIK-P. A series of trainings, application guideline development, and participatory development activities were conducted to ensure the sustainability of the regional mechanism. The ROK-PI CliPS project was approved for a second phase and is scheduled to be completed in 2021. Through the second phase, the project is updating the forecast tool to address NMHS concerns regarding conflicting seasonal climate models by developing a Consensus Climate Outlook (CoCO) function. The Programme will leverage technical support and incorporate best practices from both APCC and SPREP in the implementation of climate modelling, prediction and forecasting interventions (Result 2) and specialised technical training (Result 4).

The ongoing **Climate Risk and Early Warning Systems (CREWS)** Pacific SIDS Project “Pacific: Strengthening Hydro-Meteorological and Early Warning Services”²¹⁵ is being implemented by WMO in seven Pacific island countries, including Cook Islands, Niue and Tuvalu. The objectives of the project are: i) Strengthened governance structures and mechanisms of the Regional Specialised Meteorological Centre in Fiji (RSMC Nadi) and the seven NMHSs that it serves; ii) Enhanced regional and national facilities and capacities to produce impact-based forecasts and risk-informed warning of extreme and high impact hydrometeorological events; and iii) Enhanced delivery of services and products to MHEWS stakeholders for decision support. The project is also supporting the Pacific islands not served by RSMC Nadi, including Palau and RMI – for example, through the development of long-term strategic plans for their NMHSs (planned for Q3 and Q4 2020).²¹⁶

A proposal for Phase II of the CREWS Pacific SIDS Project intends to further strengthen RSMC-Nadi, regional coordination mechanisms and provide country level support to facilitate more integrated and inclusive early warning systems in the Pacific. Phase II will cover all 14 Pacific island countries. In June 2020, at the 11th Meeting of the CREWS Steering Committee, the allocation of funds for Phase II of the project was approved.²¹⁷ Programme Result 2 will specifically build on CREWS interventions undertaken in Niue, Palau and Tuvalu. The Programme will implement “Contributions to Value” approaches proposed under the CREWS project, including use of gender-sensitive indicators in assessments of NMHS capacities and regional assessments; people-centred early warning systems focused on reaching communities that are not currently well connected with the NMHS; promote coherence through cooperation with ongoing projects and initiatives; and promote an active dialogue with beneficiaries to find solutions to their identified EWS-related problems.

²¹⁴ Pacific Meteorological Desk & Partnership, 2019. Project Description – ROK-PI CliPS. Available at: <https://www.pacificmet.net/project/republic-korea-pacific-islands-climate-prediction-services-project-rok-pi-clips-phase-1>

²¹⁵ CREWS, 2020. Pacific: Strengthening Hydro-Meteorological and Early Warning Services. Available at: <https://www.crews-initiative.org/en/projects/pacific-strengthening-hydro-meteorological-and-early-warning-services>

²¹⁶ CREWS, 2020. Pacific 1.0 Achievements and Rationale for Additional Financing

²¹⁷ CREWS, 2020. CREWS/SC.11/Decisions. The allocation of funds was approved “pending inclusion of the comments raised at the meeting...[T]he approval depends on the availability of funds in the CREWS Trust Fund.

Despite several initiatives having been implemented in the Pacific region, no previous project has so far attempted to address the priorities of the *Pacific Island Meteorological Strategy 2017-2026*²¹⁸ in a comprehensive manner and address all the barriers to effective communication of climate information concurrently—that is, the lack of data, the lack of clarity on roles and responsibilities among national agencies, and the lack of communication to people at “the last mile”. Valuable lessons have been drawn from completed projects that addressed one of these obstacles. A particularly important lesson is that change cannot be sustained unless all the barriers are addressed concurrently. For instance, COSPPac Phase 1 enabled NMHSs to significantly strengthen their capacity to undertake climate forecasting, including forecasting of droughts and drought periods. However, without formal agreement on their role in disaster forecasting, and without effective access to communities and the ability to effect behaviour change, the opportunity to help people prepare for climate impacts is much reduced. In addition, the UNDCF Local Climate Adaptive Living Facility (LoCAL) programme has been piloted to provide capacity development and technical support to local governments in three *kaupules* (island councils) in Tuvalu. At the programme outset, a number of village-level stakeholders were not fully aware of their role and responsibilities. Thus, a major lesson learnt was that meaningful participation of vulnerable and marginalised communities must be ensured to effectively integrate climate risk management activities at the local level.²¹⁹

Another pilot project worked successfully with communities in several Pacific SIDS on understanding and applying basic climate science. However, the communities still receive forecasts and warnings in overly technical English and knowledge of how to use them is lapsing. A tsunami warning project conducted in Samoa demonstrated that engagement with all related disaster management services, agreement on roles and responsibilities and well-organised disaster response drills has a transformative effect: Samoa’s response to an early morning warning in September 2009 was exemplary, although the proximity of the under-sea earthquake meant many of those woken and alerted had no time to reach higher ground.

A further significant lesson from previous climate change-related projects with Pacific SIDS is that it takes years to establish trust in new systems and practices, and information alone, no matter how well presented, does not produce behavioural change. This Programme’s point of difference is that each output reinforces others, addressing all the major structural barriers in concert. Its level of resourcing will make it possible to prompt permanent behaviour changes from multiple entry points. As demonstrated in the below figure, the Programme is fully aligned with the broader context provided by the *Pacific Island Meteorological Strategy 2017-2026*²²⁰ and addresses its priorities in a comprehensive manner in the five countries while reinforcing the coordinating role of the Pacific Meteorological Council (PMC).

²¹⁸ SPREP, 2012. Pacific Islands Meteorological Strategy 2017-2026: Sustaining Weather, Climate, Water and Ocean Services in Pacific Island Countries and Territories

²¹⁹ UNCDF, 2020. LoCAL – Tuvalu. Available at: <https://www.uncdf.org/local/tuvalu>

²²⁰ SPREP, 2012. Pacific Islands Meteorological Strategy 2017-2026: Sustaining Weather, Climate, Water and Ocean Services in Pacific Island Countries and Territories

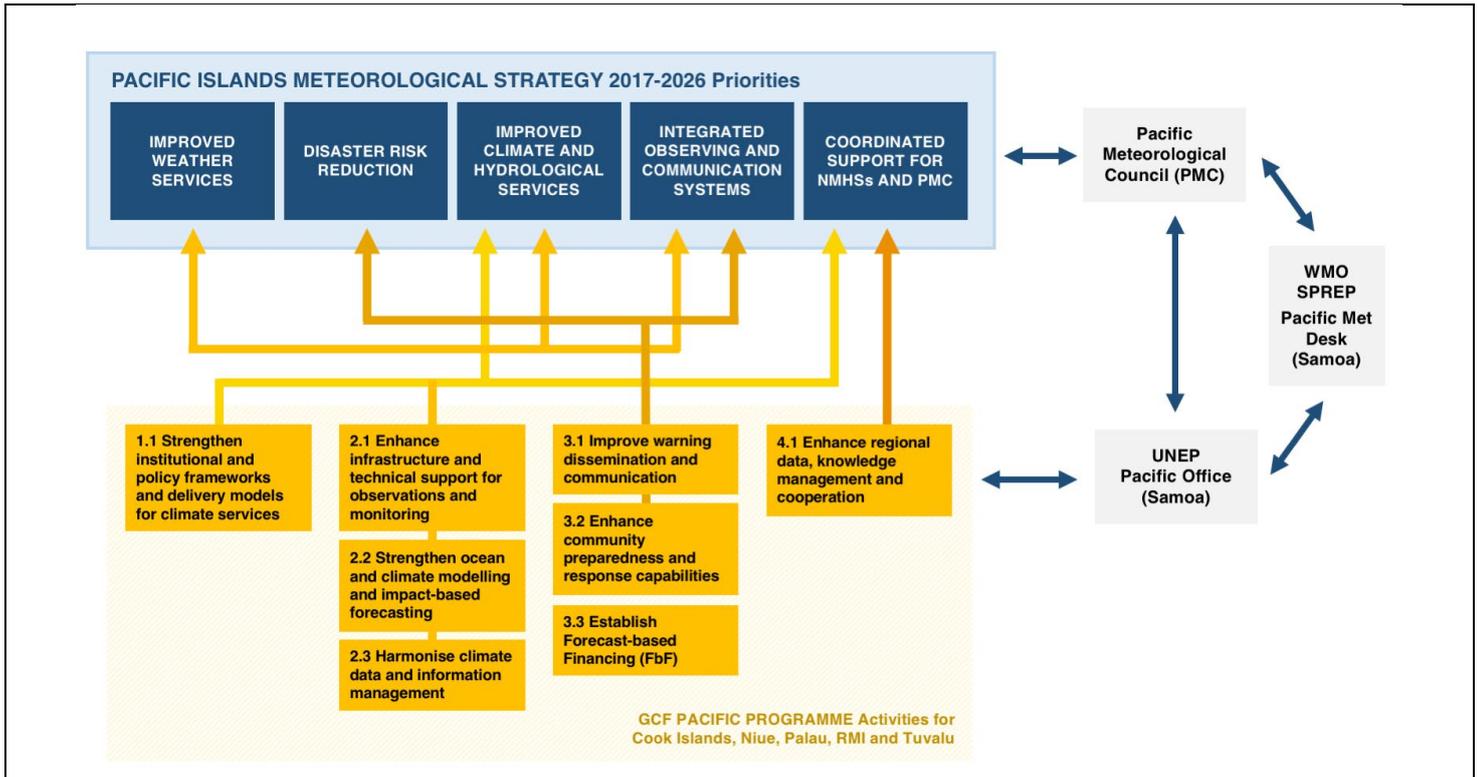


Figure 21. Alignment of the Programme Activities with the Pacific Islands Meteorological Strategy 2017-2026

A more detailed assessment of the baseline, existing projects and priorities in the five countries is provided in the Feasibility Study (Annex 2).

Problem statement

The livelihoods and economies of Cook Islands, Niue, Palau, Republic of the Marshall Islands and Tuvalu depend heavily on the ocean and climate-sensitive sectors such as fisheries, tourism and agriculture. Changes in precipitation and cyclone patterns^{221, 222} are already having devastating effects on the availability of fresh water, agricultural yields and availability of arable land. Fisheries are under threat owing to loss of coral reef, mangrove and sea grass habitats as a result of destructive climate-related events and warming of the sea.²²³ Lives, livelihoods, assets and infrastructure are threatened by several climate-related hazards. Current forecasts are not sufficiently reliable and downscaled for use in disaster risk management. As recognised in the Pacific Island Meteorological Strategy 2017–2026, essential services provided by National Meteorological and Hydrological Services (NMHSs) underpin economic growth and sustainable development in the region and yet they cannot be consistently provided. Their weather, climate, water and ocean information services are critical to the safety and livelihoods of Pacific island populations, but communication of the information is not reliably reaching the people who need it. These services are crucial to enhancing resilience and reducing vulnerability of Pacific people to climate-related hazards and the effects of climate change.²²⁴ However, governments in these small countries need support in integrating climate information from their NMHSs into their planning and management processes.

The Programme will address constraints including gaps in geographical coverage (e.g. of ocean areas and outer islands); lack of capacity to deal with multiple aspects of climate-related risks and hazards; lack of end-to-end

²²¹ Australian Bureau of Meteorology (BoM) and CSIRO, 2011. Climate Change in the Pacific: Scientific Assessment and New Research
²²² McGree, S. *et al.*, 2019. Journal of Climate. Recent Changes in Mean and Extreme Temperature and Precipitation in the Western Pacific Islands
²²³ Mcleod, E. *et al.*, 2019. Frontiers in Marine Science. Lessons from the Pacific Islands – Adapting to Climate Change by Supporting Social and Ecological Resilience
²²⁴ SPREP, 2016, Pacific Island Meteorological Strategy 2017-2026

climate and ocean information services, from data collection to delivery and response of users; inadequate communication and outreach systems, especially to communities on remote outer islands; and a lack of comprehensive early warning systems for disaster risk management.

The common vulnerabilities, climate change impacts and capacity challenges outlined above limit the ability of the five countries to provide reliable, timely advice and early warning on their local weather, climate and ocean environments; as well as science-based advice on adaptation planning for longer term climate change impacts. This restricts their capability to safeguard vulnerable island populations and assets against multiple and compounding climate-related hazards.

“Without the Programme” Scenario

Without the proposed Programme, a “business as usual” scenario is likely to continue, characterised by the poorly coordinated use of insufficient climate data and information. NMHSs will continue to generate basic weather forecasts and useful seasonal rainfall predictions but their information will be based on incomplete data (particularly for ocean areas) and it will not always reach its intended audiences in good time or in a useful form. The roles of agencies responsible for disaster preparation and warnings will often remain unclear and they will operate reactively in the absence of reliable forecasts. Data critical to adaptation planning will be lost or forgotten, or not collected, and maladaptation may result. Communities will find traditional forecasting systems less and less reliable but will not be able to understand the technically worded information available, or how they should use it.

NMHSs’ traditional development partners will continue their support, addressing some of the obstacles to effective adaptation, but underlying barriers will remain and undermine the sustainability of efforts. Severe hardship and loss of lives, assets and livelihoods will escalate as extreme events become more common and less predictable. Maladaptation and inadequate disaster responses are likely to result, and the five countries’ development progress will be halted or even reversed.

Preferred solutions

The preferred solution is to implement integrated climate and ocean information services and impact-based MHEWS in Cook Islands, Niue, Palau, RMI and Tuvalu, simultaneously addressing the major barriers to coherent systems. This will address the common vulnerabilities of the island populations, their livelihoods and assets to climate change impacts and multiple climate-related hazards. As they confront common challenges and vulnerabilities, these five countries have indicated interest in adopting demand-driven solutions that establish sustainable climate information and multi-hazard early warning systems in the same timeframe. This will be achieved through:

- Strengthened delivery model for climate information services and MHEWS covering oceans and islands;
- Strengthened observations, monitoring, modelling and prediction of climate and its impacts on ocean areas and islands;
- Improved community preparedness, response capabilities and resilience to climate risks; and
- Enhanced regional knowledge management and cooperation for climate services and MHEWS.

The Programme will ensure that:

- Governments implement policies, plans and (early) actions based on timely and credible climate information and risk analysis; investments in infrastructure will be climate-informed; public health agencies will be alert to and prepared for the impacts of climate change.
- Integrated climate information and early warning systems are in place in Cook Islands, Niue, Palau, Republic of the Marshall Islands and Tuvalu and sustained in response to continued demand, in recognition of their practical value; and

- Communities adopt new climate-resilient livelihood practices by using improved climate information, risk knowledge and early warning systems: based on the creation of trust through long-term, consistent demonstration of the efficacy of climate science, so that communities use climate information to protect their ecosystem resources and adapt subsistence activities to predicted seasonal conditions.

This transformation to increased resilience and enhanced livelihoods of the populations in the five Pacific SIDS to climate change threats is expected to reduce the damages and losses incurred through increased frequency and intensity of climate-induced disasters, such as flooding and tropical cyclones, by between 15-30%.²²⁵ This assumption is derived from the known impacts of effective early warning, that is, the difference in effective preparation and response if a warning can be delivered and acted upon hours or days earlier than previously, including through Forecast-based Financing.

Barriers

The main barriers to the implementation of integrated and effective climate and ocean information services and MHEWS in the five Programme countries include:

- Lack of legislative, regulatory and policy frameworks and delivery models for climate services (e.g. legislation establishing the role and responsibilities of the weather service and ensuring its funding, clarification of their NMHSs' mandate and the relationship with National Disaster Management Authorities and other national partners);
- Inadequate observation networks and limited climate and ocean sector-specific information (including the use of outdated technologies and gaps in geographical coverage of monitoring and observation);
- Limited preparedness, understanding and use of climate and ocean information (including limited access to expertise for analysis of climate risks and hazards, climate modelling and hydro-meteorological data; inadequate resources for delivery of tailored, appropriately-packaged climate information and early warnings to end-users; limited capacity of vulnerable communities and sectors to interpret and use climate information services); and
- Limited regional cooperation, knowledge management and training for climate services (e.g. in an archipelagic country such as the Cook Islands climate risks are amplified for communities on outer islands by a lack of local climate data, unreliable communication links and a lower level of awareness of both risks and available services).

The effect of these barriers is that island communities, policy and decision-makers are not being provided with the accurate, timely and actionable climate information required to address the climate change risks and hazards facing their islands, countries and the Pacific region at large.

Furthermore, it should be noted that as reaffirmed by the UN General Assembly in the 2019 *Political declaration of the High-Level Meeting to Review Progress Made in Addressing the Priorities of Small Island Developing States through the Implementation of the SIDS Accelerated Modalities of Action (SAMOA) Pathway*, SIDS remain a special case for sustainable development as they continue to face the combined challenges arising, in particular, from their geographical remoteness, the small scale of their economies, **high costs and the adverse effects of climate change and natural disasters**.²²⁶ The small size, remoteness and insularity of SIDS pose daunting challenges in amongst others transport logistics. For example, domestic inter-island shipping services in many countries of the Pacific region – especially to outer islands – are infrequent, unreliable and expensive. Similarly, air travel in the Pacific often involves long-haul, multi-leg and expensive flights in the

²²⁵ Giorgetti, A. (2018). Preliminary Cost-Benefit Analyses of Early Warning Systems for the Mitigation of Natural Disasters. Timor Leste, Papua New Guinea, Solomon Islands, Vanuatu and Fiji. Final Report prepared for WMO, February 2018; Subbiah, A., Bildan and L., Narasimhan, R. (2008). Background Paper on Assessment of the Economics of Early Warning Systems for Disaster Risk Reduction. World Bank Group for Disaster Reduction and Recovery.

²²⁶ <https://undocs.org/pdf?symbol=en/A/74/L.3>

absence of direct flight connectivity.²²⁷ Therefore, the cost of travel, general logistics and transactions in the Pacific region are comparatively higher than in many other parts of the world.

B.2. Theory of change (max. 1000 words, approximately 2 pages plus diagram)

The Programme interventions aim to shift the paradigm away from the current “business as usual”, characterised by the poorly coordinated use of insufficient climate data and information towards a **new paradigm** in which accurate, timely and actionable climate information is used in policy, planning and response actions, and enables sectors and communities in the five Pacific island countries to adapt to increasing climate variability and change. In order to effect this transformation, the following **key barriers to adaptation** will have to be overcome in the five Pacific SIDS covered by this Programme:

- 1) Lack of legislative, regulatory and policy frameworks and delivery models for climate services, as also highlighted in the 2030 Agenda for Sustainable Development and its Sustainable Development Goal (SDG) 13, target 13.b, which aims to “*Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States*”.
- 2) Inadequate observation networks and limited climate and ocean sector-specific information, as also recognised under the Paris Agreement Article 7, 7c, which stresses the need for “*Strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making*”.
- 3) Limited preparedness, understanding and use of climate and ocean information, as also recognised by the Sendai Framework on Disaster Risk Reduction, which highlights in I, 14 that “*there is a need to address existing challenges and prepare for future ones by focusing on monitoring, assessing and understanding disaster risk and sharing such information...and enhancing multi-hazard early warning systems...*” and in III, 19g that “*Disaster risk reduction requires a multi-hazard approach and inclusive risk-informed decision-making based on the open exchange and dissemination of disaggregated data...*”.
- 4) Limited regional cooperation, knowledge management and training for climate services, as also recognised under the Paris Agreement Article 7, 7a which stresses the need for “*Sharing information, good practices, experiences and lessons learned, including, as appropriate, as these relate to science, planning, policies and implementation in relation to adaptation actions*”.²²⁸

To address these barriers, the proposed Programme will establish integrated climate and ocean information services and MHEWS in Cook Islands, Niue, Palau, RMI and Tuvalu. This will be achieved through the following four inter-related **Programme Results**, which also aim at creating enabling conditions for scaling up and replicating the Programme impact beyond the immediate target area. The Programme Results are based on the pillars of Global Framework for Climate Services, a UN-wide initiative coordinated by the World Meteorological Organization (WMO).

- 1) *Strengthened delivery model for climate information services and MHEWS covering oceans and islands.* Amongst others, each country will establish a National Framework for Climate Services (NFCS) based on the GFCS to coordinate, facilitate and strengthen collaboration among national institutions for enhanced use of climate information and provision of climate services and to facilitate a long term sustainable business delivery model.
- 2) *Strengthened observations, monitoring, modelling and prediction of climate and its impacts on ocean areas and islands.* This will be based amongst others on guidance from the Global Climate Observing System (GCOS), of which the AE is one of the co-sponsors, and facilitate compliance with global

²²⁷ https://unctad.org/meetings/en/SessionalDocuments/cimem7d8_en.pdf

²²⁸ United Nations, 2015. Paris Agreement

frameworks and standards such as the Global Basic Observing Network (GBON) for surface-based observations. As a result of the Programme, the five NMHSs will transform from “Basic” (WMO category 1) to “Essential” (WMO category 2) services.

- 3) *Improved community preparedness, response capabilities and resilience to climate risks.* This will be based on priorities for Multi-Hazard Early Warning Systems (MHEWS) and Disaster Risk Reduction set in the Paris Agreement, Sendai Framework and SDGs (further elaborated in section B.5.) and will contribute to the outcomes of the 2019 UN Climate Action Summit, in particular targets 3 and 4 of the Risk-informed Early Action Partnership (REAP) on investment in “*early warning system infrastructure and institutions to target early action in ‘last/first mile’ communities*” and “*more people are covered by new or improved early warning systems...*”.
- 4) *Enhanced regional knowledge management and cooperation for climate services and MHEWS.* This responds to the need for regional cooperation and training on climate services and disaster risk reduction identified in amongst others the Paris Agreement (Article 7, 7a), Sendai Framework (IV, 34f) and SDG 17, target 6 (“*Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing*”).

Each of the Programme Results comprises a set of **Activities and Sub-Activities** that have been designed to remove specific barriers to achieving increased resilience to climate change threats. The four Programme Results are interlinked and are essential to enable countries to be better prepared for climate-related disasters and to build climate change resilience through institutionalising and mainstreaming climate and ocean information into sectoral and community level planning; ensuring climate risk-informed decision making and response actions including Forecast-based Financing; expanding the range, quality, and volume of reliable data available to countries; strengthening the capacities of their NMHSs and other agencies to analyse and apply their data; and improving their communication of useful information so that it reaches everyone who needs it. Furthermore, climate services market assessments and the preparation of national policies for financing climate services will facilitate sustainability beyond the Programme’s duration. Every country at national, sectoral and community level requires specific localised climate and ocean information, which is often not available due to lack of in-situ data or lack of local capacity to provide tailored products. Where climate and ocean information exists, it is useless unless it can be readily accessed, understood and applied to planning, decision making and financing. National climate and ocean services cannot advance in isolation and therefore information sharing through regional and global platforms will provide access to new technology and products, and support for further national capacity development, fostering long-term sustainability.

As elaborated in section D.1. and Annex 3 (Economic Analysis report), the transformative **Impact** of the Programme will be ***increased resilience and enhanced livelihoods of the populations in Cook Islands, Niue, Palau, RMI and Tuvalu to climate change threats*** through:

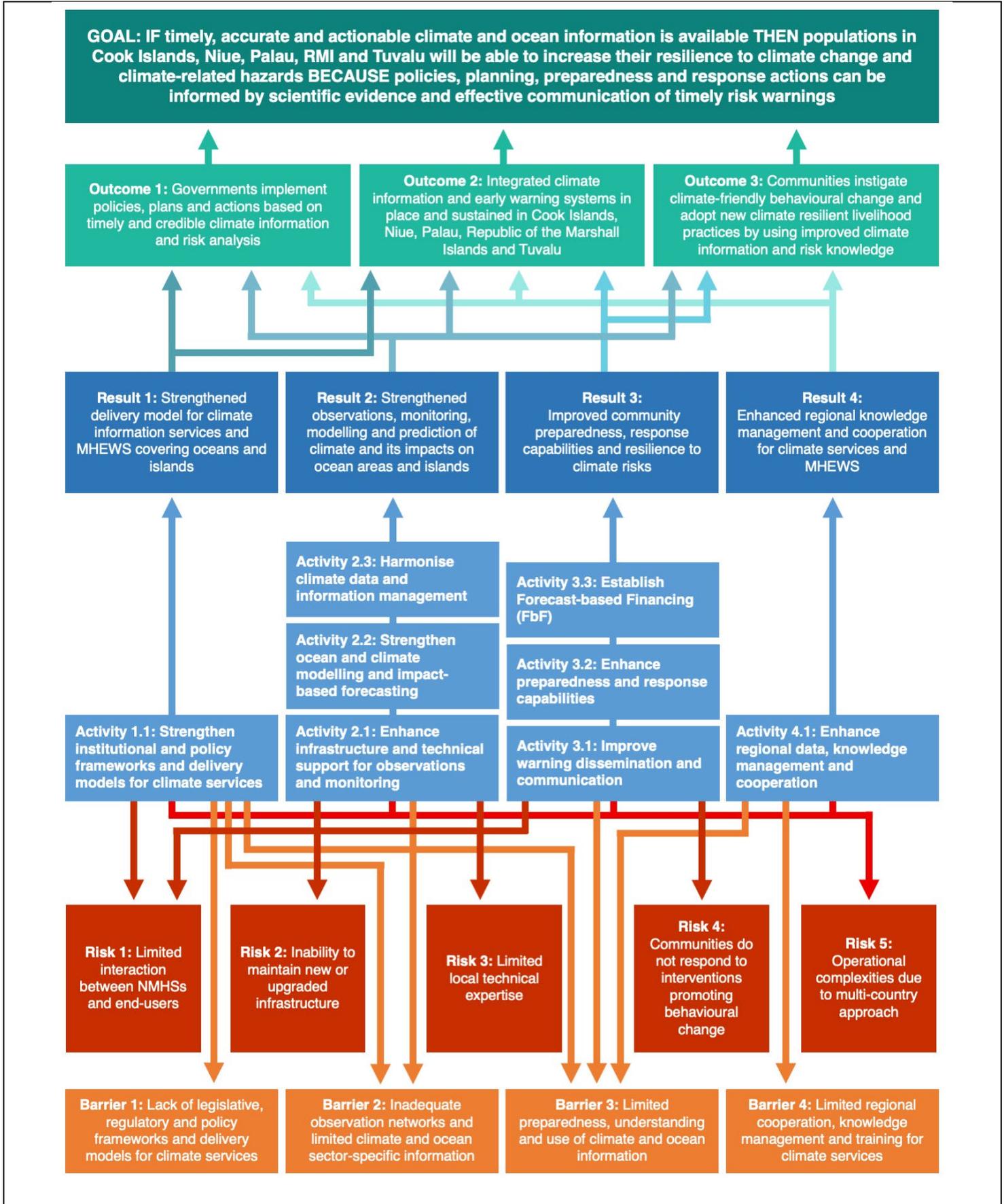
- i) *Reduced expected losses of lives and economic assets due to the impact of extreme climate-related disasters.* Economic damages and losses are expected to be reduced by 15-30%,²²⁹ including through increasing the safeguarding of assets (such as fishing boats and equipment, agricultural land and properties) from climate-related hazards using accurate, timely and actionable early warning services established by the Programme; and
- ii) *An increase in the number of males and females benefiting from the adoption of diversified, climate resilient livelihood options.* The Programme aims to improve the resilience of up to 110,739 people (51% male and 49% female). This is the estimated entire population of the Cook Islands, Niue, Palau, the

²²⁹ Giorgetti, A. (2018). Preliminary Cost-Benefit Analyses of Early Warning Systems for the Mitigation of Natural Disasters. Timor Leste, Papua New Guinea, Solomon Islands, Vanuatu and Fiji. Final Report prepared for WMO, February 2018; Subbiah, A., Bildan and L., Narasimhan, R. (2008). Background Paper on Assessment of the Economics of Early Warning Systems for Disaster Risk Reduction. World Bank Group for Disaster Reduction and Recovery.

Republic of the Marshall Islands (RMI) and Tuvalu.²³⁰ The whole population of the five SIDS is at risk from climate-related hazards such as cyclones, storm surges, coastal inundation, floods and droughts. The most vulnerable groups include the population living in coastal zones (estimated at 90-100% for the five countries) and communities in remote island locations.

The Theory of Change diagram below shows how implementation of the Programme Activities leads to the Programme Results, which in turn will contribute to achieving the longer-term Outcomes, and ultimately the Goal. The Programme Results are further unpacked in section B.3.

²³⁰ Using figures from the Statistics for Development Division of the Pacific Community (SPC)



Assumptions:

- Governments are committed to the development of climate and oceans information services and early warning systems
- Governments are committed to mainstreaming climate information into policy and planning
- Stakeholders and partners are willing to adopt new governance, institutional and regulatory mechanisms to ensure the incorporation of climate and oceans information into decision making and policy planning
- Sectors are willing to utilise climate and oceans information to make their businesses more efficient and resilient to climate change impacts
- Government, private agencies and local councils participate, cooperate and coordinate effectively
- NMHSs engage with end-users and ensure that their inputs are reflected
- Households, communities and individuals are willing to change behaviours and adopt climate-resilient livelihood options by using climate and oceans information and early warning systems
- Households, communities and individuals are able to access and understand new information on climate risks and appropriate response measures
- Countries are willing and able to strengthen regional cooperation, knowledge management and training for climate services

Drivers:

- Capacity of NMHSs to deliver high-quality and reliable data for better resilience against climate change
- Capacity of countries to share climate and oceans data and information
- Awareness of the Pacific region and at country level of the value of using climate and oceans information to be better prepared for and resilient against the impacts of climate change
- Capacity of communities to change behaviours and adopt new livelihood practices based on improved climate information and multi-hazard early warning systems
- Collaborative partners on the national and regional levels

Figure 22. Programme Theory of Change

The Programme will contribute to the attainment of selected targets and indicators of the Paris Agreement, Sustainable Development Goal (SDG) 13 on Climate Action and the Sendai Framework on Disaster Risk Reduction as detailed in the below table:

Outcomes	Contribution to Paris Agreement	Contribution to Sendai Framework	Contribution to SDGs
1. Governments implement policies, plans and actions based on timely and credible climate information and risk analysis	Article 7, 7a: “Sharing information, good practices, experiences and lessons learned, including, as appropriate, as these relate to science, planning, policies and implementation in relation to adaptation actions”.	Priority 1 (Understanding Disaster Risk), 24 (n): “To apply risk information in all its dimensions of vulnerability, capacity and exposure of persons, communities, countries and assets, as well as hazard characteristics, to develop and implement disaster risk reduction policies”.	SDG 13, Target 13.2: “Integrate climate change measures into national policies, strategies and planning”.
2. Integrated climate information and early warning systems in place and sustained in Cook Islands, Niue, Palau, RMI and Tuvalu	Article 7, 7c: “Strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making”	Priority 1 (Understanding Disaster Risk), 24 (a): “To promote the collection, analysis, management and use of relevant data and practical information and ensure its dissemination, taking into account the needs of different categories of users, as appropriate”.	SDG 13, Target 13.3: “Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning”.

<p>3. Communities adopt new climate resilient livelihood practices by using improved climate information and risk knowledge</p>	<p>Article 7, 5: <i>“Parties acknowledge that adaptation action should follow a country-driven, gender-responsive, participatory and fully transparent approach, taking into consideration vulnerable groups, communities and ecosystems, and should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems, with a view to integrating adaptation into relevant socioeconomic and environmental policies and actions, where appropriate”.</i></p> <p>Article 8, 4: <i>“Accordingly, areas of cooperation and facilitation to enhance understanding, action and support may include: (a) Early warning systems; (b) Emergency preparedness...”.</i></p>	<p>Priority 1 (Understanding Disaster Risk), 24 (o): <i>“To enhance collaboration among people at the local level to disseminate disaster risk information through the involvement of community-based organizations and nongovernmental organizations”.</i></p>	<p>SDG 13, Target 13.1: <i>“Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries”.</i></p>
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Table 9. Contribution of Outcomes to the Paris Agreement, Sendai Framework and Sustainable Development Goals (SDGs)

B.3. Project/programme description (max. 2000 words, approximately 4 pages)

The overall objective of the Programme is to support increased climate-resilient sustainable development in the Cook Islands, Niue, Palau, the Republic of the Marshall Islands (RMI) and Tuvalu through the achievement of three key GCF-level outcomes: i) Increased generation and use of climate information in decision making; ii) Strengthened adaptive capacity and reduced exposure to climate risks; and iii) Strengthened awareness of climate threats and risk-reduction processes.

The populations of the five Programme countries have extensive traditional knowledge concerning adaptation to climate variability, but a combination of both traditional approaches and decision-making informed by science is essential for their adaptation to long-term changes. The Programme recognises the complementarity between traditional and scientific knowledge systems and will support communities to adapt their traditional techniques to utilise up-to-date climate science and risk knowledge. That science must be based on more data than is currently available to them, from the limited observation and monitoring networks that their small and narrowly based economies can afford. The Programme will effect a paradigm shift to science-informed evidence-based climate adaptation, disaster risk reduction and people-centred multi-hazard early warning. This will be complemented by a transformation in the way that climate and risk information is communicated to island populations and mainstreamed into community planning and decision-making processes, so that people at “the last mile” clearly understand climate change and have the capacity to prepare for and respond to its impacts.

The Programme will assist five Pacific island countries to address their common vulnerabilities and increase the resilience of their livelihoods and assets to climate change impacts and multiple climate-related hazards. The countries will integrate the use of climate and disaster risk information across and within sectors and communities, and develop and adopt demand-driven solutions, which will be achieved through coordinated activities supported by a regional hub. The end-to-end Programme will have measurable impacts on the resilience of the five countries to climate change. The Programme is described in detail in the Feasibility Study (Annex 2) and is summarised below.

Result 1: Strengthened delivery model for climate information services and MHEWS covering oceans and islands

The effective delivery of user-tailored climate services is essential for the provision of climate information to assist with decision making and climate-resilient sustainable development.²³¹ Pacific NMHS advice can significantly reduce climate risks if the advice has a recognised formal role in disaster preparation, warnings and management and in long-term planning for climate change impacts by infrastructure, health, tourism, agriculture, fisheries and other climate-sensitive sectors. While Pacific NMHSs have competencies in monitoring and analysing weather and climate patterns, they are constrained by poor infrastructure and limited human, financial and technical resources.²³² Furthermore, all Programme countries lack clarification and/or formalisation of their NMHS's mandate and its relationship with National Disaster Management Authorities, other national institutions and sectors. While some of the Programme countries have a Meteorology Act that sets out the mandate and functions of their NMHSs in relation to weather services, none has an Act that adequately covers the roles of its NMHS in disaster warning and management, or in providing advice on climate change. Furthermore, with the exception of Tuvalu, none of the Programme countries allocates for climate change programming in the national budget and any disaster funds are limited to immediate relief efforts rather than pre-emptive disaster risk management actions.

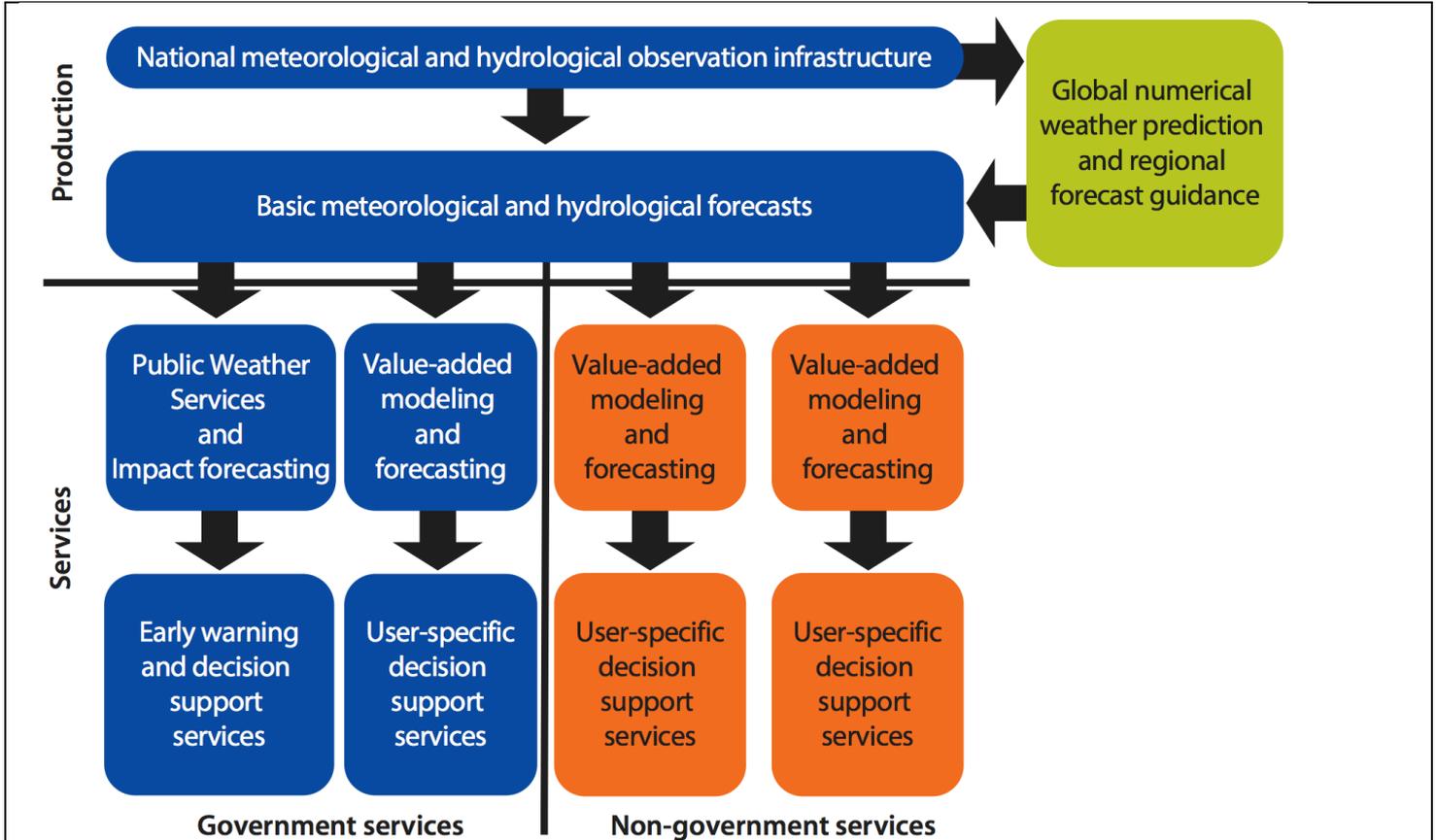
Therefore, Programme Result 1 will assist each country to establish a coherent National Framework for Climate Services (NFCS) to coordinate, facilitate and strengthen collaboration among national institutions for enhanced climate information services and products, supported by effective coordination mechanisms to integrate climate information and disaster risk knowledge into the decision-making of climate-sensitive sectors. Continuing, regular stakeholder engagement will inform the development of tailored, accessible products and services that serve the practical needs of end users. This will lead to increased understanding of and use of NMHSs' information and advice, and reduced losses from climate variability and extreme events. Moreover, NMHS staff will gain cumulative experience in communicating with non-scientists to achieve practical outcomes and ensure that essential climate information reaches "the last mile".

Long-term sustainability of climate services and disaster risk management will be achieved through strengthened institutional and stakeholder partnerships as a result of the NFCSs, identification of opportunities for private sector engagement and investment based on detailed market assessments, and the development of financial policies to ensure that the five NMHSs have the means to sustain and ensure the ongoing operation of their mandated services in order to mitigate weather-, climate-, and water-related risks. This will facilitate national climate funding, including through cost-recovery mechanisms from sectors, where feasible, beyond the Programme's lifespan, based on the value chain captured in the figure below.²³³

²³¹ WMO, 2018, Step-by-step Guidelines for Establishing a National Framework for Climate Services.

²³² SPREP, Pacific Roadmap for Strengthened Climate Services 2017-2026

²³³ The World Bank, 2013. Weather and Climate Resilience. Effective Preparedness through National Meteorological and Hydrological Services



Note: Users are governments, households, and businesses.

Figure 23. Value chain for weather and climate services.

Programme Result 1 has a proposed budget of \$4,700,181.15. The Cook Islands, Niue and Palau will provide in-kind co-financing of \$4,571.40, \$17,250.75 and \$150,000 respectively, whilst the remaining \$4,528,359.00 is as a grant request from GCF.

Activity 1.1 – Strengthen institutional and policy frameworks and delivery models for climate services

Under this Activity, the Programme will establish comprehensive institutional and policy frameworks and delivery models for strengthened climate services, including the development of a National Framework for Climate Services (NFCS) in all five countries and national meteorological strategies and legislation in Palau and RMI. The frameworks will be supported by effective coordination mechanisms to mainstream climate risk knowledge into the decision making of climate-sensitive sectors. Moreover, each country will conduct a climate services market assessment and develop a policy for sustainable financing and delivery of climate services. Amongst others, engagement with the development of national budgets will enable justification of the value of climate services, strengthen existing funding for disaster relief and contribute to the identification of long-term sources of funds.

Sub-activity 1.1.1. Develop National Frameworks for Climate Services

Each country will develop a National Framework for Climate Services (NFCS) to coordinate, facilitate and strengthen collaboration among national institutions for enhanced use of climate information and provision of climate services and to facilitate a long-term sustainable business model for national climate services.²³⁴ This

²³⁴ WMO, 2018. Step-by-step Guidelines for Establishing a National Framework for Climate Services

will put into practice the five pillars of the Global Framework for Climate Services (GFCS) in the five countries as follows:

- User Interface Platform (UIP): a structured means for users and NMHSs as climate information providers to interact at all levels.
- Climate Services Information System: the mechanism through which information about climate (past, present and future) is routinely collected, stored and processed by the five NMHSs to generate products and services that inform often complex decision-making across a wide range of climate-sensitive activities and enterprises.
- Observations and Monitoring: to be implemented under Result 2 of this Programme.
- Research, Modelling and Prediction: to be implemented under Result 2 of this Programme with a focus on climate modelling and prediction of its impacts on ocean areas and islands.
- Capacity Development: to be implemented across the four Programme Result areas (as described in section C.3).

In a series of consultative workshops with government agencies (including representatives of key climate-sensitive sectors such as agriculture and food security, health, disaster risk management, energy, infrastructure, transport, tourism, etc.) and all stakeholders with a role in the climate services value chain (from production and co-development through to use at the local level), NMHSs will communicate what information they can generate and how it can be applied to policy and practice. Sectors will present how they currently use climate information, what additional information would be useful to receive, and how they would like to work with the NMHS. This will help stakeholders to identify and agree on more specific functions, relationships and services to ensure that their operations take into account climate change impacts. The outcomes of the workshops will be used to establish the NFCSs and to develop a suite of sector-specific climate information products. These decisions will be revisited each year during the National Climate Outlook Forum (NCOF) and modified according to feedback and learnings. The process will be repeated in the second, third and fourth years with the private sector, NGOs and community representatives respectively. The NFCSs will therefore serve the following functions in the five countries:

- A platform for institutional coordination, collaboration and co-production amongst relevant technical departments across line ministries at national and sub-national levels, NMHSs, and technical experts to develop and deliver user-oriented climate services.
- Support the development of a legal framework by articulating collaboration at the national level to generate and share user-oriented climate services for use by the relevant social and economic sectors. The framework will support the Governments of Palau and the Republic of the Marshall Islands (RMI) who will develop national meteorological strategies and legislation to clarify and formalise the mandate of their NMHSs.
- An opportunity to bridge the gap between available climate services and user needs at national, sub-national and local levels through the User Interface Platform, which will continuously identify user needs for climate services, communicate available climate products and services to users in the relevant sectors, and obtain feedback from users on climate products and services.
- A vehicle for scientific coordination to monitor the state of the climate at the national level and disseminate climate knowledge outputs for policymaker actions founded on scientific evidence through the Climate Services Information System.
- A functional chain for linking climate knowledge with action on the ground so as to maximise the application of climate information and products, including the identification and removal of bottlenecks for improved delivery of climate services.

- An opportunity for enhancing the contribution of climate science to the development of national adaptation plans, disaster risk reduction and management, Sustainable Development Goals and national development policies by enhancing the integration of climate information and products into decision-making as well as into national policies.

Also essential is the negotiation and development of institutional structures that will formalise the role of NMHSs in the provision of services to climate-sensitive sectors and in emergencies. The Programme will support each NMHS in developing and formalising agreements with related national agencies (disaster management organisations, public broadcasters, public works departments, public health authorities) on roles and responsibilities.

To support its NFCS, RMI plans to develop a national Meteorology Act for presentation to Parliament with the help of WMO. The Palau and RMI Weather Services Offices (WSOs) will each develop a National Meteorological Strategy. For Palau, its objective is to document the process by which the WSO will put the Pacific Islands Meteorological Strategy and the Pacific Roadmap for Strengthened Climate Services into operation. RMI will document the process by which the WSO will put its proposed Meteorology Act into operation.

Sub-activity 1.1.2. Conduct market assessment to explore viable opportunities for climate information services in sectors and business segments

This sub-activity will support the Programme countries to utilise a value chain approach for mobilising private sector finance in climate service delivery. The Programme will conduct a detailed market assessment in each country, which will assess the following:

- Involved actors in climate services – including providers, intermediaries and users;
- Regulatory environment – including identification of policy incentives to unlock barriers to private sector investment in climate information and early warning services;
- Supply and demand analysis – including identification of sector and business needs for climate services (for example, level of information, scales and access required);
- Private sector engagement – including identification of private sector sponsors' interest in the generation, translation and transfer function and in purchasing climate-related information; and
- Business models – including analysis of viable business models that are successful in other countries.

Based on the above analysis, the Programme will support the five countries to identify opportunities to develop value-added climate products and services; and potential for public-private partnerships and private sector investment in climate services. Private sector engagement will improve the cost-effectiveness of NMHSs and increase potential for catalysing innovation in climate information technologies. This sub-activity will also inform development of the national policies for financing climate services in Sub-activity 1.1.4.

Sub-activity 1.1.3. Mainstream climate risk knowledge into sectors

Each country will undertake a systematic five-year process of mainstreaming climate risk knowledge into government, private and community sectors through a value chain approach of linking climate knowledge to action.²³⁵ An annual National Climate Outlook Forum (NCOF) will take place before the start of the cyclone season and after the regional Pacific Islands Climate Outlook Forum (PICOF). These forums will provide a platform for dialogue between climate service providers, disaster risk management actors and all relevant stakeholders with a role in the climate services value chain, from production and co-development through to use at the local level. This will facilitate users to better understand the content and uncertainties in climate forecasting, and how exposure and vulnerability factors result in differential impact of climate risks; and will facilitate service providers to better understand and coordinate how climate and disaster risk information is used, and thus develop tailored climate products for each sector. Each NCOF will be preceded by stakeholder

²³⁵ WMO, 2018. Step-by-step Guidelines for Establishing a National Framework for Climate Services

workshops as outlined in Sub-activity 1.1.1. As each group – public and private sector organisations, community groups – takes part in the workshops, the relevance and practical applications of the Climate Outlook Forums will be better understood and acted upon by its members.

Building on the NCOF process, each country will draft Climate Sector Action and Communication Plans for key sectors. The plans will address sector-specific needs for information services relating to both disaster risk reduction and management, and effective climate change adaptation; and will outline a process to test the best ways of regularly communicating climate information to sectors. Based on the plans, a Sector-Specific Climate Training Programme will be developed and delivered to facilitate uptake of climate information services by key sectors and their stakeholders.

Furthermore, each country will undertake specific climate risk knowledge mainstreaming activities based on their needs. These include: i) conducting vulnerability assessments and incremental climate change costing to inform the National Infrastructure Investment Plan (NIIP) in Cook Islands; ii) delivering an annual briefing to Niue's Parliamentary Ministers on the climate outlook and use of its data to inform climate-resilience planning; and iii) conducting crop climate change risk assessments to inform agricultural crop planning in Tuvalu.

The national data consultants (detailed under Results 2 and 4) will play a key role in keeping climate risk information on the agendas of sector agencies. Their responsibilities include regular liaison with ministerial and departmental staff, making relevant data discoverable by agencies and their development partners for planning processes, and facilitating the addition of new data to the national data portal to improve the quality of monitoring and evaluation processes. This will also contribute to generating and accessing essential data and information for the Nationally Determined Contributions (NDCs) under the UNFCCC in each country.

Sub-activity 1.1.4. Develop national policies for financing climate services

This sub-activity will provide the foundation for the establishment of a financially sustainable business model for climate services in the five Programme countries. Based on the NFCs established under Sub-activity 1.1.1, the Programme will develop national policies focused on the sustainable financial management of climate services, which will facilitate that the five NMHSs have the means to sustain and ensure the ongoing operation of their mandated services in order to mitigate weather-, climate-, and water-related risks.

Cook Islands, Niue, Palau and RMI do not have an established national climate finance policy or dedicated Fund. However, RMI organised a workshop in May 2019 to explore the setup of a national climate finance mechanism, in collaboration with the NDC Partnership.²³⁶ The workshop resulted in agreement on a "Climate Finance Action Plan"²³⁷ to strengthen climate financing in RMI. The Programme will coordinate with the Climate Finance subgroup in RMI to ensure that development of the national policy is aligned with, and facilitates, climate services-oriented actions outlined in the Plan. In Tuvalu, a Climate Change and Disaster Survival Fund – the "Tuvalu Survival Fund" (TSF) – was established in 2015. The TSF is intended to support both immediate disaster response efforts and longer term responses to future climate change impacts and natural disasters.²³⁸ The Programme will work with the TSF Board and Committee to enhance the functions of the existing Fund to ensure that Tuvalu's national climate services are adequately and sustainably financed.

Given the specific circumstances of the five Programme countries relating to their extremely small economies, remote locations, large marine areas and numerous scattered islands, the financial policies will be carefully developed with the support of the World Meteorological Organization (WMO) to ensure their tailoring to the realities of Pacific SIDS. In line with World Bank guidance,²³⁹ the financial policies will cover the following elements:

²³⁶ NDC Partnership, 2019. Press Release: Marshall Islands Takes Next Steps on National Climate Finance Mechanism. Available at: <https://ndcpartnership.org/news/marshall-islands-takes-next-steps-national-climate-finance-mechanism>

²³⁷ Republic of the Marshall Islands, 2019. RMI Climate Finance Action Plan. Available at: <https://www.dropbox.com/s/1e6ker0nnfe42cf/RMI%20Climate%20Finance%20Action%20Plan%20-%20Final%20Draft%20-%20May%202019.docx?dl=0>

²³⁸ Tuvalu, 2015. Climate Change and Disaster Survival Fund Act 2015

²³⁹ Ibid.

- Opportunities for greater cooperation between the public and private sectors and academia given that many economic sectors increasingly depend on meteorological information for safe and efficient operations.
- Opportunities for win-win situations that fulfil the public sector responsibility to help the economically disadvantaged while meeting the needs of enterprises for climate services. To this end, the Programme will ensure partner governments are made aware of the economic value of climate information in, for instance, reducing the need for dangerous marine rescues, reducing the need for transport of drinking water to outer islands in drought, and reducing the costs of recovery from cyclone damage.
- Opportunities to coordinate and/or integrate financing for climate services and disaster risk management to strengthen existing disaster relief funds and establish reliable funding for disaster preparedness activities, which are often limited to ad-hoc donor funding. This would facilitate a more efficient and streamlined approach to implementing often overlapping actions for climate change adaptation and disaster risk management.
- Identification of the elements for a sustainable financial model for NMHSs based on the climate services value chain, which highlights the different roles of NMHSs in providing basic forecasts and warnings to protect society from the adverse effects of severe weather (a public good typically supported by governments, for which predictable national budget allocations need to be ensured) but also in providing specialised value-added services to sectoral government agencies and individual businesses (which may offer opportunities for cost-recovery from governmental and non-governmental sources beyond the Programme's lifespan).
- Potential to establish National Climate Funds (NCFs) as mechanisms that support countries to manage their engagement with climate finance by facilitating the collection, blending, coordination of, and accounting for climate finance directed towards climate services.²⁴⁰ According to UNDP guidance,²⁴¹ these funds could have the following goals: i) collect sources of funds and direct them toward climate change activities that promote national priorities; ii) blend finance from public, private, multilateral and bilateral sources to maximise a country's ability to advance national climate priorities; iii) coordinate country-wide climate change activities to ensure that climate change priorities are effectively implemented; and iv) strengthen capacities for national ownership and management of climate finance, including for "direct access" to funds. Functions of NCFs could include: i) support goal setting and the development of programmatic strategies for climate resilience; ii) fund capitalisation; iii) management of partnerships; iv) provide project approval and support implementation; v) supply policy assurance; vi) provide financial control; vii) manage performance measurement, including monitoring and reporting on activities and resource disbursement; and viii) provide and support knowledge and information management.
- Potential for continued support from the Systematic Observations Financing Facility (SOFF) as part of the Alliance for Hydromet Development, which was launched in December 2019 by 12 international organizations including UNEP. The SOFF is envisaged to ensure provision of basic systematic observations as a global public good by providing equitable, predictable, sustainable, and performance-based finance as well as technical assistance to developing countries for the provision of foundational observational data as per the Global Basic Observing Network (GBON) standard adopted by the WMO Congress. GBON aims to improve the global availability of the most essential surface-based data by defining the obligation for countries to implement a minimal set of surface-based observations for which international exchange of observational data will be mandatory. Further details are provided under Activity 2.1.

²⁴⁰ UNDP, 2015. Blending Climate Finance Through National Climate Funds.

²⁴¹ Ibid.

Result 2: Strengthened observations, monitoring, modelling and prediction of climate and its impacts on ocean areas and islands

Despite its critical significance in driving the global climate system and generating severe weather events, the equatorial and sub-equatorial Pacific Ocean is a data-sparse region.²⁴² The current baseline observation network in Cook Islands, Niue, Palau, RMI and Tuvalu is insufficient to adequately provide the climate and ocean information required at national, sectoral and community levels. Several observation sites for ground and upper air data have been established in the region, but many are no longer in operation. The reasons include obsolescence; lack of technical and financial capacity for observations and maintenance; the ongoing need to fund the supply of consumables (disposable or non-recoverable items used routinely in observing programs); and limited communications infrastructure. Investment in maintaining and expanding national in-situ measurements is essential.

Programme Result 2 will enable the five countries to expand their observation networks with robust and well-supported equipment, collecting data from critical sites such as distant inhabited outer islands and from ocean areas. Information derived from systematic upper air observations in the Pacific region, using meteorological consumables such as radiosondes launched from the ground, underpins all hydrometeorological early warning systems, as well as other weather and climate-related services.²⁴³ The Programme will enhance the observations and monitoring network in all five countries to enable full compliance with the requirements of the WMO Global Basic Observing Network (GBON), which “represents a new approach in which basic surface-based observations are designed, defined and monitored at the global level”²⁴⁴ and emphasises the need for access to 24/7 global observations as a global public good. Installation and capacity building for weather radar observations will further enhance extreme weather monitoring and early warning systems, and support validation of Numerical Weather Prediction (NWP) forecasts.^{245, 246} An improved observation system in the tropical Pacific will not only benefit the host countries but also the entire global forecasting capability.²⁴⁷ One of the most significant activities in this Programme will be to establish end-to-end ocean services. This is a major priority for Pacific NMHSs, in response to user demand for ocean climate information, particularly relating to fishing conditions and safety.²⁴⁸ The ocean is a fundamental climate regulator and is the major influence on the climate of small, isolated islands,²⁴⁹ but the small economies of the Programme countries render most modern equipment and consumables infeasible to obtain.

This Result will support implementation of the Global Framework for Climate Services (GFCS) helping to address deficiencies in the Observation and Monitoring Pillar of the GFCS in Cook Islands, Niue, Palau, RMI and Tuvalu. This is fully in line with the *Pacific Roadmap for Strengthened Climate Services 2017–2026*, which proposes several regional and national actions within the GFCS pillars as shown in the below figure.

²⁴⁴ WMO, 2019. New Global Basic Observing Network gets go-ahead. Press Release Number: 07062019. Available at: <https://public.wmo.int/en/media/press-release/new-global-basic-observing-network-gets-go-ahead>

²⁴⁵ Gabella, M. et al. 2012. A Network of Portable, Low-Cost, X-Band Radars. DOI: 10.5772/38997

²⁴⁶ Vanuatu Meteorological and Geo-hazards Department, 2017. Radar, AWS and Other Equipment: Technical Specifications, Operations and Maintenance

²⁴⁸ Pacific Islands Meteorological Strategy, 2017-2026

²⁴⁹ IPCC, 2019, Special Report on the Ocean and Cryosphere in a Changing Climate

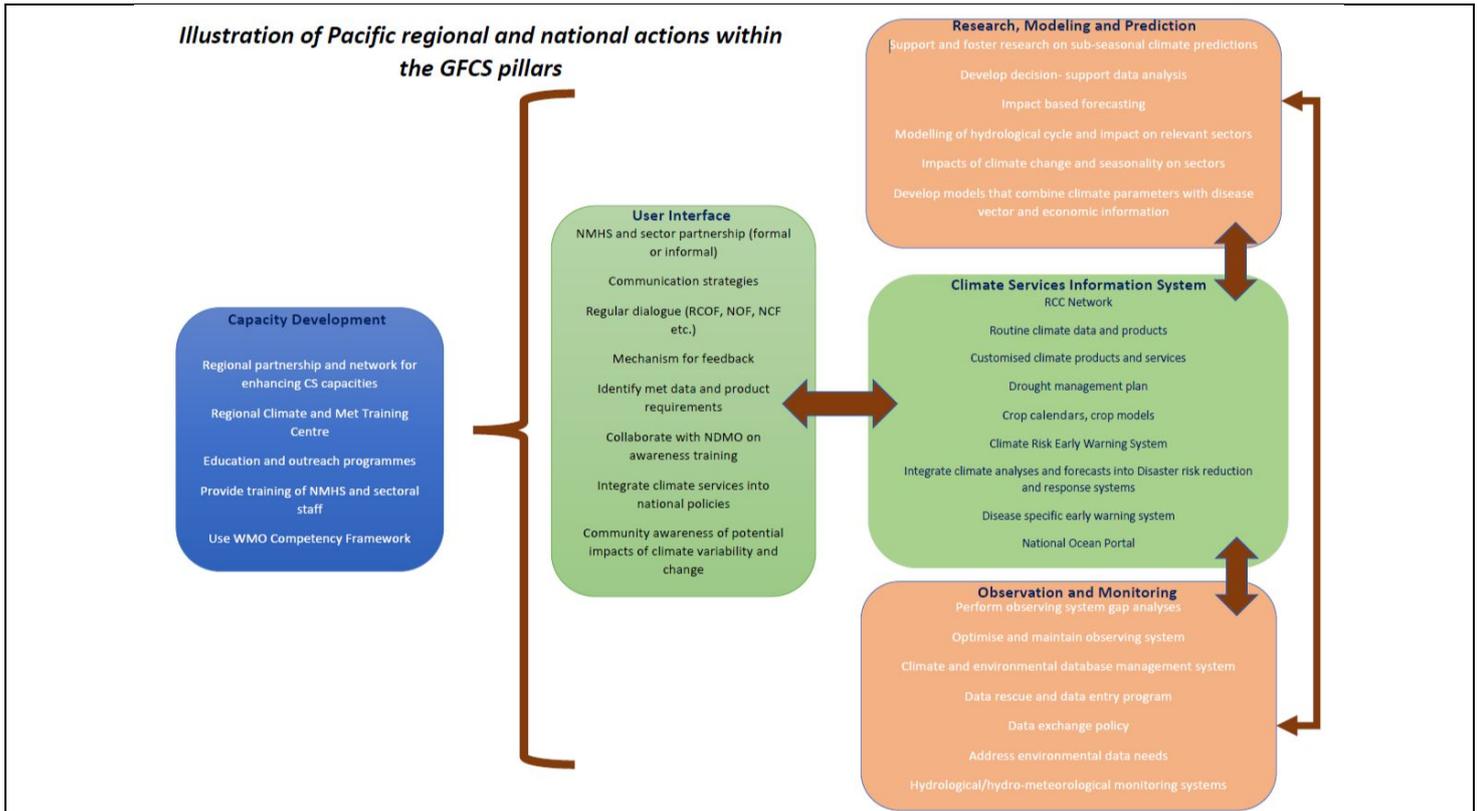


Figure 24. Pacific regional and national actions within the GFCS pillars

Programme Result 2 addresses most of the actions outlined above and will also support implementation of the GFCS's recommended infrastructural capacity building.²⁵⁰ Emphasis has been put on ensuring that equipment to be installed under this Programme can be operated and maintained by the NMHSs in the long-term. This will be supported by targeted technical training under Sub-activity 4.1.2. Particularly in remote locations such as the five Pacific SIDS, Numerical Weather Prediction (NWP) outputs provides the first line of warnings, with satellite data becoming increasingly useful at shorter ranges. The Programme therefore prioritises feeding the global NWP systems with enhanced local observations and developing in-country capacity to use the output. Developing capabilities to exploit satellite data is the second priority.

Hence the main focus of this Result is on **transforming the five NMHSs from WMO's Basic-Category 1 level to WMO's Essential-Category 2 level**. Generally, Category 1 NMHSs can provide basic weather and climate services to their countries through delivering a basic range of climate data and products, participating in regional climate forums and engaging in limited interactions with end-users. At Category 2 level, the NMHSs will be able to:

- Deliver a basic range of climate services and products;
- Provide climate predictions;
- Participate in climate forums;
- Interact with end-users from different sectors;
- Gather feedback on the information that end-users provide;
- Have well-established protocols for emergencies, backup of data and some off-site facilities;
- Have climate observers and meteorologists trained to WMO standards;
- Have 24/7 operation (where possible);

²⁵⁰ WMO (Kolli, R), 2016, Presentation called "National Perspectives of the Implementation of the Global Framework for Climate Services"

- Have a well-established Quality Management System (QMS); and
- Have access to most Numerical Weather Prediction (NWP) data/products from other centres.

Thus, whilst Category 1 NMHSs engage in basic climatology (related to the pillars focused on the technical aspects of climate science), the Level 2 and higher incorporate capacity that spans all five GFCS pillars.²⁵¹

This Result accords with GCF advice on addressing adaptation results areas by helping recipient countries to overcome the barriers caused by a lack of suitable technology. Strengthened observations, monitoring, modelling and impact-based forecasting will improve national multi-hazard early warning systems and make innovations such as Forecast-based Financing (Activity 3.3) possible. It will also improve the quality of the information used by the countries and their development partners in planning adaptation activities.

Furthermore, in its June 2020 Briefing Note, the Global Ocean Observing System (GOOS) highlighted that “Despite its significant impacts on the ocean observing system, the Covid-19 crisis can also be an opportunity for us to look at how to build greater resilience into the system.”²⁵² The Programme will contribute to resilience building in the ocean observation system through installing autonomous observing instruments, ensuring robust equipment maintenance schedules, and supporting increased coordination between the Pacific island countries.

Programme Result 2 has a proposed budget of \$34,014,223.19. The Cook Islands, Niue, Palau, RMI and Tuvalu will provide in-kind co-financing of \$285,210.53, \$449,831.55, \$544,036.34, \$237,364.73 and \$427,249.37 respectively, whilst the remaining \$32,070,530.67 is as a grant request from GCF.

Activity 2.1 – Enhance infrastructure and technical support for observations and monitoring

The Programme will strengthen infrastructural and in-country technical capacity to enhance observations and monitoring networks in all five countries. Amongst others, this will be achieved through the installation of new and upgraded infrastructure and equipment to strengthen the network and extend the geographical coverage of climate and weather observations in compliance with WMO Global Basic Observing Network (GBON) standards; training and support for observations, monitoring and maintenance; and establishment of robust Quality Management Systems (QMSs).

The Global Basic Observing Network (GBON) concept was approved at the 18th World Meteorological Congress in June 2019 in order to ensure a robust supply of real-time observational data from the entire global domain to the global Numerical Weather Prediction (NWP) systems. The outputs from these systems are critical to the quality of forecasts and climate analyses, which in turn are essential for public services that help save lives, protect assets and foster economic prosperity. The GBON design specifications are based on up-to-date observational requirements for global NWP as defined by WMO technical experts, and specify in quantitative terms which parameters to measure, how often, at what horizontal and vertical resolution, and provide advice on which measurement techniques to use. Based on the GBON concept adopted by the World Meteorological Congress, the detailed GBON regulatory material is currently under development and will be submitted to the Extraordinary World Meteorological Congress in June 2021 for approval. While the final GBON regulatory material is thus yet to be approved, for the purpose of this Programme, the draft regulatory material that served as the basis for the Congress approval of the GBON concept is used. This approach for the design of the observations-related activities, as discussed with the five countries and the AE and agreed upon with WMO,²⁵³ will help ensure that the activities proposed represent suitable, feasible and optimal solutions for the national

²⁵¹ Mahon R, 2019. “Fit for purpose? Transforming national meteorological and hydrological services into national climate services centers”, Climate Services

²⁵² Global Ocean Observing System, 2020. Briefing Note: Covid-19’s impact on the ocean observing system and our ability to forecast weather and predict climate change

²⁵³ As formally confirmed by the WMO Director, Infrastructure Department in his message to the AE dated 7 July 2020: “Through this initiative, WMO, in collaboration with the AE and the countries involved has undertaken the review of individual countries’ observational gaps based on draft GBON regulatory provisions and current capacity and reporting practice. The resulting proposed activities correspond to an optimal, suitable, and feasible national basic observing network design that responds to country priorities and needs while ensuring consistency with the proposed concept and draft regulatory material for the GBON...”

basic observing networks and their contributions to the global public good provided by the NWP systems, regardless of any potential further refinements of the GBON requirements.

As a priority of the Alliance for Hydromet Development in 2020, the Systematic Observations Financing Facility (SOFF) is being developed as a new financial mechanism to address the fundamental mismatch between the current country-based financing of basic observations and the value of these observations as a global public good. It will provide long-term finance and technical assistance to developing countries – prioritising Africa, Small Island Developing States and Least Developed Countries – beyond the current nationally focused, fragmented and time-bound funding model, to achieve and maintain GBON compliance and data sharing at the global level. This will translate to better weather forecasts, early warnings and climate information products, which are essential for effective climate action.

With the objective to advance the concept and design of the SOFF, around 30 organisations are jointly working on multi-partner parallel Working Groups. In order to bring the GBON concept into practice, the SOFF Working Group 2 is working on implementation case studies, including proposing concrete gap mitigation activities based on existing investment opportunities in selected countries. In-depth country case studies are being undertaken to assess the number of functioning (reporting) stations; number of stations required per draft GBON provisions; and estimates of the resulting number of stations to be newly established, rehabilitated or upgraded. The case studies will also include an institutional and human capacity gap analysis and provide a more detailed cost estimate for establishing and maintaining GBON compliance in the developing world.

The five Programme countries were selected as initial case studies for the GBON country gap analyses and a relevant GBON approach was agreed upon. Based on the preliminary assessments and discussions with WMO the following outcomes are highlighted:

- GBON obligations should take into account the unique circumstances of SIDS with small land masses and vast marine areas – for example, the land area of Cook Islands (240 km²) constitutes just 0.012 % of its EEZ (1,947,760 km²);
- The observations from SIDS are of high value for the global observing network – the SOFF Working Group 2 reported that optimal observations data in the south-west Pacific are estimated to account for 17 % of global forecast improvements;
- The Programme will ensure that **all inhabited islands / atolls in the five countries will have an observing point**;
- GBON compliance in Pacific SIDS will be achieved through a mix of surface-based Automatic Weather Stations (AWS), marine observations (e.g. through equipment that the Programme will install under Activity 2.2), ship-based observations – including through the Voluntary Observing Ship (VOS) program – and selected upper air observations. Together, these will ensure GBON coverage of land surface and ocean areas in the five countries through a significant increase in density of observation points.

As case studies at the forefront of developing the Systematic Observations Financing Facility (SOFF) initiative for GBON as a global public good, the five Programme countries are in a leading position to demonstrate the value of investing in GBON both to protect local communities and benefit local populations, but also as a critical element of regional and global forecasting and climate analyses. After the Programme implementation period, support from the SOFF is expected to be available to continue maintaining GBON standards in the five Programme countries.

Sub-activity 2.1.1. Enhance national observations and monitoring networks to GBON standards and establish QMSs

The Programme countries will extend the geographical coverage of their climate and weather observations through enhancement of infrastructure and local technical capacity in alignment with draft GBON provisions for surface-based observations. Each NMHS has committed to securing sound Operations and Maintenance (O&M) for its expanded hydrometeorological networks during and for up to 20 years after the end of the Programme

(see Annex 21). Development partners, including regional organisations and developed country WMO members, have expertise and experience in the deployment and management of equipment in tropical Pacific environments and will contribute to maintenance and calibration as needed, while supporting in-country acquisition of skills. Robust and user-friendly new communications equipment will make it possible to contact remote communities reliably, even in extreme conditions, and will also be covered by the maintenance schedules.

Partners' long-term support for climate change adaptation will help to ensure the sustainability of the expanded network. All development partners need reliable climate data and information if they are to design climate resilient activities in any sector—this creates an incentive to support the observations essential to generation of the information. Increasing concern about the impact of climate change factors on every aspect of development makes it reasonable to project that current levels of support will be at least maintained, and likely increased.

The following interventions will contribute to the achievement by the five countries of WMO Category 2 (Essential) status for climate services:

- **Strengthen the network of land-based observation stations** measuring atmospheric pressure, temperature, humidity, horizontal wind and precipitation and regular reporting of data **in compliance with Global Basic Observing Network (GBON)** requirements and obligations. The Programme will install new/upgraded climate monitoring stations (AWS and AWOS) in all five countries that will feed data into GBON for use in global Numerical Weather Prediction (NWP). In addition, Cook Islands will procure upper air land-based consumables and a DigiCORA receiver to ensure that CIMS can collect, contribute and use data from its existing network.
- **Improve observation station density** based on established and known national requirements in each of the five countries and compliance with GBON (see above). Details of the proposed enhanced observation network in each country can be found in Annex 2 (Feasibility Study) and Annex 21 (Operations and Maintenance Plan).
- **Introduce weather radar for severe weather and climate monitoring** through infrastructure and capacity building. The Programme will install a dual-polarization X-band Doppler radar system in each of the five countries and provide technical training (Sub-activity 4.1.2) to build in-country capacity for radar operations, maintenance and data applications for weather and climate monitoring and analyses.
- **Improve observations through compliance with WMO Integrated Global Observing System (WIGOS)** regulatory and guidance material. All five countries will strengthen their maintenance schedules, procure spare parts and calibration equipment, and undertake iterative training in calibration and maintenance with development partners; Niue will source in-country IT expertise to ensure that all equipment is maintained and operational.
- **Enhance data and data management** so that historical as well as real-time observations in the atmosphere, the oceans and over land of the Essential Climate Variables (ECVs) prepared by GCOS and partners for climate purposes are exchanged freely for use in Regional Climate Centres (RCCs) for at least one Global Surface Network site in each country.
- Adopt a well-documented strategy including vision and operating manual for ensuring security, integrity, retention policy and technology migration for **data archival process and systems**.
- **Generate generic monitoring products** (i.e. drought monitoring, climate watch, etc.). For example, the Programme will build on the CREWS Pacific SIDS Project²⁵⁴ to enhance Climate Risk Early Warning Systems (CREWS) and Early Action Rainfall Watch (EAR Watch) in Niue, Palau and Tuvalu.

²⁵⁴ CREWS, 2020. Pacific: Strengthening Hydro-Meteorological and Early Warning Services. Available at: <https://www.crews-initiative.org/en/projects/pacific-strengthening-hydro-meteorological-and-early-warning-services>

- **Compute sector-specific Climate Indices** and other sector-oriented climate products – to be delivered under Sub-activity 2.2.2.
- **Create value-added products** such as graphics, maps and reports to explain climate characteristics and evolution, according to the needs of specific sectors such as health, agriculture, water and disaster management – to be delivered under Sub-activity 2.2.2.
- **Establish a Quality Management System (QMS)** to help enhance the quality of NMHS activities including streamlining and optimising the processes and procedures applied and the products and services provided, with the aim of obtaining certification of compliance with relevant ISO standards.²⁵⁵ Since the Cook Islands has a close relationship with New Zealand’s NMS, and RMI and Palau with NOAA, these partners will be fully engaged in the QMS process.
- **Enhance Forecasting systems** through the generation of specialised value-added products; development of monthly, seasonal and longer scale climate predictions; and assimilation of satellite images and data into NWP – to be delivered under Sub-activity 2.2.2.

In respect of each of the five Programme countries, UNEP will ensure compatibility of observation equipment with WMO standards for meeting the GBON requirements. To this end, UNEP will work with relevant Regional Technical Partners to provide technical support for the assembly, calibration, installation, operation and/or maintenance of observations equipment – upon country request. UNEP will also undertake procurement of equipment directly upon request from countries. National Executing Entities (EEs) will ensure that observation equipment is suited to the national context through coordination with the NMHSs and technical partners. National EEs will also be responsible for country-specific interventions requiring localised solutions such as the hiring of local consultants, convening national workshops and procurement of certain items required nationally.

Activity 2.2 – Strengthen ocean and climate modelling and impact-based forecasting

Under this Activity, the Programme will establish end-to-end ocean services and strengthened climate information and early warning systems in all five countries in recognition of the fact that Pacific island countries are custodians of 20% of global Exclusive Economic Zones (EEZs), where ocean space exceeds land area by an average factor of 300 to 1, and which are rich in biodiversity and natural resources. The Programme will develop a new ocean modelling framework, along with web-based portals for climate and oceans data. Furthermore, the Programme will enhance NMHS capacity to use the data to develop tailored, location-specific climate services and products relevant to climate-sensitive sectors from government agencies to community level, including through the establishment of in-house impact-based forecasting capacity.

The diagram below represents the proposed development of ocean services in the five Pacific SIDS, aligned with the GFCS pillars.

²⁵⁵ WMO, 2017. Guide to the Implementation of Quality Management Systems for National Meteorological and Hydrological Services and Other Relevant Service Providers

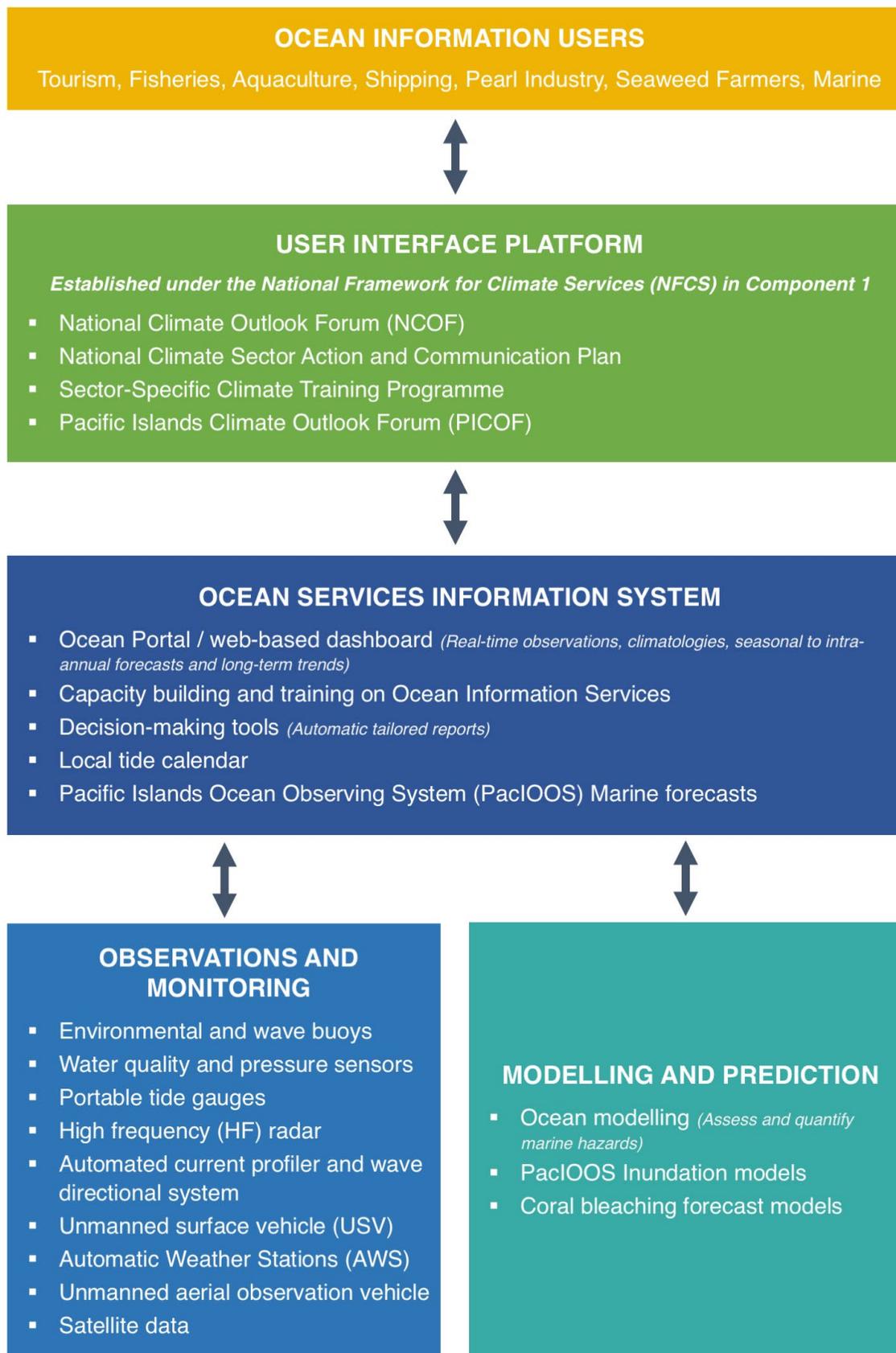


Figure 25. Alignment of the proposed Ocean Services Information System with the GFCS pillars

Sub-activity 2.2.1. Establish ocean information services

This sub-activity will develop end-to-end ocean services in all five Programme countries through the establishment of ocean observations and monitoring, strengthened ocean modelling and prediction, and tailored decision-making tools and ocean data portals to enable optimised use of climate and ocean information. This will enable the NMHSs to engage with the marine sector within their respective countries and provide information vital for safe and effective industry operation. The Programme will facilitate that NMHSs have access to relevant ocean data that is frequently updated, low bandwidth, tailored for priority applications within their EEZs, and accompanied by targeted training and capacity building. It is essential that guidance is provided to NMHSs and relevant stakeholders on how to access and interpret ocean and climate data, which can then inform relevant decision-making.²⁵⁶

The following interventions will contribute to the achievement of WMO standards for marine and oceanographic services in the five Programme countries:

- **Establish ocean observations and monitoring** through the installation and maintenance of surface wave and environmental buoys for in-situ measurements of a wide range of physical and environmental oceanic variables (e.g. real-time temperature, salinity, dissolved oxygen, waves, pH, etc.); multi-parameter water quality and/or pressure sensors for systematic ocean monitoring; establishment of high frequency (HF) radar²⁵⁷ to provide real-time 2D current and wave data (Niue); precision sensor water temperature loggers to expand in-situ ocean temperature observations (RMI); deployment of a near-breaking-zone current profiler and wave directional system (Palau) and unmanned deep ocean observing vehicle (Cook Islands); installation of automatic weather stations (AWSs) on four inter-island shipping vessels to measure atmospheric pressure, wind speed and direction, air temperature, sea surface temperature and wave height (Cook Islands); and routine deployment of an unmanned aerial vehicle to quantify 3D shoreline change and erosion (Cook Islands, Niue and Tuvalu). The Programme will also enhance capacity for remote sensing derived coastal observations such as water quality mapping (e.g. turbidity, chlorophyll, coloured dissolved oxygen matter, etc.), marine habitat mapping and shoreline change analysis. In addition, NMHS staff will be supported to integrate site monitoring data to calibrate satellite-derived ocean observations to improve understanding of local impacts and establish proxy relationships between ocean drivers and coastal impacts.
- **Strengthen ocean modelling and prediction** to improve local ocean and coastal impact monitoring programmes and enhance capacity for risk-based planning and impact-based early warning systems. With the support of regional technical partners, the Programme will build in-country capacities for statistical and dynamic downscaling of localised ocean information and multivariate forecast modelling based on individual country needs and priorities. In Cook Islands, Niue and Tuvalu, the Programme will develop an ocean modelling framework utilising a three-step methodology: i) analysis of long-term large-scale ocean and atmospheric data to map spatial and temporal variabilities and identify annual, monthly and daily predictors that drive localised ocean conditions and impacts; ii) development of downscaled wave, circulation and inundation models at country, island and lagoon scales; and iii) establishment of a long-term integrated ocean and coastal impact monitoring program combining remote sensing and in-situ ocean and coastal impact data. The framework will enable NMHS staff to assess and predict short and long-term lagoon health-related hazards and risks; and will be tailored to specific sites to identify large and small spatio-temporal scale drivers that can play a significant role in modulating lagoon health. The Programme will establish and develop in-house capacity and capabilities for ocean modelling and prediction – for example, understanding the contribution of various drivers to forecast marine health from days/weeks to seasonal scale – through technical training and workshops, including the use of satellite

²⁵⁶ Powers M, Begg Z, Smith G and Miles E (2019) Lessons from the Pacific Ocean Portal: Building Pacific Island Capacity to Interpret, Apply, and Communicate Ocean Information. *Front. Mar. Sci.* 6:476. doi: 10.3389/fmars.2019.00476

²⁵⁷ HF radar will be installed in-land to increase sustainability of the ocean monitoring station (i.e. reduced risk inherent to cyclone hazard, vandalism, etc.)

(e.g. COPERNICUS) and HF radar. Engagement of the Copernicus Marine Service²⁵⁸ will support lagoon health monitoring through a combination of remote sensing, in-situ environmental sampling and dynamic modelling. In Palau, the Programme will build capacity for ocean modelling through the Pacific Islands Ocean Observing System (PacIOOS) to include: i) near-term wave, circulation and inundation forecast models; and ii) long-term future climate scenarios to ascertain the most at-risk coastlines and advise vested parties on response efforts. PacIOOS provides coastal and ocean information, tools and services to empower ocean users and stakeholders in the U.S.-affiliated Pacific Islands, including Palau and RMI. The Programme interventions in Palau will build on and complement existing efforts in the region, including development of wave run-up forecast tools that are already being used by RMI to predict high sea levels and wave inundation. In RMI, the Programme will focus on ocean modelling and prediction to improve the accuracy of coral bleaching forecasts and inform fisheries planning and decision-making. Forecasters will be supported to integrate multi-parameter (temperature, conductivity, dissolved oxygen, pH and turbidity) in-situ data with satellite-derived information and high-definition photogrammetry to refine models and enhance predicting skills. The Programme will organise a national stakeholder workshop in RMI focused on improving coral bleaching model forecasting skill and warning efficacy. Representatives from the other four countries (e.g. forecasting professionals, coral reef and fisheries scientists, natural resource managers, etc.) will be invited to participate virtually for the purpose of knowledge transfer.

- **Establish ocean information services** through the development of tailored decision-making tools and integration of quality controlled data into local databases and regional interfaces (e.g. the Pacific Ocean Portal – the region’s centralised platform for ocean data visualisation) to facilitate optimised use of location-specific ocean and climate information. This will include the integration of satellite-derived data (e.g. from the EU COPERNICUS Programme and NOAA) to complement and enhance information from in-situ observations. In Cook Islands, Niue and Tuvalu, the Programme will facilitate the conversion of ocean observation and monitoring data into actionable information via decision-making tools tailored to fulfil ocean stakeholder needs. This will include a graphical user interface with capacity to generate automated reports; impact-based ocean outlook and multi-variate forecasting tool; state-of-the-art satellite and HF radar data-derived products tailored to provide optimised benefit to stakeholders; and high-resolution circulation models and particle tracking to support decision-making on search and rescue, pollution management, navigational safety and marine protection areas (MPAs). In particular, the Copernicus Marine Service will support the use of Sentinel-2 satellite-derived lagoon health parameters / proxies to be calibrated using in-situ data (from buoys and data loggers) for specific sites in Cook Islands, Niue and Tuvalu. A user-friendly tool will be developed and deployed in each country to deliver a free Sentinel-2 derived lagoon health monitoring product. In Palau and RMI, the Programme will develop web-based national “dashboards” including (where available) real-time observations, climatologies, seasonal to inter-annual forecasts and long-term trends. The dashboards will draw existing data from and be integrated into a regional dashboard, which will support the development of the WMO’s Regional Area 5 (RA-V; Asia Pacific region) Pacific Islands Regional Climate Centre, as well as many ongoing facilities and programmes for ocean information services and early warning systems. The dashboards will integrate data from the global tide gauge network (sea level), drifting floats and observing system arrays (SST) and meteorological stations (precipitation); as well as satellite measurements from AVISO (sea level), Pathfinder (SST) and PERSIANN (precipitation). A training exercise whereby the dashboards are presented, and users trained on how to make best use of the information, will be held at the annual Pacific Islands Climate Outlook Forum. This will also provide a mechanism for wider exposure of the interventions.

Sub-activity 2.2.2. Enhance climate information and impact-based forecasting

²⁵⁸ Copernicus Marine Service, 2020. Available at: <https://marine.copernicus.eu/>

The Programme will enhance NMHS capacity for the provision of tailored, location-specific climate services and products relevant to climate-sensitive sectors from government agencies to community level. This will be achieved through the following interventions:

- **Enhance in-house forecasting capacity and systems:** the five countries do not currently undertake forecasting in-country but use forecasts provided by other national meteorological organisations such as the Regional Specialised Meteorological Centre – a section of the Fiji Meteorological Service – and the Pacific National Weather Services – a department of the US National Ocean and Atmospheric Administration (NOAA). To enhance in-house forecasting capacity and the utilisation of high quality climate information for developing monthly, seasonal and longer-scale climate predictions, the Programme will conduct training on forecasting; use of data and information in preparing for the tropical cyclone season and for climate extremes (e.g. drought and floods); dynamical seasonal prediction (ACCESS-S); and hybrid multi-model ensemble prediction (PICASO). The use of MME systems will improve the ability of NMHSs to utilise all of the already existing high-quality climate information available to them, which is limited in the common use of single-model forecasts. MME systems have been proven to be a valuable method to overcome model biases that can hinder prediction skill in individual dynamical models, which may have systematic errors and biases.²⁵⁹ The Programme will also enhance forecasting systems by creating value-added products, such as graphics, maps and reports to explain climate forecasts and climate model information (for example, Niue and Tuvalu will develop user-friendly forecast information products customised to specific user needs); and enhance the use of satellite data (e.g. from Himawari and COPERNICUS) through developing skills in image analysis and assimilation of observations in the NWP. NMHSs mostly rely on global products to provide their stakeholders with ocean prediction services. Global ocean products are often too coarse to provide reliable information in Pacific island countries. Under this Programme, high-resolution ocean forecast systems will be developed (Cook Islands, Niue and Tuvalu), which will significantly improve wave, current and inundation prediction products. The new ocean forecast systems will be based on meta-models, providing a lightweight solution tailored to the resources available at the NMHS. Through this approach, the ocean forecast system will be hosted by the NMHS, thereby increasing country ownership of the Programme's outputs.
- **Introduce impact-based forecasting** – forecasting that considers the vulnerability of people, livelihoods and assets as well as consideration of the hydrometeorological hazard — to support NMHS staff in building their capacity to understand the relationships between the spatial and temporal variations in vulnerability and exposure as they relate to various hazards; and strengthen their partnerships with Disaster Management Officers and other partner agencies and user communities. Building on the ocean framework developed under Sub-activity 2.2.1, the Programme will support NMHSs to generate impact-based ocean outlooks and impact-based forecasts. This will be complemented by training on the use of monitoring data to inform the continuous improvement of impact-based forecasts; and on communicating forecasts, warnings and local-scale impact-based advice – to be further supported under Sub-activity 4.1.2. In Palau and RMI, the Programme will develop health and drought early warning systems to generate more useable climate information to inform focused and timely interventions that maximise population health and wellbeing.
- **Establish climate science and analysis capacity:** To support the enhancement of in-house forecasting capacity, the Programme will build a strong scientific and analytical foundation for NMHSs through training and mentoring attachments covering climatology and oceanography. Early-career scientists from NMHSs will be selected to undertake in-depth technical capacity building through a customised Young Scientist Support Program (supported by APCC), including highly in-depth training for 2 – 3 months exploring various climate prediction and analysis techniques such as downscaling predictions, generating sub-seasonal-to-seasonal forecasts, analysing large-scale patterns, and tropical

²⁵⁹ Kim, G. et al. Global and regional skill of the seasonal predictions by WMO Lead Centre for Long-Range Forecast Multi-Model Ensemble

cyclones, etc. This will equip participants, particularly those with less experience, with both the basic knowledge needed to perform their duties as climate officers, as well as more advanced knowledge that can help them develop downscaled or impact-based forecasts.

- **Facilitate stakeholder uptake of impact-based forecasts and information** through the development of tailored products and services for climate-sensitive sectors. This will include the Climate Risk Early Warning System (CREWS) and Early Action Rainfall Watch (EAR Watch) in Niue, Palau and Tuvalu; and harmonisation of climate and sector data between the NMHS, Ministry of Health and Fisheries Department in the context of developing data and information products that will be useful to those sectors in Tuvalu. Each country will engage a Programme-hired local climate expert who will facilitate provision of the much-expanded climate information services and will focus on climate science and data analysis for new functions. The climate experts will also be responsible for sector and inter-ministry coordination; and the development of new products and services in response to sector demand.
- **Introduce customised climate information and early warning generation** through enhancing existing climate prediction systems to generate local station-based temperature outlooks, provide monthly forecast data, and be equipped with the ability to generate flexible sector-tailored climate information and variables upon request – and based on sector needs identified in stakeholder workshops (Sub-activity 1.1.3). The Programme will also facilitate the tailored and iterative development of products generated by the existing climate data management system (CDMS). NMHS staff in Niue and Tuvalu will be supported to undertake real-time analysis of climate and other environmental data and develop customised products, reports and advisories for early warnings. This will enhance capacity for the communication of up-to-date climate risk information to key stakeholders and facilitate risk-informed early action decision making. In Tuvalu, the Programme will facilitate all historical climate observation records on paper to be digitised and ingested into the CDMS; and climate records held in NIWA’s database to be made compatible with existing data management software. The availability of a decades-long reliable dataset from a specific location will make it possible to discover long-term trends and to make projections of future changes.

Activity 2.3 – Harmonise climate data and information management

Under this Activity, the Programme will integrate climate data and information into decision-making and planning in climate-sensitive sectors through the development and implementation of climate data and information strategies in Cook Islands, Niue, Palau and RMI.

Sub-activity 2.3.1. Establish and implement national climate data and information strategies

In support of the observation and monitoring action “address environmental data needs” recommended under the Pacific Roadmap for Strengthened Climate Services (PRSCS) each country will develop a National Data and Information Strategic Action Plan for improved climate-related data management, governance and enhanced inter-sectoral communication. The Plans will stipulate that future climate-related data collection is sex- and age-disaggregated, where possible and/or relevant. Building on the GEF-funded “Inform” project, a dedicated Programme-hired national climate data consultant will collate national data, research and information relevant to climate change into previously established Environmental Data Portals. This will be implemented in close cooperation with National Statistics Offices and other data custodians. The national climate data consultants will analyse and publicise the existence and value of their portals’ contents, and the Programme will build capacity for countries to use the data, with technical support from SPREP. Two immediate benefits will be greater availability of essential data for planning climate change interventions and infrastructure investments, and improved tracking and reporting of progress against the UNFCCC and other climate-related multi-lateral environmental agreements and conventions. As usable data from climate-sensitive sectors becomes available (for some sectors and countries directly through this Programme’s inputs), the potential will be created for overlay of datasets such as climate and disease incidence in such a way that risks can be predicted.

National Statistics Offices (NSOs) are fully engaged with and leading the implementation of the “Inform” project through: i) setting up national data management and governance networks; ii) design and use of cloud-based national environmental databases and reporting tools; iii) facilitating the collection and management of national environmental statistics; and iv) design and validation of national State of Environment (SoE) reporting templates. Lessons learnt from the “Inform” project will be utilised when working with NSOs and other data custodians as part of the Programme.

Result 3: Improved community preparedness, response capabilities and resilience to climate risks

Vast ocean areas and widely dispersed islands mean that isolated communities are under considerable threat from climate-related hazards and increasingly frequent extreme climate events. Making climate information accessible and actionable to populations in very remote locations, so that vulnerable communities can enhance their preparedness and response capabilities, represents a significant challenge. Therefore, this Result will focus on enhancing warning dissemination and communication mechanisms, coordinating and integrating sustainable disaster risk management actions, and building local capacity to improve community preparedness and disaster risk reduction for multiple climate-related hazards.

Programme Result 3 contributes to the attainment of the overall Goal of the Sendai Framework for Disaster Risk Reduction: “*The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries*”. In particular, the Programme will contribute to the Framework’s Global Target (g) “***Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030***”.

The Programme will also contribute to the outcomes of the 2019 UN Climate Action Summit, in particular targets 3 and 4 of the Risk-informed Early Action Partnership (REAP) on investment in “***early warning system infrastructure and institutions to target early action in ‘last/first mile’ communities***” and “*more people are covered by new or improved early warning systems...*”.

Furthermore, this Result will introduce Forecast-based Financing (FbF) in the five countries as an innovative mechanism whereby early actions at community and government level are pre-planned based on credible forecasts, and are funded and implemented before a climate shock to minimise losses and damages caused by climate-related hazards and reduce the need for humanitarian assistance in their aftermath.

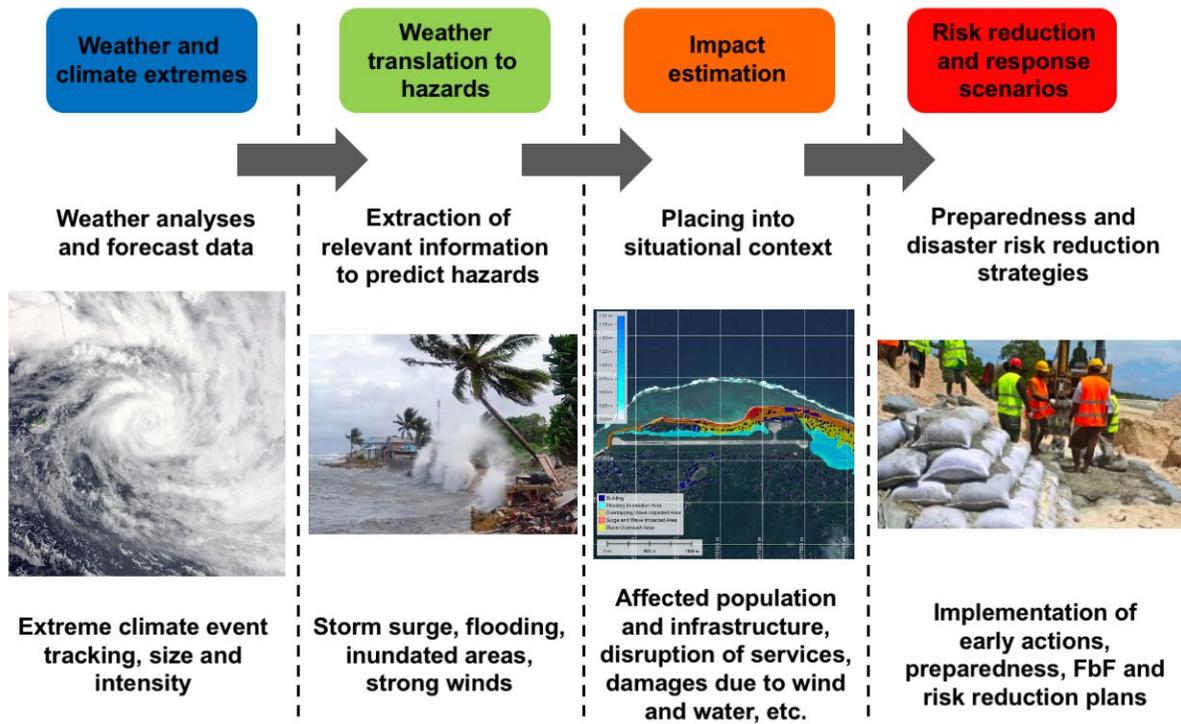


Figure 26. Translating weather forecasts into impact-relevant information for community preparedness and disaster risk reduction²⁶⁰

Selection criteria

Specific island communities / beneficiaries will be identified based on the following general eligibility criteria:

- Exposure and vulnerability to hydrometeorological hazards;
- Dependency of livelihoods in climate-sensitive sectors;
- Potential to support increased livelihood opportunities – in particular, for women and other high vulnerability groups;
- Willingness to participate in Programme activities.

Additional selection criteria for beneficiary groups relevant to specific sub-activities are outlined in Table 27 of the Feasibility Study (Annex 2). At the inception phase, the Programme Management Unit (PMU) will further elaborate and refine transparent and just selection criteria in consultation with the Programme Steering Committee (PSC).

Programme Result 3 has a proposed budget of \$6,429,558.66. The Cook Islands, Niue and Palau will provide in-kind co-financing of \$50,570.60, \$71,012.50 and \$143,387.00 respectively, whilst the remaining \$6,164,588.56 is as a grant request from GCF.

Activity 3.1 – Improve warning dissemination and communication

Under this Activity, the Programme will enhance the dissemination and communication of climate risk information and early warnings based on the enhanced data generated under Result 2. The Programme will

²⁶⁰ Adapted from: WMO (Kootval, H.), 2016. Impact-based Forecast and Warning Services Presentation – Curaçao. Photo sources: NASA, AFP, World Bank, Water Research Laboratory Technical Report (Coastal Adaptation Needs Cook Islands Project Stage 3 – Vulnerability Assessment).

particularly focus on strengthening last-mile communication systems to ensure that people and communities in remote locations receive warnings in advance of impending hazard events. NMHSs will be supported to develop a range of communications products tailored to end-users at the community level. National Disaster Management Authorities, Red Cross Red Crescent National Societies and community-based organisations will play a key role in enhancing preparedness and response capabilities.

Sub-activity 3.1.1. Strengthen EWS organisational and decision-making processes

This sub-activity will ensure the effective and coordinated delivery of early warning services through strengthened organisational and decision-making processes of NMHSs, disaster management agencies, civil society organisations and other key actors. In conjunction with the establishment of National Frameworks for Climate Services (Sub-activity 1.1.1), the functions, roles and responsibilities of key EWS actors will be defined and included in standard operating procedures, such as the Early Action Protocols to be developed in Sub-activity 3.3.2. Warning communication strategies will be developed to ensure coordination between NMHSs – as warning issuers – and downstream dissemination channels, such as island community volunteer networks and women’s groups. The communication strategies will include the development of community feedback mechanisms to verify that warnings have been received and to alert NMHSs to potential gaps in communication networks. At the start of Programme implementation, an in-country deep dive study on gender and community stakeholders will be conducted to facilitate that the design of EWS organisational and decision-making processes is gender-responsive and that such processes proactively consider and address the specific needs, concerns and capabilities of different gender groups.

Sub-activity 3.1.2. Strengthen communication systems to reach the last-mile

This sub-activity will enhance connectivity and communication systems to facilitate that climate information and early warnings reach communities at the last-mile, including on remote outer islands; and that communication channels are resilient to the impacts of extreme climate events. This will be achieved through the following interventions:

- **Develop last-mile communication strategies** based on understanding of last-mile connectivity (which population groups can be reached by different communication channels) and tailored to the differential needs of specific groups (including women and men, elderly people and children, people with disabilities, and remote island populations). This will include agreement on a glossary of climate and weather terms in local languages, and the routine use of the terms in television weather reports, which will enhance understanding between NMHSs and communities.
- **Upgrade last-mile communications infrastructure** through equipment maintenance and upgrade; establishment of backup systems and processes; and the development of additional communication channels to improve coverage and resilience to impacts on infrastructure. For example, Niue and Tuvalu will install village “compass” posts with pointers to known locations, and signposts to show people which way to go during different extreme events. This will enable communities to appropriately action local climate and early warning information. In addition, backup systems using Pactor modems and HF radio will be established in all islands of Tuvalu to improve two-way communications with isolated communities during a disaster. In Palau, a maritime safety information network will be established in accordance with the International Hydrographic Organization’s Safety of Life at Sea (SOLAS) convention.
- **Enhance communication channels and early warning systems** through the development of multiple-channel climate and ocean information products (e.g. for social media, mobile, radio, television and website applications). For example, Niue and Palau will each develop an ocean and climate mobile application, which will provide immediate access to detailed, up-to-date information on local terrestrial and ocean climate conditions. NMHS websites will also be upgraded with a user-friendly interface to enable easy access to climate and ocean information. Niue will increase their reach into communities with additional radio and newspaper coverage. In RMI, development of a web-based dashboard linked

to the regional portal will improve accessibility and understanding of RMI's ocean data and early warnings as they relate to coral reefs.

- **Develop and implement localised mobile climate information communication systems with early warning to reach last-mile populations.** Through mobile-cellular communication channels, this system will provide predicted risks and alerts utilising geostationary satellite nowcast and local/regional forecast information. The system could also integrate information on locations of first-aid stations and nearby medical facilities, and status reports. For example, at-risk populations could receive information on their mobile device detailing nearby hospitals and shelters. The system will be designed to handle potential and existing risks on a 24/7 basis and will be customisable for any population group size – from small communities to larger central governments. For short-term disasters, the system will utilise satellite imagery analysis based on 2 km, 10-minute resolution (e.g. Chollian 2A) for nowcasting of wind, wave height and convective initiation of rapidly developing thunderstorms two hours in advance, which is not possible with Numerical Weather Prediction. Localised mobile climate information communication systems will support disaster risk management on various timescales from short-term disasters (e.g. torrential rainfall, coastal flooding, etc.) to long-term disasters (e.g. droughts). The possibility to integrate a two-way communication channel between end-users and information providers would allow for continued enhancements to the system based on user feedback.²⁶¹
- **Identify opportunities to utilise private sector resources to disseminate warnings,** such as mobile-cellular, television, radio broadcasting and social media. The identification of appropriate private sector partners could be facilitated by the market assessment that will be undertaken under Sub-activity 1.1.2.

Sub-activity 3.1.3. Communicate early warnings to island communities

This sub-activity will use tailored approaches to improve the content and communication of NMHS forecasts to ensure the effective dissemination of impact-based early warnings and enable communities to take advantage of all available forecast information. In doing so, the Programme will utilise the improved forecasts and warnings of severe weather as a result of, amongst others, the WMO Severe Weather Forecasting and DRR Demonstration Project (SWFDDP) in South Pacific, in which Cook Islands, Niue and Tuvalu participated. This will be achieved through the following sub-activities:

- **Improve warning messages to provide clear guidance for triggering response actions.** The Programme will work with NMHSs, National Disaster Management Authorities and local communities to co-design and co-produce information products, drawing on their specialised knowledge of their environment to create warnings that are actionable and effective.
- **Ensure that the public and other stakeholders are aware of which authorities issue the warnings and trust their messages:** engagement with island communities and other stakeholders will improve community awareness of which authorities issue warnings, build trust between stakeholders and improve acceptance of science-based information products.
- **Include the different risks and needs of subpopulations in early warnings:** the particular climate information needs of the elderly, people living with disabilities and geographically and/or socially vulnerable communities (e.g. on remote outer islands) will be taken into account, as well as ensuring that warnings are gender responsive. For example, the Disability Coordination Office at the Ministry of Culture and Internal Affairs in RMI will partner with the Disabled Persons Organization to ensure effective communication on disability-inclusive programming for early warning. Additionally, the delivery of disability-inclusive climate change and disaster preparedness activities and educational products will be expanded. This will include production of an educational video using a Sign Language Interpreter on

²⁶¹ This will be delivered by the APEC Climate Center in collaboration with the Ewha Womans University, utilising a proven method that is currently being implemented in Cambodia, with the endorsement of the Cambodia Ministry of Water Resources and Meteorology, Asian Disaster Preparedness Center (ADPC) and the Preah Vihear National Authority

climate change early warnings in Marshallese with English captions. In Tuvalu, a National Coordination Team will be established to engage with and address the priorities of vulnerable groups.

Activity 3.2 – Enhance preparedness and response capabilities

Under this Activity, the Programme will engage with communities at the last mile to enhance preparedness and response actions at the local level. The proposed interventions will focus on knowledge and capacity building to support the adoption of climate-resilient livelihood practices. This will be facilitated by the development of community-based disaster risk reduction and disaster risk management plans, community level vulnerability assessments, and training and awareness workshops to enhance awareness of climate hazards and risks.

Sub-activity 3.2.1. Enhance disaster preparedness and response measures

This sub-activity will use community-based approaches to enhance risk ownership at the local level and help establish collaborative community networks for coordinated action for preparedness and response to climate-induced hazards. This will include the following sub-activities:

- **Community-based disaster preparedness plans** including co-development of community-based sustainable climate adaptation plans for climate resilience, using integrated scientific information and traditional climate knowledge (see Sub-activity 3.2.3) in Niue; and development of community-based disaster risk reduction plans and a Drought Monitoring Plan for each inhabited island in Tuvalu. Participation in the development of community-based plans will encourage community members to consider how their current livelihood practices can be adapted to enhance their climate resilience, which will serve as an essential primary step for communities to adopt new climate-resilient livelihoods. Furthermore, the plans will outline locally relevant adaptation strategies, including options for livelihood diversification.
- **Multi-hazard risk and vulnerability assessments** utilised to develop disaster risk reduction strategies and products. For example, Cook Islands will utilise community-based vulnerability assessments to develop hazard maps, damage assessment tools and a National Emergency Operation Centre (NEOC); and Niue will update their vulnerability and adaptation assessment tool.
- **Capacity building for disaster response**, including women's training programmes in Palau to enhance capacity to prepare for and respond to climate disasters and emergencies. The activities will be delivered in partnership with several government and non-government agencies, such as the Ministry of Natural Resources, Environment and Tourism (Bureau of Agriculture), who will ensure that knowledge gained is contextualised to the context of key sectors and how it related to livelihood resilience. In RMI, the Programme will establish 70 outer island Emergency Response Teams (ERTs) and provide training and capacity building to ensure that the ERTs are sustained. The existing ERT training curriculum will be reviewed and expanded to include information about RMI Weather Service Office's climate and weather services, traditional knowledge and effective ways to convey climate information. The expanded curriculum will include capacity building activities on the use and integration of WSO services, traditional knowledge and climate information to enable communities to adopt climate-resilient livelihoods.
- **Assessment of community-level communications and response actions** to test and optimise the effectiveness of early warning dissemination processes, preparedness and response actions. For example, Tuvalu will conduct periodic disaster warning drills previously developed by island communities.

Sub-activity 3.2.2. Conduct public awareness and education campaigns on climate hazards and risks

The Programme will conduct public awareness and education campaigns to enhance community knowledge and understanding of climate hazards and the potential impacts on lives and livelihoods of local populations. Communities will be educated on how warnings will be disseminated; which sources are reliable and how to respond. The Programme will ensure the use of targeted approaches to improve awareness of climate hazards

and risks tailored to the specific needs of vulnerable groups (e.g. women, children, older people and people with disabilities). The interventions will include the delivery of school and community-based activities for climate change awareness, and training and capacity building workshops on climate hazards and disaster risk reduction. Niue will establish two Climate Information Centers and undertake several community-based and youth climate initiatives, such as climate change awareness days, Talanoa sessions on climate-related stories with elders, and climate and health wellness programs. The initiatives will deliver information on climate hazards and risks that is relevant to local livelihoods and promotes awareness of how the information can be used to enhance climate resilience. In Palau, RMI and Tuvalu, the NMHSs will undertake public awareness and education workshops in both their capitals and outer islands to enhance knowledge and understanding of climate hazards and potential impacts on lives and livelihoods. The workshops will build the capacity of participants to apply the knowledge to their individual circumstances and consider suitable options for livelihood diversification or alternative livelihoods. In the Cook Islands, the Women's committee (Au Vaine Kumiti) will work with island communities, specifically through training by technically qualified women to educate children and elders on how to use technology to access early warning information and to contribute to local scale vulnerability assessment. The Programme will also support Au Vaine Kumiti to expand its work with young farmers, which strengthens capacity to undertake climate-resilient agriculture practices.

Sub-activity 3.2.3. Integrate traditional knowledge into early warning services

The populations of the participating countries have extensive traditional knowledge concerning adaptation to climate variability. Application of this knowledge to decision-making informed by science will enhance adaptation to long-term changes. While remote Pacific island communities may listen to NMHS forecasts, most rely only on traditional climate knowledge (TK) when they make decisions, or at best on TK in combination with official forecasts.²⁶² WMO recommends that TK be recognised, valued and used to explain climate science—the long-term benefit of recognising TK will be that broadcasted advice will be accepted and acted upon so that communities are better prepared to respond to climate extremes, leading to reduced socio-economic disruption and fewer morbidities and deaths. The importance of integrating TK into climate-related decision-making was also highlighted in the IPCC Special Report on Global Warming of 1.5°C, which noted the cultural resilience of Pacific island inhabitants and how their knowledge can underpin the development of adaptation strategies.²⁶³

Therefore, this sub-activity will incorporate TK into NMHS products to significantly improve forecast communication while expanding the spatial and temporal relevance of the forecasts²⁶⁴ and increasing community acceptance of NMHS materials. The Programme will facilitate engagement with community elders to discuss the types of information that local communities use, their traditional methods of forecasting and how TK can be applied to and complement scientific forecasts. Such discussions are envisaged to generate local acceptance of technically derived climate forecasts, so that communities trust NMHS's information and act on their advice to improve their climate risk preparedness and response capacity.

Support for TK under this Programme builds upon previous work undertaken through the Climate and Oceans Support Program in the Pacific (COSPPac), which included Niue in its TK interventions. Under COSPPac, the Niue Meteorological Service (NMS) worked with community elders to collect and digitise TK indicators in a TK database. The Programme will build on this to collate and verify traditional climate and weather indicators documented under the COSPPac project. Beyond this stage, the Programme will develop seasonal calendars and utilise traditional terminology in translating seasonal forecasts and extreme weather warnings in Vagahau Niue. Moreover, the Programme will upscale the TK work to other countries – notably Palau and RMI – using the methodology that proved successful in COSPPac. Niue, Palau and RMI will recruit a local TK consultant who will be responsible for all Programme work relating to TK, including the establishment of a national workplan; engagement with relevant stakeholders; provision of community education and awareness activities; and collection and archiving of climate TK information. In Tuvalu, the TK intervention builds on the Community-

²⁶² Lefale, P., 2009, Ua 'afa le Aso Stormy weather today: traditional ecological knowledge of weather and climate, the Samoa Experience. Climate Change. doi:10.1007/s10584-009-9722-z.

²⁶³ IPCC, 2018. Special Report on Global Warming of 1.5°C.

²⁶⁴ SPREP, Pacific Roadmap for Strengthened Climate Services 2017–2026

based Early Warning System and DRR (CB-EWS/DRR) implemented under Sub-activity 3.2.1. The Programme will undertake consultations with communities and TK information holders; and TK indicators will be documented and stored in a TK database. Note that Cook Islands did not express a desire to undertake the TK project under this Programme as it is already being progressed through other activities.

Activity 3.3 – Establish Forecast-based Financing (FbF)

Under this Activity, the Programme will establish Forecast-based Financing (FbF) in Cook Islands, Niue,²⁶⁵ Palau, RMI and Tuvalu as an innovative mechanism whereby early actions are pre-planned based on credible forecasts, and are funded and implemented before a climate shock to minimise losses and damages caused by climate-related hazards and reduce the need for humanitarian assistance in their aftermath.²⁶⁶ The combination of FbF mechanisms with impact-based forecasting (Activity 2.2) can be a transformative means of improving disaster preparedness and enabling more efficient management of government budgets to promote the shift from traditional post-disaster response to pre-event early action²⁶⁷ as shown in the figure below.

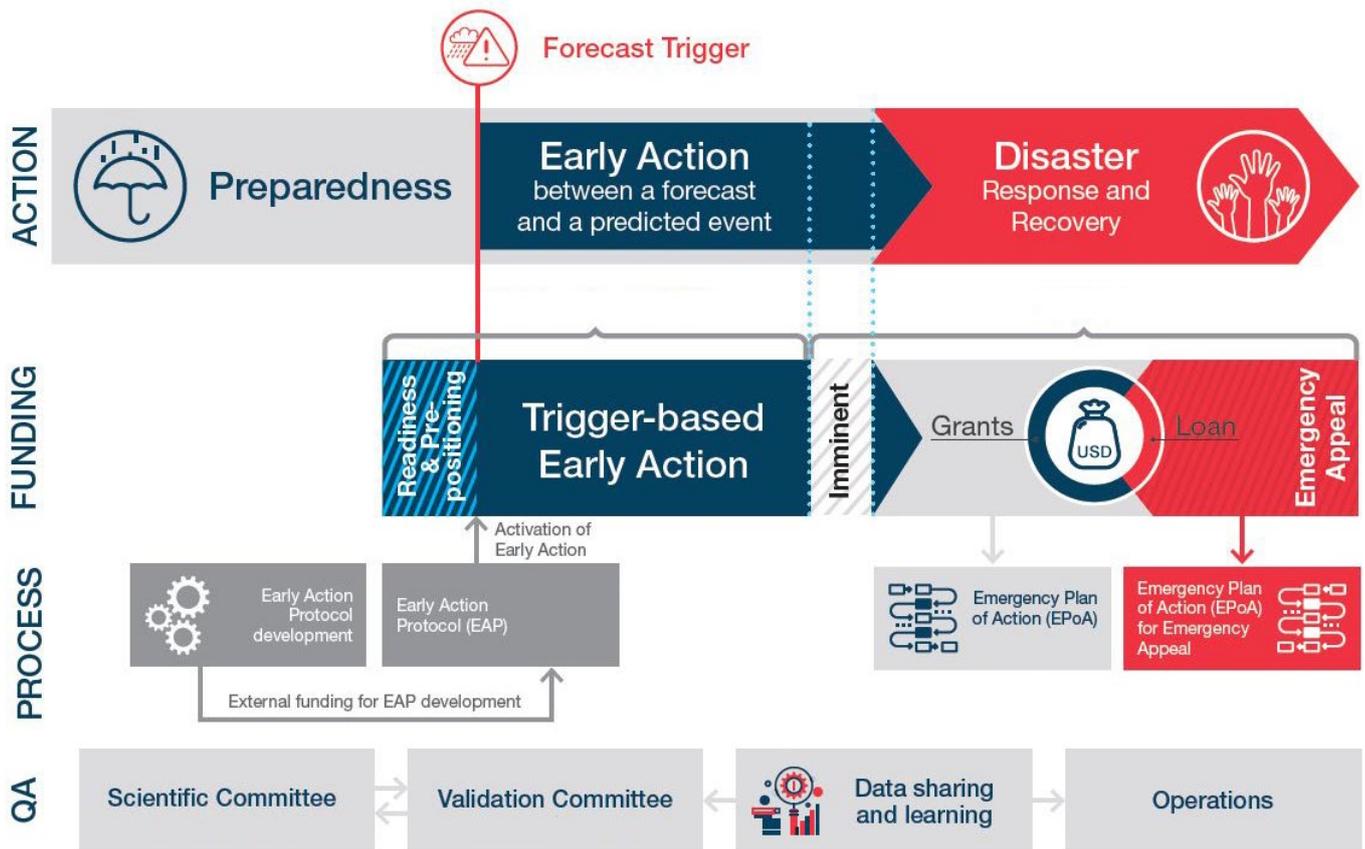


Figure 27. Forecast-based Financing conceptual framework²⁶⁸

Sub-activity 3.3.1. Develop FbF Roadmaps defining thresholds and triggers

This sub-activity will develop an FbF Roadmap for each Programme country, which will identify forecasts (magnitude, probability and lead time) that can trigger humanitarian actions.²⁶⁹

²⁶⁵ There is no Red Cross Red Crescent National Society in Niue, thus potential implementation of FbF-related actions awaits verification

²⁶⁶ WFP, 2019. Forecast-based Financing Factsheet

²⁶⁷ IFRC, 2018. DRR in Action Case Study. Forecast-based Financing: Effective early actions to reduce flood impacts

²⁶⁸ Adapted from: IFRC, 2020. Forecast-based Action (FbA) by the DREF. Available from: <https://media.ifrc.org/ifrc/fba/>

²⁶⁹ Lopez, Coughlan de Perez, Bazo, Suarez, Van den Hurk, Van Aalst, 2018: Bridging forecast verification and humanitarian decisions: A valuation approach for setting up action-oriented early warnings

The first phase of the Roadmap will begin with a scoping study that will cover feasible hazards to target with FbF, forecasting capability, and the institutional landscape in each of the five countries. For FbF to be a sustainable and effective mechanism, Early Action Protocols (EAPs) need to be embedded in national institutions, who have roles and responsibilities for taking early action. The scoping phase will identify the national and/or sub-national actors (government and civil society) in each country and enter into a dialogue with them about the potential for early action.

For the countries with a positive landscape for institutional participation in Forecast-based Financing, the second comprehensive phase of the Roadmap will be developed. This phase will consist of collaborative consultations with country institutions to delineate three key elements that would enable country-led design of an FbF mechanism:

- Possible early actions that can be triggered by existing forecasts, which aim to avoid losses and damages if an extreme event materialises;
- A “menu” of the available early warning information derived from forecasts that can trigger the early actions;
- A potential architecture of country-level technical working groups and institutional ownership for FbF, including funding mechanisms when necessary.²⁷⁰ A lead national agency/s in which to embed EAPs will be identified.

The FbF Roadmaps will provide a set of 10 recommendations per country for critical next steps to move forward with Forecast-based Financing. These next steps will be focused on filling capacity gaps that enable the design and activation of an FbF mechanism by the identified lead agency/s, and the design and testing process for EAPs. The Roadmaps will include the following components:²⁷¹

- **Stakeholder Identification** – The Programme will identify the key stakeholders to be involved in the development and implementation of FbF in each country, including international, national, regional and local actors and lead agency/s.
- **Risk Assessment** – The Assessment will include individual analysis of risk factors, key hazards, past impact, exposure and vulnerability. Based on the analysis, the priority impacts to be addressed will be identified. The assessment will provide an overview of the different types of early actions that could be taken to mitigate risk by the identified stakeholders, in different sectors (agriculture, health, etc).
- **Impact-based Forecasting (Triggers)** – The Trigger analysis will provide an overview of all available forecasts – including lead time, skill/confidence and extreme event probability. This analysis will also offer suggestions on impact-based forecasting products or the potential for such products to be developed, which would overlay a forecast with exposure and vulnerability information. Close collaboration with the executing agencies of Result 2 will be required.
- **Resourcing Overview** – The Assessment will identify various options for accessing funding or necessary resources for potential early actions that are more costly or resource-intensive. This will include an overview of potential national level funds for anticipatory actions, Disaster Risk Financing options, and humanitarian funding options.

The sub-activity will build on the scoping study commissioned by the Australian Red Cross and Red Cross Red Crescent Climate Centre²⁷² in 2016, which assessed the main considerations of adapting FbF to the Pacific with a focus on three larger Pacific island countries (Fiji, Papua New Guinea and Solomon Islands), to adapt it to the

²⁷⁰ Ibid.

²⁷¹ IFRC, 2018. Forecast-based Financing Early Action Protocol template

²⁷² Australian Red Cross and Red Cross Red Crescent Climate Centre, 2016: Use of Forecast-based Financing in the Pacific: A Scoping Study

context and capacities of the much smaller five Programme countries. In developing the FbF Roadmaps, the following key findings from the Red Cross scoping study will be taken into account:

- Forecast skill and possible warning lead times differ considerably from other countries, primarily because the Pacific has very small dispersed islands, short rivers, steep catchments, high El Niño–Southern Oscillation (ENSO) sensitivity, and each country experiences a broad spectrum of extreme events;
- Forecast skill and timeframes differ considerably for different hazards;
- Lack of historical hydrological data and modelling capability throughout the region;
- Some of the most difficult disturbances in the Pacific happen on much longer timescales than FbF has typically operated under;
- Many small island nations have capacity constraints that limit possible early actions;
- Concerns about false alarms and potentially creating apathy towards other forms of early warning are pervasive in the region; and
- The extent to which the populations are dispersed and remote has strong implications for FbF design and budgeting.

Sub-activity 3.3.2. Build capacity for FbF

In this sub-activity, up to five of the 10 “next steps” that were identified for each country in their Roadmap will be developed and executed. Steps that fall within technical capacity building, research or technical advice will be supported by the IFRC Climate Centre. Depending on the national context and the findings of the scoping study, these activities could include the following:

- Scientific collaboration with national or regional forecasters to carry out a forecast verification analysis or forecast calibration to support the development of triggers;
- Technical support to build enthusiasm for anticipatory actions and change mindsets;
- Specific links between the FbF and EWEA narrative with the principles and activities embedded in other outputs of the Programme;
- Technical support in finding ways to connect with existing regional systems, mechanisms and/or priorities to have a region-wide understanding or buy-in of FbF;
- Table-top exercise to discuss a historical extreme event and what could have been done by different actors to prevent impacts;
- Round-table discussion on financing mechanisms for critical early actions that could be part of an FbF mechanism.

Sub-activity 3.3.3. Support development of Early Action Protocols (EAPs)

In this sub-activity, the IFRC Climate Centre will support the countries that have full Roadmaps and identified appropriate national institutions to spearhead FbF (Sub-activity 3.3.1) to develop Early Action Protocols (EAPs) through technical working groups for the priority impacts identified in Sub-activity 3.3.1. These EAPs will vary from country to country, depending on the results of the Roadmap and the capacity building activities. Each country will carry out a series of conversations to develop an EAP, which could range from focusing on a simple life-saving action by one actor to a more complex document with a greater variety of actions and forecast analysis.

To identify what should be in the EAP, each country lead agency/s will convene a technical working group, engaging stakeholders at all levels – including community representatives, disaster risk reduction committees, civil society organisations, local and national government departments, NGOs and private sector actors. The

Climate Centre can provide technical guidance to the lead agency on the process and provide quality assurance, but delivery of the EAP will rest with the lead agency.

The determination of forecast-based actions will be based on: i) preparation and implementation/activation time and action lifetime; ii) capacity to implement the proposed action; iii) financial, material, human and technological resources required; and iv) access issues in providing assistance. Following identification of the most suitable forecast-based actions, the EAPs will be developed by the lead national agency/s.

The EAPs will describe which forecast will trigger which action; where to act – based on the forecast and trigger information; and assign responsibilities to specific stakeholders for implementation of each action. In the case of more complex EAPs, they can also include a proposal for a Financial Mechanism, which will outline what funds need to be made available (including readiness costs, stock pre-positioning and activation cost for trigger-based early actions) and how they will be accessed by specific stakeholders. This sub-activity will collaborate with national climate finance policies (Sub-activity 1.1.4) to explore situations when funding for early action can be linked to government budgets.²⁷³ Depending on local capacity, simulations can be held to carry out a “test” of the actions of the EAP.

Result 4: Enhanced regional knowledge management and cooperation for climate services and MHEWS

Programme Result 4 will optimise synergies among the Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu. Benefits of the multi-country approach include: i) Facilitation of strategic partnerships, stronger relationships and collaboration; ii) Cost efficiency, ease of planning and coordination; iii) Knowledge sharing; iv) Increased awareness of the Programme, leading to increased likelihood of replication of community interventions across the region; and v) South-South cooperation modalities enhancing the multiplier effects of the Programme. To this end, the Programme will organise joint learning events and training; promote equipment, software and tools common to all five countries; and foster networking and mentoring among the five NMHSs. The Result will directly address the key education and training needs – such as Forecasting and Numerical Weather Prediction (NWP), Instrumentation and Observation and Climate Services – reported by Pacific NMHSs to WMO²⁷⁴ and in a study conducted by the Disaster Resilience for Pacific SIDS (RESPAC) project.²⁷⁵

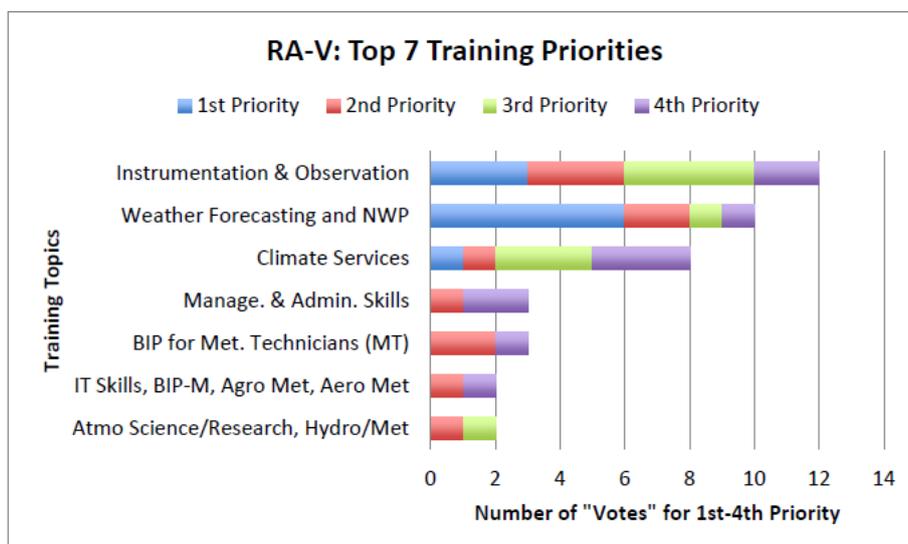


Figure 28. RA-V NMHS training priorities (Source: WMO)

²⁷³ IFRC, 2018. Monitoring and Evaluation (M&E) of Forecast-based Financing (FbF). A practical reference for country-level implementation

²⁷⁴ WMO, 2017. Status of Human Resources in National Meteorological and Hydrological Services

²⁷⁵ UNDP, 2018. Feasibility Study for a Pacific based WMO Regional Training Centre

In general, Pacific NMHSs are aiming to improve the quality of their services and increase the number of products in existing service areas, rather than increase the provision of broader types of services. Figure 23 indicates that there is a notable demand for professionalisation of the climate, forecasting and marine services areas (dark cyan), whereas improved observations capacity is a priority for technical staff with 2-year or lesser qualifications (light cyan).

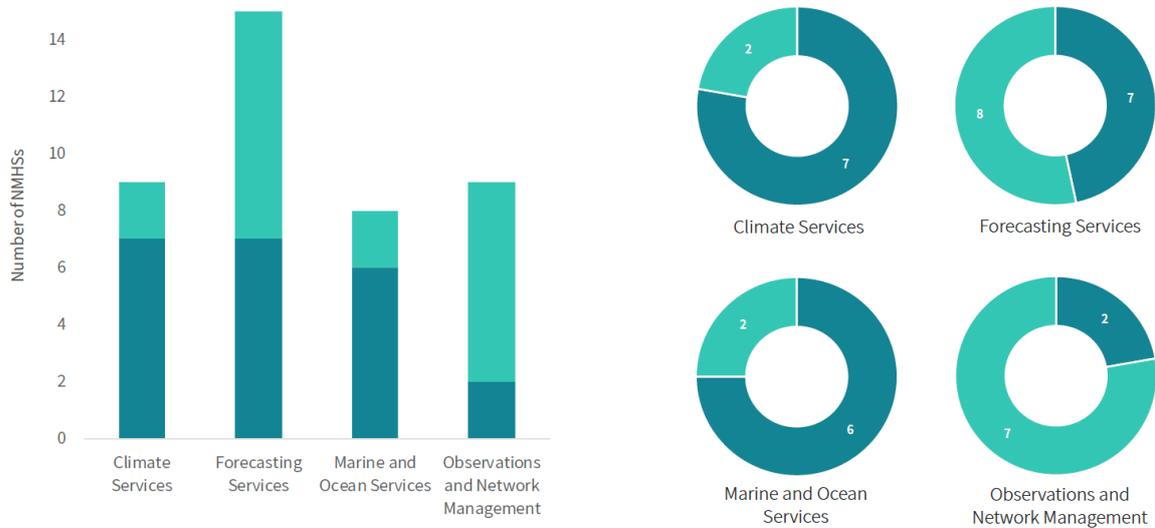


Figure 29. Pacific Islands Meteorological Strategy (PIMS) Pacific Key Outcomes (PKO) areas rated in the top three priority areas by staff type (Source: UNDP RESPAC)

This regional approach will ensure optimal knowledge management by sharing lessons learned and information on best practices. Programme Result 4 will complement and build on existing mechanisms for the entire Pacific region such as the newly established Pacific Climate Change Centre (PCCC), the Pacific Meteorological Council (PMC), the Regional Climate Outlook Forum, WMO regional meteorological centres and training and regional learning institutions such as the University of the South Pacific (USP) and its Pacific Centre for Environment and Sustainable Development (PaCE-SD). The Result will facilitate sharing of successes and lessons on the communication of climate-related information throughout the implementation of the Programme and foster South–South collaboration.

The Result takes advantage of the already established GEF-funded “Inform” project, implemented by UNEP and executed by SPREP, which is helping 14 Pacific island countries to manage and use environmental data well (discussed under Programme Result 2). Under the Programme, SPREP will further embed workflows, data validation and the interactive ICT platform into both the national processes in the five countries as well the operation of the secretariat in multiple focal areas. Building on the platform and processes that the “Inform” project has developed amongst select environment ministry staff, the Programme will expand the workflows to a wider stakeholder group and thereby increase use and demand at both the national and secretariat levels. Upon completion of the Programme, the ICT Officer position as well as associated fees including hosting will be absorbed by the SPREP CORE budget and country funding, as formally committed by SPREP. These are already indications of increased direct national support in several Pacific island countries for data management, use and sharing; and the Programme will continue to grow this national commitment and ownership over its implementation period.

Programme Result 4 has a proposed budget of \$1,556,100.00 as a grant request from GCF.

Activity 4.1 – Enhance regional data, knowledge management and cooperation

Under this Activity, the Programme will enhance coordination and knowledge sharing among the five countries to improve data and knowledge management, including establishment of an interactive ICT platform and regional data centre. The organisation of joint learning, mentoring and training events through existing WMO,

USP and other centres to facilitate sharing of successes and lessons learned will further strengthen climate and ocean information services across the region.

Sub-activity 4.1.1. Establish interactive ICT platform

This sub-activity will establish an interactive ICT platform, which will serve as a data analytic centre for the management and organisation of climate data, information, experiences, case studies and other forms of knowledge from the five Programme countries in standardised, comparable formats most useful for end-users. The platform will include the establishment of a regional data centre fed by national data centres in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu. The countries will make as much as possible of their climate-related data publicly available through their national data portals and the regional Pacific Environmental Portal. The GEF-funded “Inform” project is already working with staff in Pacific environment ministries to find and harvest useful datasets and information on their countries’ environment and to publicise the existence of the information. All five countries now have national data portals which can be used to develop workflows to share data seamlessly between sectors. The Programme will add a repository for climate data and bring data management and coordination into its schedule of capacity building activities. Improved data sharing and discoverability will provide a conduit for NMHSs to assess partners’ sector data or knowledge products, while hosting and sharing their own on a common platform. Enhancement in data management capacity will be achieved through the following steps:

- Addition of a new category for climate data and information to each national portal;
- Training and engagement of national climate data consultants (see Sub-activity 2.3.1);
- Support for countries to prepare their national reporting for climate-related agreements (e.g. NDCs, VNRs, National Communications to UNFCCC). This is currently a major administrative burden for very small countries, but with access to good quality data, it provides an opportunity to evaluate policy and assess progress on adaptation. A two-way flow of information from NMHSs to and from relevant sectors for national and global reporting will ensure coordination in the use of climate data and information and raise the profile of NMHSs in other sectors thereby supporting demand and fostering sustainability.
- Participation of data consultants in regional forums to enhance the use of data in national planning;
- Establishment of electronic links with existing data sources and back-up in the regional portal; and
- Management of the ICT platform for the five Programme countries through support for ICT interventions across the five countries, including application of ICT in NMHSs operations and upgrading or introducing new methods and systems, such as wireless communications and Internet of Things (IoT) infrastructure for climate services.

Sub-activity 4.1.2. Organise learning, mentoring and training

This sub-activity will comprise training, mentoring and advisory services for local consultants and staff in NMHSs in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu on strengthening climate information services; strengthening observations, monitoring, modelling and prediction; strengthening of marine weather and ocean services; establishing MHEWSs at national and community levels; and building community resilience against climate risks. This will be facilitated through partnerships with existing WMO regional training centres (e.g. China Meteorological Administration (CMA) Training Centre²⁷⁶ through coordination by the Chinese Academy of Meteorological Sciences), USP and others in the organisation of:

- Joint learning events for exchanging knowledge and sharing experiences and lessons learned in strengthening climate information services and MHEWSs in the five countries. This will have a major focus

²⁷⁶ CMA propose to provide free in-person and remote training courses covering the top seven training priorities of Pacific NMHSs (see Figure 29)

on the development and implementation of National Frameworks for Climate Services (NFCSSs) through all Results and related activities of this Programme.

- Targeted training of NMHS staff (e.g. meteorologists, ICT administrators, forecasters) in key areas that are essential for the Programme's impact and long-term sustainability. This will be undertaken through existing training centres in the WMO network, the University of the South Pacific (USP), the International Centre for Theoretical Physics (ICTP) and others. Training will be delivered through a combination of on-site workshops and remote learning courses. Topics of training could include:
 - Forecasting and Numerical Weather Prediction (NWP) by suitably qualified providers such as WMO regional training centres and other WMO-approved meteorological organisations. This could include nowcasting techniques for severe weather, and short-term climate monitoring and prediction in disaster prevention and mitigation.
 - Observation and Instrumentation, including Operation and Maintenance (O&M) of equipment for long-term sustainability.
 - Innovative and cost-saving technologies for observation, modelling and prediction with special focus on the application of ICT. Hence, these events will also be critical for regularly reviewing options for upgrading or introducing new methods and systems in NMHSs in the five countries, such as wireless communications and Internet of Things (IoT) infrastructure for climate services and disaster management.
 - Principles of satellite remote sensing and use of meteorological satellite images in weather analysis and forecasting.
 - Demonstration and training on the operation and maintenance of weather radar systems – installed under Sub-activity 2.1.1 by regional partners from the WMO network (possibly the Fiji Met Service in cooperation with USP under the new WMO Regional Training Center). The demonstrations and training will build capacity of the NMHSs for the provision of improved and more accurate weather monitoring and forecasts; tracking of local extreme events; better determination of rainfall rate/intensity, which is important for determining the potential for extreme rainfall and flash flooding enabling hazard warnings to be issued more accurately and in more timely fashion; and validating Numerical Weather Prediction (NWP) forecasts.
 - Enhancing institutional effectiveness of NMHSs through Quality Management Systems (QMS), Weather Forecast Service Standard and related certification.
 - Enhancing NMHS services through Impact-based forecasting and Forecast-based Financing.
 - Enhancing climate services in NMHSs, including options for ensuring long-term financing and cost-recovery such as private sector investment, public-private partnerships and the application of National Climate Funds.
 - Use of alerts, information exchange and coordination in the first phase after major sudden-onset disasters, including through the Global Disaster Alert and Coordination System (GDACS).

Furthermore, the Programme will provide mentoring and technical advisory services to NMHSs in the five countries through capacity building, training and awareness raising initiatives and materials for a range of stakeholders; provide technical backstopping and capacity support to the national delivery of Programme activities; and provide expert advice to the Programme team on key climate information services and best practices, including gender-responsive implementation. In order to enhance synergies and avoid creating parallel structures, the Programme will work closely with the WMO-SPREP Pacific Meteorological Desk

Partnership (PMDP), a regional coordination mechanism that supports and coordinates meteorological activities in the Pacific, and the Pacific Meteorological Council (PMC) at large.

Alignment with the Pacific Islands Meteorological Strategy 2017-2026 and the Global Framework for Climate Services (GFCS)

The Programme Components, Outputs and Activities are fully aligned to the Global Framework for Climate Services (GFCS) which served as the basis for designing the *Pacific Islands Meteorology Strategy 2017–2026 (PIMS)* as demonstrated in the following table.

Programme Result	Activity	Alignment with Pacific Island Meteorological Strategy 2017-2026 Pacific Key Outcomes (PKOs)	GFCS Pillars
1 – Strengthened delivery model for climate information services and MHEWS covering oceans and islands	1.1 – Strengthen institutional and policy frameworks and delivery models for climate services	<p>PKO 5 – NMHSs contribution to climate change activities</p> <p>PKO 6 – Improved climate information and prediction services through the implementation of the Pacific Roadmap for Strengthened Climate Services</p> <p>PKO 7 – Strengthen collaboration between meteorological and hydrological services to better manage water resources and reduce the impact of water related hazards</p> <p>PKO 9 – NMHSs institutional strengthening and capacity development</p>	<p>User Interface Platform</p> <p>Capacity Development</p>
2 – Strengthened observations, monitoring, modelling and prediction of climate and its impacts on ocean areas and islands	2.1 – Enhance infrastructure and technical support for observations and monitoring	<p>PKO 2 – Improved marine weather services and establishment of ocean services</p> <p>PKO 6 – Improved climate information and prediction services through the implementation of the Pacific Roadmap for Strengthened Climate Services</p> <p>PKO 8 – Integrated observing and communication systems</p>	<p>Observations and Monitoring</p> <p>Research, Modelling and Prediction</p> <p>Climate Services Information System</p> <p>User Interface Platform</p>
	2.2 – Strengthen ocean and climate modelling and impact-based forecasting	<p>PKO 2 – Improved marine weather services and establishment of ocean services</p> <p>PKO 3 – Improved public weather services</p> <p>PKO 4 – Strengthened NMHSs capacity to implement MHEWS for tropical cyclones, coastal inundation and tsunamis</p> <p>PKO 6 – Improved climate information and prediction services through the implementation of the Pacific Roadmap for Strengthened Climate Services</p> <p>PKO 8 – Integrated observing and communication systems</p>	Capacity Development
	2.3 – Harmonise climate data and information management	PKO 6 – Improved climate information and prediction services through the implementation of the Pacific Roadmap for Strengthened Climate Services	

		<p>PKO 7 – Strengthen collaboration between meteorological and hydrological services to better manage water resources and reduce the impact of water related hazards</p> <p>PKO 8 – Integrated observing and communication systems</p>	
3 – Improved community preparedness, response capabilities and resilience to climate risks	3.1 – Improve warning dissemination and communication	<p>PKO 3 – Improved public weather services</p> <p>PKO 4 – Strengthened NMHSs capacity to implement MHEWS for tropical cyclones, coastal inundation and tsunamis</p> <p>PKO 6 – Improved climate information and prediction services through the implementation of the Pacific Roadmap for Strengthened Climate Services</p>	Climate Services Information System User Interface Platform Capacity Development
	3.2 – Enhance preparedness and response capabilities	<p>PKO 3 – Improved public weather services</p> <p>PKO 4 – Strengthened NMHSs capacity to implement MHEWS for tropical cyclones, coastal inundation and tsunamis</p> <p>PKO 6 – Improved climate information and prediction services through the implementation of the Pacific Roadmap for Strengthened Climate Services</p>	
	3.3 – Establish Forecast-based Financing (FbF)	<p>PKO 4 – Strengthened NMHSs capacity to implement MHEWS for tropical cyclones, coastal inundation and tsunamis</p> <p>PKO 6 – Improved climate information and prediction services through the implementation of the Pacific Roadmap for Strengthened Climate Services</p>	
4 – Enhanced regional knowledge management and cooperation for climate services and MHEWS	4.1 – Enhance regional data, knowledge management and cooperation	<p>PKO 7 – Strengthen collaboration between meteorological and hydrological services to better manage water resources and reduce the impact of water related hazards</p> <p>PKO 8 – Integrated observing and communication systems</p> <p>PKO 9 – NMHSs institutional strengthening and capacity development</p> <p>PKO 10 – Support to NMHSs is coordinated</p> <p>PKO 11 – PMC is an efficient and effective body</p>	User Interface Platform Capacity Development

Table 10. Alignment with the Pacific Islands Meteorological Strategy 2017-2026 and the Global Framework for Climate Services (GFCS)

B.4. Implementation arrangements (max. 1500 words, approximately 3 pages plus diagrams)

Accredited Entity (AE)

UNEP will be the Accredited Entity for the Programme and will be responsible for overseeing the implementation, financial management, evaluation, reporting and closure of the activities under the Programme. UNEP will monitor and supervise the execution of the Programme and ensure the proper management and application of GCF Grant Proceeds by the Executing Entities. UNEP will ensure that the Grant Proceeds are utilised in

accordance with the terms of the Funded Activity Agreement and the Accreditation Master Agreement. UNEP will also assume a limited role as Executing Entity, as described in the relevant section below.

UNEP brings more than 20 years' experience working on climate change and is an established GCF Accredited Entity. It brings a comprehensive approach to climate change mitigation and adaptation that is grounded in both natural science and economics and is tied to the environmental and development concerns of countries. Based on its core science-based mandate, one of UNEP's seven sub-programs is entirely dedicated to keeping the world environment under review.

Through its Science Division, UNEP has longstanding expertise in environmental and climate change information management and early warning systems. For example, with GEF and EC funding it is currently supporting over 50 countries in establishing or strengthening their environmental information management systems and using them for reporting progress on SDGs and MEAs. Its Science Division manages the CLIMWARN and Country Level Impacts of Climate Change (CLICC) projects, and UNEP also convenes and facilitates regional environmental information networks and the world adaptation science program (formerly PROVIA). Through its work on early warning and foresight, UNEP enables stakeholders to respond to the latest emerging issues related to environment and climate change. UNEP has a strong convening power at regional and sub-regional level including a Sub-regional Office for the Pacific co-located with the Secretariat of the Pacific Regional Environment Programme (SPREP) in Apia, Samoa.

Under its 7th sub-programme, 'Keeping the Global Environment under Review', UNEP also produces a major Global Environmental Outlook (GEO) report every four years, assessing the states, trends and outlooks of the environment. Five Regional GEO assessment reports are produced between each global GEO report—their contents are later used to inform the latter. The Regional and Global reports would greatly benefit from climatic data, information, models, projections, lessons and experiences, capacity assessment reports and other products from the proposed GCF Programme. UNEP and SPREP are respectively implementing and executing a GEF-funded cross-cutting capacity development project—the "Inform" project—which is putting in place national and regional repositories of existing environmental data and reporting tools in Pacific Island States. This Programme will partner with Inform and, more generally, build on existing climate information inputs to policymaking in the region.

The Pacific Meteorological Council (PMC) has defined issues and priorities for the region in the *Pacific Islands Meteorology Strategy 2017–2026*, endorsed by the Council members and Pacific government ministers responsible for meteorology. The PMC fulfills a crucial convening and coordination role in the region that will be leveraged for this Programme. It is an influential body and may advise the PMU and the Programme partners on coordination, technological and political issues if required. Programme annual reports will be provided as meeting papers to PMC members before their biennial meetings. Members of the PMC endorsed the Programme at their 5th biennial meeting in July 2019.

Programme Management Unit (PMU)

The proposed Programme will set up a central Programme Management Unit (PMU) hosted by UNEP's Sub-regional Office for the Pacific, which is co-located with SPREP and the new Pacific Climate Change Center (PCCC) in Apia, Samoa. The PMU will provide management and support to the national implementation of the Programme through coordination by the five national Executing Entities (EEs) and the Regional Technical Partners involved in Programme execution, in line with their obligations under the respective legal instruments and will coordinate to ensure that reports are received. The PMU will consolidate all half yearly progress reports and quarterly financial reports, including co-financing reports and annual audit reports, from EEs and Regional Technical Partners and submit these to the AE. The PMU will provide guidance and source expertise as needed on project management, financial management, procurement and technical issues. It will establish contact with other development partners working with the Programme countries to ensure that activities in related fields are complementary, and to seek opportunities for collaboration. The PMU will also provide secretariat services to the Programme Steering Committee.

The PMU will be staffed by three full-time staff administered by UNEP: a Programme Coordinator (PC), a Fund Management, Monitoring and Procurement Officer (FMMPO) and a National Finance and Administrative Assistant (NFAA). Both the FMMPO and the NFAA will report directly to the PC. All staff will be recruited in line with UN regulations, rules and policies. The PC will be overall responsible for the day-to-day management of the Programme. This role will include an overall responsibility for:

- i. Coordinating the Programme Steering Committee (PSC);
- ii. Managing the Programme in line with the budget and workplans, and in accordance with GCF and UNEP guidelines;
- iii. Being responsible for financial management and disbursements;
- iv. Coordinating national EEs and Regional Technical Partners to manage the Programme effectively;
- v. Consolidating national EE and Regional Technical Partner reports and report to the AE; and
- vi. Ensuring exchange of information and knowledge across the five countries.

To achieve the targets of the proposed Programme the PM will, inter alia:

- i. Acquire on-the-ground information to inform UNEP progress reports;
- ii. Engage with Programme stakeholders;
- iii. Arrange PSC, PMU and other meetings;
- iv. Provide technical support, including measures to address challenges to Programme implementation;
- v. Participate in training activities;
- vi. Write technical reports; and
- vii. Facilitate relevant expert activities.

Additionally, the PC will liaise with members of the PSC and PMU, technical experts, government staff, civil society and stakeholders involved to coordinate the implementation of the proposed Programme's activities. For technical aspects of the Programme, the PC will work closely with the SPREP-WMO Pacific Meteorological Desk Partnership (PMDP), with which the PMU will be co-located in Apia, Samoa. In cooperation with the PMDP, the PC will coordinate expert advice to the Programme on key climate information services and best practices and support the development of technical terms of reference for the engagement of services and procurement of meteorological and other project-related equipment.

A range of equipment (i.e. AWS, AWOS, weather radars, etc.) and communication infrastructure upgrades will be procured to strengthen observations in the five Programme countries, based on the priorities identified in the Feasibility Study (Annex 2). In addition to undertaking direct procurement as part of UNEP's EE function, the PMU will provide guidance and support to national EEs and technical partners on procurement in line with the provisions of the respective Project Cooperation Agreements (PCAs). The PMU will ensure compliance with the UN rules and regulations related to procurement.

Executing Entities (EEs)

The national Executing Entity designated by the Government in each country will be respectively accountable to UNEP for Programme execution at a national level, and for the effective and efficient use of resources. Each EE is an existing established national agency with financial management responsibilities and expertise. Each is an experienced manager of externally funded development activities, and routinely partners with multiple regional and international donors, contributing to the effective coordination of nationally and internationally funded projects and programs. All are adequately resourced and meet the stringent reporting and fiduciary standards of multilateral funding agencies, developed country partners and their own governments.

The responsibilities of the national EEs are to coordinate the execution of the Programme at a national level. They are accountable to the AE for Programme execution and the effective and efficient use of resources.

Therefore, UNEP shall enter into an appropriate agreement (Project Cooperation Agreement) with national EEs for the execution of the Programme. The Project Cooperation Agreements (PCAs) will establish clear roles and responsibilities of the respective parties for the delivery of the proposed activities, and the schedule and conditions for instalments, the determination of the prevailing fiduciary standards and the terms and conditions for arbitrations and termination of contract. The PCAs will include specific obligations for the national EEs on Programme execution, financial management, personnel administration and reporting, as well as on arbitration and liability terms. The EEs will be required to comply with UNEP rules, policies and procedures on procurement.

Each Executing Entity will be responsible for establishing national programme implementation in a relevant part of the government administration to provide implementation guidance and support to the national service providers and Regional Technical Partners (see below section) in each country. Thus, the EE will provide technical and implementation guidance and will facilitate cooperation among the implementing organisations. It will also convene the National Coordination Committee that will be established in each country, including quarterly reports on progress and expenditure. It will be accountable to the central PMU and the National Coordination Committee on Programme progress and will submit regular progress reports to the PMU.

UNEP will also undertake limited Executing Entity functions through its Sub-regional Office for the Pacific, including in the context of Programme Result 4 focusing on regional knowledge management and cooperation. UNEP will execute the Programme in line with its programme manual and standard business procedures and will contract international consultants and Technical Partners to undertake relevant activities as appropriate.

Implementation arrangements for all EEs are outlined in section 9.3 of the Feasibility Study (Annex 2) and are summarised in the table below.

Country	Executing Entity	Details of EE and track record	Role in programme sub-activities
Cook Islands	The Cook Islands, acting through the Ministry of Finance and Economic Management (MFEM)	<p>The Development Coordination Division of MFEM is responsible for all external funding programmes/projects and activities in Cook Islands and working closing with the NDA in Climate Change Cook Islands (CCCI). MFEM was accredited by GCF as a Direct Access Entity for Cook Islands in October 2018. MFEM has a significant track record in managing projects, with recent examples including:</p> <ul style="list-style-type: none"> • Performance Based Budget Support by New Zealand (\$5.6 million); • Sanitation Upgrade Programme (\$11 million); • Te Mato Vai - Water Programme (\$39 million); • Tereora College Rebuild (\$7.6 million); • Renewable Energy programme (\$40 million); • Apii Nikao Rebuild (\$10 million); • SRIC Adaptation Fund (\$5.6 million); • GEF-funded Ridge to Reef programme (UNDP) (\$4.5 million); • PEARL (Pa Enea Action for Resilient Livelihoods project (\$3 million). 	<p>Cook Islands' national EE will deliver parts of and engage relevant national service providers to implement sub-activity 1.1.1: Development of the National Framework for Climate Services (NFCS); sub-activity 1.1.3: Mainstream climate risk knowledge into sectors; sub-activity 1.1.4: Advisory for development of the national policy for financing climate services; sub-activity 2.1.1: Ensure that observation equipment is suited to the national context through coordination with CIMS and technical partners to in enhancing the national observations and monitoring network in alignment with Global Basic Observing Network (GBON) standards and recommendations; sub-activity 2.2.1 and 2.2.2: Engagement of a national ocean expert and support to establish ocean information services and enhance climate information and impact-based forecasting; sub-activity 2.3.1: Engagement of a national climate data consultant and coordination to establish and implement a National Data and Information Strategic Action Plan; sub-</p>

			<p>activity 3.1.1, 3.1.2 and 3.1.3: Coordination of annual multi-stakeholder early warning services (EWS) and communications workshops and systems; sub-activity 3.2.1 and 3.2.2: Coordination of disaster preparedness and response, and climate risk awareness and education campaigns.</p>
Niue	Niue, acting through the Project Management Coordinating Unit (PMCU) in the Central Agency for Finance and Planning within the Premier's Office	<p>The Central Agency for Finance and Planning (equivalent to a Ministry of Finance) is part of the Premier's Office of Niue. In turn, the Central Agency comprises the PMCU. The PMCU provides a centralised project management service dedicated to coordinating project management activities for all donor funded projects in Niue through effective stakeholder relationships (including for this Programme). PMCU has a track record in managing projects, with recent examples including:</p> <ul style="list-style-type: none"> • Niue Waste Management (\$2,827,052); • Alofi Waste Septic Tanks (\$249,421); • Asbestos replacement (GEF) (\$200,000); • GCF Readiness Programme 1 (\$132,000); • Fale Fono (New Zealand AID) (\$3,283,500); • Tuapa Learning Centre (\$98,505); • Airport Tower (\$249,546); • GEF Small Grants programme (\$124,773); • Community Projects (\$65,670); • Wharf Upgrades (\$656,700). 	<p>Niue's national EE will deliver parts of and engage relevant national service providers to implement sub-activity 1.1.1: Development of the NFCS; sub-activity 1.1.3: Mainstream climate risk knowledge into sectors, including coordination of the annual Ministers' climate briefing workshop; sub-activity 1.1.4: Advisory for development of the national policy for financing climate services; sub-activity 2.1.1: Ensure that observation equipment is suited to the national context through coordination with NMS and technical partners to in enhancing the national observations and monitoring network in alignment with GBON standards and recommendations; sub-activity 2.2.1 and 2.2.2: Engagement of a national ocean expert and support to establish ocean information services and enhance climate information and impact-based forecasting; sub-activity 2.3.1: Engagement of a national climate data consultant and coordination to establish and implement the Ministry of Natural Resources Data Strategy and Action Plan; sub-activity 3.1.1, 3.1.2 and 3.1.3: Coordination of annual multi-stakeholder early warning services (EWS) and communications workshops and systems; sub-activity 3.2.1, 3.2.2 and 3.2.3: Coordination of disaster preparedness and response, climate risk awareness and education campaigns, and integration of traditional knowledge into EWS.</p>
Palau	Palau, acting through the Ministry of Finance	<p>The Bureau of Budget and Planning in the Ministry of Finance houses the Office of Climate Change and is working closely with the NDA in the Office of the President. The Ministry has a track record in managing</p>	<p>Palau's national EE will deliver parts of and engage relevant national service providers to implement sub-activity 1.1.1: Development of the NFCS; sub-activity 1.1.3: Mainstream climate risk knowledge into sectors; sub-activity</p>

		<p>similar projects, with recent examples including:</p> <ul style="list-style-type: none"> • GEF-funded Sustainable Resource Management to Improve Livelihoods and Protect Biodiversity (\$3,747,706); • GEF-funded Integrating Biodiversity Safeguard and Conservation into Development in Palau (\$150,000); • UNDP-funded Enhancing Disaster & Climate Resilience in Palau through Improved Disaster Preparedness and Infrastructure (\$7.5 million). 	<p>1.1.4: Advisory for development of the national policy for financing climate services; sub-activity 2.1.1: Ensure that observation equipment is suited to the national context through coordination with PWSO and technical partners to in enhancing the national observations and monitoring network in alignment with GBON standards and recommendations; sub-activity 2.2.1 and 2.2.2: Engagement of a national ocean expert and support to establish ocean information services and enhance climate information and impact-based forecasting; sub-activity 2.3.1: Engagement of a national climate data consultant and coordination for climate data and information management; sub-activity 3.1.1, 3.1.2 and 3.1.3: Coordination of annual multi-stakeholder early warning services (EWS) and communications workshops and systems; sub-activity 3.2.1, 3.2.2 and 3.2.3: Coordination of disaster preparedness and response, climate risk awareness and education campaigns, and integration of traditional knowledge into EWS.</p>
<p>Republic of the Marshall Islands</p>	<p>Republic of the Marshall Islands, acting through the Ministry of Finance</p>	<p>The Ministry of Finance has a Division of International Development Assistance (DIDA) and is working closely with the NDAs located in the Climate Change Directorate, Ministry of Environment. The Ministry has a track record in managing similar projects funded by ADB, the World Bank, the IUS Government and others, with recent examples including:</p> <ul style="list-style-type: none"> • Public Financial Management Project (\$2 million); • Technical Cooperation Facility (TCF) No. 2 Program Estimate 2 (PE2) (\$243,000); • Kwajalein Landowners programme funded by the US Government (\$21 million); • Compact Trust Fund funded by the US Government (\$17 million); • Capacity Building for Resilient Agriculture in the Pacific (\$140,525); • Building Capacity for resilient Agriculture in the Pacific (\$500,000); 	<p>RMI's national EE will deliver parts of and engage relevant national service providers to implement sub-activity 1.1.1: Development of the NFCS; sub-activity 1.1.3: Mainstream climate risk knowledge into sectors; sub-activity 1.1.4: Advisory for development of the national policy for financing climate services; sub-activity 2.1.1: Ensure that observation equipment is suited to the national context through coordination with RMI WSO and technical partners to in enhancing the national observations and monitoring network in alignment with GBON standards and recommendations; sub-activity 2.2.1 and 2.2.2: Engagement of a national ocean expert and support to establish ocean information services and enhance climate information and impact-based forecasting; sub-activity 2.3.1: Engagement of a national climate data consultant and coordination to establish and implement a National Data Strategy for climate data; sub-activity 3.1.1, 3.1.2 and 3.1.3:</p>

		<ul style="list-style-type: none"> • Telecommunications and ICT - Technical Assistance Project (\$950,000); • RMI Pacific Resilience Program Phase 1 (\$1.5 million); • Strengthening Budget Execution and Financial Reporting (\$9.5 million). 	<p>Coordination of annual multi-stakeholder early warning services (EWS) and communications workshops and systems; sub-activity 3.2.1, 3.2.2 and 3.2.3: Coordination of disaster preparedness and response, climate risk awareness and education campaigns, and integration of traditional knowledge into EWS.</p>
Tuvalu	Tuvalu, acting through the Ministry of Finance	<p>The Climate Change Department (CCD) sits under the Ministry of Finance and is established under Tuvalu laws, in particular the Climate Change Resilience Act. The Ministry has a track record in:</p> <ul style="list-style-type: none"> • Overall co-ordination and oversight of all ODA in Tuvalu; • Managing similar projects, such as the GCF Readiness project for which it is the Delivery Partner and Adaptation Fund projects (for which the Ministry is accredited as National Implementing Entity); • Examples of other recent projects managed by the Ministry include: Strengthened Fiscal Sustainability Program (ADB, \$2 million); and six active World Bank projects in Tuvalu totalling US\$106 million in commitments across sectors including aviation and transport, climate resilience, energy and electricity, fisheries and telecommunications.²⁷⁷ 	<p>Tuvalu’s national EE will deliver parts of and engage relevant national service providers to implement sub-activity 1.1.1: Development of the NFCS; sub-activity 1.1.3: Mainstream climate risk knowledge into sectors; sub-activity 1.1.4: Advisory for development of the national policy for financing climate services; sub-activity 2.1.1: Ensure that observation equipment is suited to the national context through coordination with TMS and technical partners to in enhancing the national observations and monitoring network in alignment with GBON standards and recommendations; sub-activity 2.2.1 and 2.2.2: Engagement of a national ocean expert and support to establish ocean information services and enhance climate information and impact-based forecasting; sub-activity 3.1.1, 3.1.2 and 3.1.3: Coordination of annual multi-stakeholder early warning services (EWS) and communications workshops and systems; sub-activity 3.2.1 and 3.2.2: Coordination of disaster preparedness and response; and climate risk awareness and education campaigns.</p>
All countries	UN Environment Programme (UNEP)	<p>UNEP has significant experience in working on climate change and is an established GCF Accredited Entity. Through its Science Division, UNEP has longstanding experience in environmental and climate change information management and early warning systems, with recent examples including:</p> <ul style="list-style-type: none"> • GEF-funded “Inform” project (\$4.3 million); 	<p>Upon requests from countries, UNEP will contract international consultants to deliver parts of sub-activity 1.1.1, 1.1.2, 1.1.3 and 1.1.4: Development of institutional and policy frameworks, sector-specific plans and training programmes and a market assessment for climate services.</p> <p>UNEP will conclude Project Cooperation Agreements with technical partners to deliver parts of sub-activity 2.1.1, 2.2.1, 2.2.2 and</p>

²⁷⁷ World Bank. 2019. Press Release: Tuvalu Gets Big Boost for Fiscal, Infrastructure and Social Resilience. Available at: <https://www.worldbank.org/en/news/press-release/2019/12/13/tuvalu-gets-big-boost-for-fiscal-infrastructure-and-social-resilience>

		<ul style="list-style-type: none"> • Climate Change Early Warning (CLIM-WARN) project in Kenya, Ghana and Burkina Faso; • Country-Level Impacts of Climate Change (CLICC) project. <p>UNEP also convenes and facilitates regional environmental information networks and the World Adaptation Science Programme (formerly PROVIA).</p>	<p>2.3.1; sub-activity 3.1.1 and 3.1.2; sub-activity 3.2.3; sub-activity 3.3.1, 3.3.2 and 3.3.3; and sub-activity 4.1.1.</p> <p>UNEP will also undertake procurement of equipment directly upon request from countries under sub-activity 2.1.1.</p> <p>UNEP will execute sub-activity 4.1.2 and contract international consultants, technical partners and training centres in the WMO network as relevant.</p>
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Table 11. Details of Executing Entities (EEs) and role in programme sub-activities

The EEs will convene regular Technical Meetings with national service providers to monitor the progress, facilitate cooperation among the implementing organisations and seek collaborative solutions to any issues that arise. As part of Programme management, the EEs will undertake regular monitoring exercises. The EEs will contribute to a formative Mid-Term Evaluation and a summative Terminal Evaluation of the whole Programme.

Regional Technical Partners

The Programme will benefit from the expertise of a broad coalition of Technical Partners, thereby ensuring coherence and complementarity. Technical Partners will include SPC, SPREP, NOAA, UH (including PacIOOS and associated EWC), BoM, NIWA, IFRC, APCC and WMO and its network. These are highly qualified, internationally recognised professional agencies with many years’ experience of partnership with Pacific countries. Based on the priorities of countries, some of the partners will lead or provide support for the implementation of specific interventions that require highly technical or scientific expertise and are in line with their mandates and comparative advantages. Although Technical Partners will work at national level, the agencies will be sub-contracted directly by UNEP in its capacity as Executing Entity, in line with UNEP procedures and policies – i.e. to deliver their agreed body of work in each country through consultation and coordination with the national EEs. Regional Technical Partners will report to the PMU and Programme Steering Committee (PSC).

In order to ensure the collaboration is documented between parties, UNEP will sign a Memorandum of Understanding (MoU) between all EEs, Regional Technical Partners supporting national execution, and UNEP to affirm the parties’ commitment to meeting the objectives of the Programme.

Agency supporting national execution		Mandate	Role in programme sub-activities
SPC	The Pacific Community	Technical and research organisation based in the Pacific (HQ in New Caledonia), 22 Pacific island and four developed country members; divisions focusing on oceanography, plant genetic resources, geoscience, public health surveillance, demography, economic development. SPC is a long-term partner in the Australian funded Pacific Sea Level Monitoring Project (1991—) with 12 Pacific countries, BoM and Geoscience Australia. Funded from	SPC will support delivery of sub-activity 2.2.1: Technical support to establish ocean information services – including support for observations and monitoring; development of an ocean modelling framework; and decision-making tools in Cook Islands, Niue and Tuvalu; and sub-activity 2.2.2: Technical support and capacity building for high-resolution ocean forecasting and impact-based forecasting; and attachments to increase knowledge on oceanography, ocean-related impact

		member contributions and project funding.	based forecasting and coastal monitoring in Cook Islands, Niue and Tuvalu. SPC will also support delivery of sub-activity 3.1.1 : Conduct an in-country deep dive study on gender and community stakeholders in all five countries.
SPREP	The Pacific Regional Environment Programme	Technical organisation based in the Pacific (Samoa), 21 Pacific island and five developed country members, focusing on protection and sustainable development of natural resources—ecosystem management, waste management, and social and physical resilience to climate change. Hosts the virtual Pacific Regional Climate Centre, the Pacific Meteorological Desk Partnership (PMDP) and the Pacific Meteorological Council and its Panels; delivers the annual Regional Climate Outlook Forum; manages the monthly On-line Climate Outlook Forum with 12 NMHSs; maintains national Traditional Knowledge databases for Pacific NMHSs; manages the Inform project (regional and national portals for all environment related data, information and documents). Funded from member contributions and project funding.	SPREP will support delivery of sub-activity 2.3.1 : Technical support for climate data and information management in Cook Islands, Niue, Palau and RMI; and development and implementation of national climate data and information strategies for Cook Islands, Niue and RMI. SPREP will also support delivery of Result 3 through sub-activity 3.1.2 : Technical support for community-based disaster preparedness and response mechanisms and plans in Tuvalu; and sub-activity 3.2.3 : Training on traditional knowledge (TK) collection and documentation; and development of TK indicators in Tuvalu. Furthermore, SPREP will provide ICT technical expertise to support sub-activity 4.1.1 : ICT training on standardised climate data, information and knowledge management; and sub-activity 4.1.2 : ICT officer to manage the ICT platform; and technical support for applications of ICT in climate services in all five countries. SPREP (including through the PMDP) will also support delivery of Result Area 2 related to the strengthening of the observation networks under sub-activity 2.1.1 – upon country request.
NOAA	US National Oceanic and Atmospheric Administration	US Government meteorological service whose mandate is: to understand and predict changes in climate, weather, oceans and coasts; to share that knowledge and information with others; and to conserve and manage coastal and marine ecosystems and resources. It supports the NMHSs of US territories and associated states including Palau and RMI and shares outputs with other Pacific countries. Member of SPC and SPREP. Agency of the US Department of Commerce.	As administrator of the NMHSs in RMI and Palau, NOAA will support delivery of Result Area 2 related to the strengthening of the observation networks in the two countries. This will be done as in-kind support based on NOAA's existing mandate and without GCF funds flowing to NOAA.
UH	University of Hawaii	The University of Hawaii is a public, co-educational college and university	UH will support delivery of sub-activity 2.2.1 : Technical support for ocean

		<p>system that confers associate, bachelor's, master's, and doctoral degrees through three university campuses, seven community college campuses, an employment training centre, three university centres, four education centres and various other research facilities throughout Hawaii, the United States. The International Pacific Research Center (IPRC) at the University maintains a climate data centre where users can get direct access to a wide array of in-situ and remote (satellite) observations, as well as output from operational forecasts and climate models. The IPRC at UH is part of the Pacific Islands Regional Climate Centre, which is a virtual centre of excellence for the WMO RA-V RCC network. UH is the co-lead for the Climate Monitoring node of the WMO RA-V RCC network and also hosts the Pacific Islands Ocean Observing System (PacIOOS). The related East-West Center (EWC) serves as a resource for information and analysis on critical issues of common concern, bringing people together to exchange views, build expertise, and develop policy options.</p>	<p>observations and monitoring; training and technical support to establish ocean information services in Palau through the Pacific Islands Ocean Observing System (PacIOOS); and technical support to develop national ocean portals and web-based “dashboards” integrating climate and ocean data, information and products for Palau and RMI through the East-West Center and in collaboration with NOAA.</p>
<p>BoM</p>	<p>Australian Bureau of Meteorology</p>	<p>Australian Government’s national weather, climate and water agency, providing observational, meteorological, oceanographic and hydrological services and researching science and environment related issues. Executive Agency of the Australian Government reporting to the Minister for the Environment on general matters. Fulfils Australia’s international obligations under the Convention of the World Meteorological Organization. Supports and mentors Pacific NMHSs and their staff. Member of SPC and SPREP.</p>	<p>BoM will support delivery of sub-activity 2.1.1: Technical support for the assembly, calibration, installation, operation and maintenance of observations equipment in compliance with the Global Basic Observing Network (GBON) requirements in all five countries – upon country request.</p> <p>BoM will also support delivery of sub-activity 2.2.2: Technical training, attachments and workshops on oceanography, climatology and climate forecasting – including dynamical prediction for multiple timescale climate outlooks and extreme event forecasting in all five countries; technical advisory and capacity building for ocean and climate modelling and impact-based forecasting in Cook Islands and Niue; NMHS and sector workshops on early warning services in Niue, Palau and Tuvalu; and technical support for climate data digitisation for Tuvalu.</p>

NIWA	New Zealand National Institute of Water and Atmospheric Research	A New Zealand government-owned Crown Research Institute enhancing the economic value and sustainable management of New Zealand's aquatic resources and environments, providing understanding of climate and atmosphere and increasing resilience to weather and climate hazards. Supports and mentors Pacific NMHSs. Member of SPC and SPREP. NZ Met is New Zealand's national meteorological service.	NIWA will support delivery of sub-activity 2.1.1 : Technical support for the assembly, calibration, installation, operation and maintenance of observations equipment in compliance with the Global Basic Observing Network (GBON) requirements in all five countries – upon country request. NIWA will also support delivery of sub-activity 2.2.2 : Technical support to harmonise climate records; and generate customised early warning information and products in Niue and Tuvalu.
IFRC	International Federation of Red Cross and Red Crescent Societies	IFRC assists the Red Cross and Red Crescent Movement and its partners to reduce the impacts of climate change and extreme weather events on vulnerable people. Together with individual Red Cross Red Crescent National Societies where present in the five Pacific island countries and National Disaster Management Authorities, IFRC will support the Programme with expertise on last-mile delivery and Forecast-based Financing (FbF).	IFRC will also provide technical expertise to support delivery of Activity 3.3 through sub-activity 3.3.1 : Technical support to develop Forecast-based Financing (FbF) Roadmaps; sub-activity 3.3.2 : Technical support and capacity building to operationalise FbF mechanisms; and sub-activity 3.3.3 : Technical support to develop Early Action Protocols (EAPs) for FbF in all five countries.
APCC	APEC Climate Center	APCC is a non-profit public organisation located in the Republic of Korea that aims to enhance socio-economic well-being of the Asia Pacific region by utilising up-to-date scientific knowledge, applying innovative climate prediction techniques, and promoting application of climate information through various programs for capacity building and reducing climate risks in the region.	APCC will support delivery of sub-activity 2.2.2 : Technical training to enhance in-house forecasting and multi-model ensemble prediction capacity; training for early-career scientists through its Young Scientist Support Program; and technical support for the generation of sector-tailored climate information in all five countries. APCC will also support delivery of sub-activity 3.1.2 : Development and implementation of localised mobile climate information communication systems in all five countries.

Table 12. Regional Technical Partner agencies, mandates and role in programme sub-activities

Programme Steering Committee

The Programme Steering Committee (PSC) will be established comprising the five NDAs and a UNEP representative. It will meet at least once per year and will be co-chaired by the NDAs (in rotation) and UNEP. The PSC will provide high-level oversight and guidance towards achieving Programme objectives. The PSC is a consensus-based decision-making body within the Programme governance structure and will provide, review and monitor strategic direction and policy guidance to the Programme team and other stakeholders. Among other functions, the PSC will review and approve the annual workplan and budget and approve the Programme's annual report as prepared by the PMU and national EEs. The committee also provides recommendations on Programme approaches and participates in discussing general strategies and opportunities for Programme planning and implementation.

The functions of the Steering Committee are:

- i. Providing overall guidance for Programme execution to the PMU, especially on cross-cutting issues which require consensus from the various stakeholders involved in the Programme;
- ii. Ensuring that recommended policy and institutional strengthening undertaken under the Programme is consistent with the Programme's overall agenda;
- iii. Ensuring full cooperation of various regional and national stakeholders under their jurisdictions to provide access and support to the Programme team in carrying out their tasks;
- iv. Representing the interests of civil society and communities in their countries derived from a regular formal dialogue between NDAs and national peak bodies; and
- v. Reviewing and monitoring progress in Programme execution.

The members of the Steering Committee will be the five NDAs and the UNEP Representative. Observers will include:

- i. the Programme Coordinator;
- ii. the five National EEs;
- iii. Representatives from the Regional Technical Partner agencies involved in Programme implementation—SPREP, SPC, NIWA, BoM, UH, NOAA, IFRC, APCC and others as appropriate;
- iv. additional entities involved in Programme implementation, in particular the NMHSs, National Disaster Management Authorities and community-based organisations with experience in disaster risk management;
- v. Representatives of civil society;
- vi. Representatives of women's organisations; and
- vii. Representatives of the private sector.

Secretariat services will be provided by the Programme Management Unit (PMU). The minutes of the Annual Meeting will be provided to the AE by the Programme Coordinator.

The Programme Steering Committee will also be used as a vehicle for enhancing South–South cooperation among the five participating countries.

National Coordination Committees

A National Coordination Committee (NCC) will be established in each of the five countries. The NCCs will include key stakeholders from the national government (in particular, the NMHS and National Disaster Management Authority), national campuses of the University of the South Pacific (USP) (present in Cook Islands, Niue and Tuvalu), community representatives, private sector representatives, civil society and NGOs involved in early warning and disaster risk reduction, as well as the NDA (who represents the country in the PSC). The NCC is a decision-making body within the national-level programme governance structure and will also play a key role in the Grievance Redress Mechanism. It consists of agency or divisional managers and decision-makers who provide, review and monitor strategic direction and policy guidance to the national Programme team and other stakeholders including community-based organisations with experience in disaster risk management. Among other functions, the NCC will review and approve the national annual workplan and budget and approve the Programme's annual report for submission to the PMU and PSC. The Committee also provides recommendations on Programme approaches and participates in discussing general strategies and opportunities for Programme planning and implementation.

The functions of the Committee will include:

- i. Providing overall guidance for Programme execution to the EEs, especially on cross-cutting issues that require consensus from the various stakeholders involved in the Programme;
- ii. Ensuring that recommended policy and institutional strengthening undertaken under the Programme is consistent with the country's overall development priorities;
- iii. Ensuring full cooperation of various stakeholders to provide access and support to the EEs in carrying out their tasks; and
- iv. Reviewing and monitoring progress in national Programme execution.

Countries may use an existing national Project / Programme Steering Committee that is managing related activities with the same members—the NMHS, the climate change agency, the national broadcaster, disaster management and emergency services, etc. If such a standing Steering Committee does not exist, the National Coordination Committee for the Programme will be established as above.

The National Coordination Committee will meet quarterly. Minutes of the quarterly meeting will be provided to the central Programme Steering Committee through the PMU.

National Service Providers

National service providers will be subcontracted by the national EEs. These include the National Meteorological and Hydrological Services (NMHSs), National Disaster Management Authorities, the government climate change agencies and environment ministries, sectoral agencies such as health, agriculture and fisheries, civil society organisations, national campuses of the University of the South Pacific (USP) (present in Cook Islands, Niue and Tuvalu), Red Cross Red Crescent National Societies, other NGOs involved in early warning, and communities. These organisations will implement activities as described in the country profiles in the Feasibility Study.

For example:

- Emergency Management Cook Islands (the national disaster management authority) will use GIS mobile apps technology to undertake household disaster risk surveys in the outer islands, storing the data in a portal to be used to improve response times and effectiveness in disasters.
- The Girls' and Boys' Brigades in Niue will conduct disaster preparation training and collect traditional climate knowledge from elders; the Broadcasting Corporation of Niue will acquire graphical software to use in weather and climate forecasts and will develop and use climate terminology in Vagahau Niue.
- The Palau Red Cross Society and the Center for Women's Empowerment Belau, in cooperation with seven government and non-government agencies, will conduct training for women's organisations on community and individual needs and responses before, during, and after a disaster or single incident emergency.
- The Marshall Islands Red Cross (MIRC) will enhance disaster preparedness and response measures through supporting Early Response Teams in outer-islands; the Marshall Islands Conservation Society will purchase community-based coral health chart kits for distribution to rural communities and will train communities in their use – the kits will be used by early warning response teams at remote locations to easily identify signs of the early onset of coral reef bleaching.
- The Red Cross Society in Tuvalu and WMO staff will conduct consultations with each island community, collecting disaggregated information on different vulnerable groups to identify risks and priorities for climate early warning systems; BoM will provide robust and user-friendly iPhone and iPad apps, to enable Tuvalu's NMHS to produce social media and video communication products for stakeholders and communities.

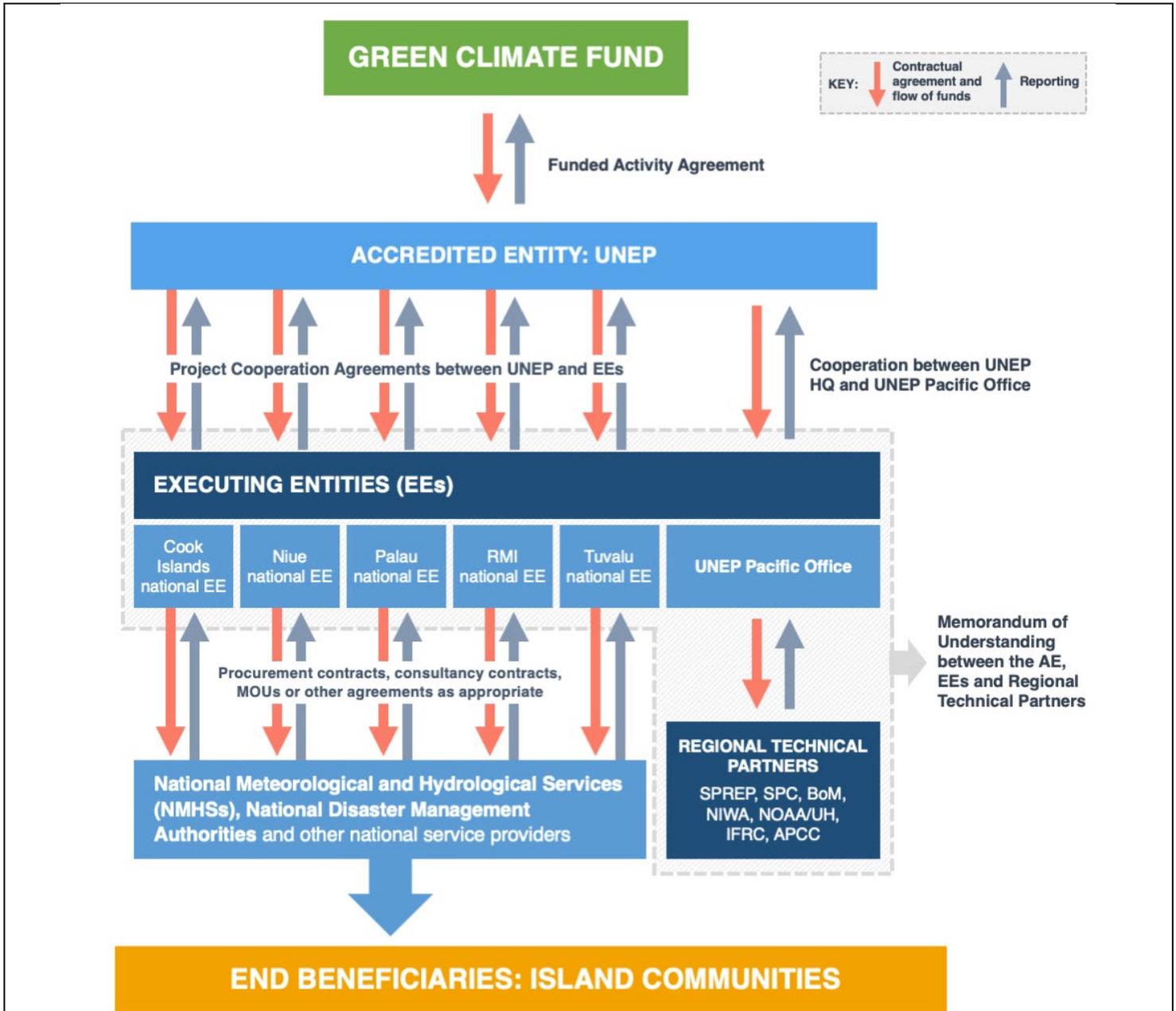


Figure 30. Flow of funds and contractual arrangements for Programme implementation. Red arrows indicate the contractual agreements, including the types of contracts between relevant parties, and flow of funds. Blue arrows indicate the reporting arrangements.

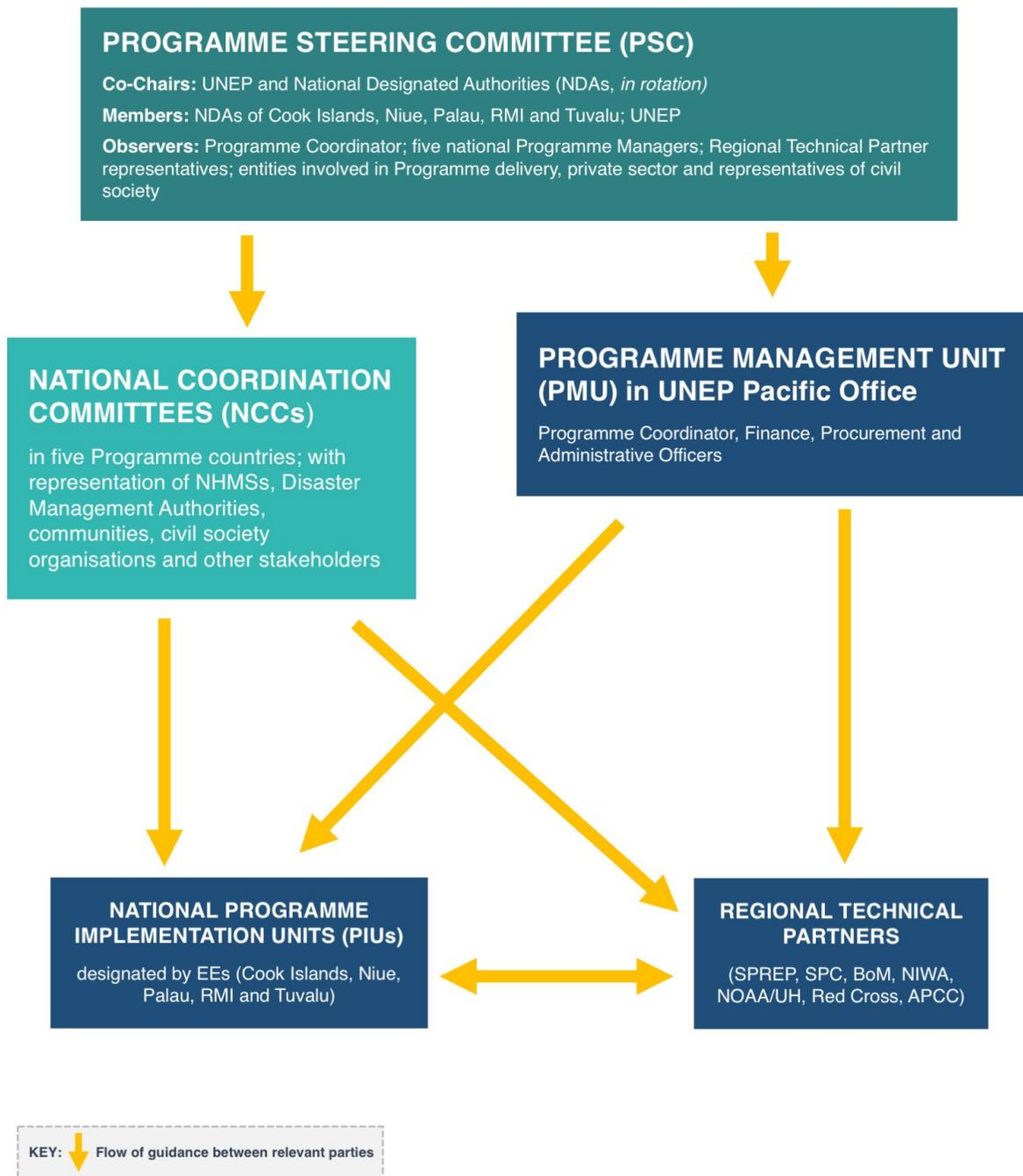


Figure 31. Programme governance arrangements. Yellow arrows indicate the flow of guidance between relevant parties.

B.5. Justification for GCF funding request (max. 1000 words, approximately 2 pages)

The Governments of the Cook Islands, Niue, Palau, the Republic of the Marshall Islands (RMI) and Tuvalu are seeking a GCF grant to strengthen their resilience to climate change impacts and enable their vulnerable populations to adapt to increasing climate variability. The proposed development of robust climate and oceans information products for the five Programme countries will improve the timing, accuracy and usefulness of immediate warnings and long-range seasonal forecasts and will provide essential data and in-country technical capacity for well-planned long-term resilience measures. The Programme will enable the populations of the five countries to safeguard their lives, livelihoods and assets from escalating climate risks. As Small Island Developing States (SIDS), the Programme countries are disproportionately affected by climate change impacts.²⁷⁸ Addressing climate change threats will require considerable adaptation measures at a cost that far exceeds many of the countries' financial capacities, with Pacific islands experiencing significant volatility in government revenue and expenditure, and aid flows.²⁷⁹ In addition, the countries all have immediate development needs that, due to budget constraints, are prioritised at the expense of longer term climate adaptation funding.²⁸⁰ Donor funds are often tied to health, water, sanitation, education and infrastructure activities, addressing obvious and highly visible needs, and rarely take adequate account of climate change in planning their inputs. External finance is therefore essential for the Cook Islands, Niue, Palau, RMI and Tuvalu to supplement their governments' own limited expenditures for building climate resilience.²⁸¹

Pacific island countries have repeatedly emphasised their priority need for *access to climate finance*.²⁸² This is particularly evident in the Suva Declaration, which also expressed deep concern for proposals that adaptation funding be provided as loans rather than grants, which would compel Pacific SIDS to "increase debt or divert resources from other development priorities to meet adaptation costs".²⁸³ There is limited scope for the five Programme countries to incur further public debt. Some have significant debt burdens, arising from concessional loans from International Financial Institutions, loans from bilateral donors, domestic borrowing and bank overdrafts.²⁸⁴ For example, Palau's total central government debt (% of GDP) rose from 23.8% in 2008 to 67% in 2016.²⁸⁵ The Marshall Islands and Tuvalu are both at high risk of debt distress according to the International Monetary Fund.²⁸⁶ Moreover, Tuvalu is classified as a Least Developed Country (LDC).

Direct revenue will not be an outcome of the GCF investment and therefore loans or non-grant instruments are not considered feasible for the Pacific SIDSs in this Programme. Although there is a clear need for climate information, there is currently no real market demand for climate information services. Climate-sensitive sectors have little awareness of the economic value of climate information services and little capacity to pay for it. The Programme is expected to generate interest in using climate information products and multi-hazard early warning systems (MHEWS), primarily aimed at reducing risks to lives and food security. Early warning services are usually regarded as a public good and are expected to be provided as an outcome of budget appropriation for NMHSs. Although Result 1 of this Programme is designed to facilitate the long-term sustainability of climate services through strengthened institutional and stakeholder partnerships, and in particular the development of financial policies to ensure that the five NMHSs have the means to sustain and ensure the ongoing operation of

²⁷⁸ WHO, 2015. Climate change and health in Pacific island states. Available from: <http://dx.doi.org/10.2471/BLT.15.166199>

²⁷⁹ Stockholm Environment Institute, 2017. Working Paper 2017-04. Climate finance in the Pacific: An overview of flows to the region's Small Island Developing States. Available from: <http://www.greengrowthknowledge.org/sites/default/files/downloads/resource/SEI-WP-2017-04-Pacific-climate-finance-flows.pdf>

²⁸⁰ See Annex 2 – Feasibility Study

²⁸¹ Stockholm Environment Institute, 2017. Working Paper 2017-04. Climate finance in the Pacific: An overview of flows to the region's Small Island Developing States. Available from: <http://www.greengrowthknowledge.org/sites/default/files/downloads/resource/SEI-WP-2017-04-Pacific-climate-finance-flows.pdf>

²⁸² Stockholm Environment Institute, 2017. Working Paper 2017-04. Climate finance in the Pacific: An overview of flows to the region's Small Island Developing States. Available from: <http://www.greengrowthknowledge.org/sites/default/files/downloads/resource/SEI-WP-2017-04-Pacific-climate-finance-flows.pdf>

²⁸³ Pacific Island Development Forum Secretariat, 2015. Suva Declaration on Climate Change. Available from: <http://pacificidf.org/wp-content/uploads/2013/06/PACIFIC-ISLAND-DEVELOPMENT-FORUM-SUVA-DECLARATION-ON-CLIMATE-CHANGE.v2.pdf>

²⁸⁴ <http://www.worldbank.org/content/dam/Worldbank/document/SSF13%20Session1%20Volatility%20Resilience%20and%20Fiscal%20Policy%20in%20Pacific.pdf>

²⁸⁵ <http://databank.worldbank.org/data/reports.aspx?source=2&series=GC.DOD.TOTL.GD.ZS&country=PLW>

²⁸⁶ <https://www.imf.org/external/Pubs/ft/dsa/DSAlist.pdf>

their mandated services, this will only facilitate national climate funding (including through limited cost-recovery mechanisms from sectors) beyond the Programme's lifespan.

Donor and bilateral support are also currently not available for upscaling regional efforts. The GCF is best positioned to provide this grant as no other financing institution, private company or donor is currently likely to do so particularly at a multi-country scale. However, strengthening and extending the observation network will provide a foundation of high quality data from a greatly expanded geographical area, including from ocean surface monitoring equipment. This data will be most valuable to future development partners in planning adaptation activities and avoiding maladaptation, not only in the five Programme countries but across the western Pacific tropics and subtropics.

The Programme includes dedicated activities for integrating climate information services into national policies, plans and budgets. It will also engage with the private sector with a view to creating an enabling environment to leverage financing for sustainability of the Programme's results in the long-term. Cash and in-kind co-financing, including for the operation and maintenance of equipment and infrastructure, will be leveraged by the Programme.

The Programme is closely aligned with regional priorities, particularly as articulated in the *Pacific Islands Meteorological Strategy 2017–2026* and the *Pacific Roadmap for Strengthened Climate Services 2017–2026* (see Table in section B.3.), as well as national government plans for strengthening their hydrometeorological services and networks. The proposed activities and outcomes are fully in line with the objectives of the GCF as well as the priorities identified in several national GCF Readiness programs. For example, the Cook Islands received a readiness grant from GCF to help strengthen the capacity of the National Designated Authority to develop national climate change strategies and has now agreed a comprehensive Programme with the GCF, which this Programme will complement.²⁸⁷ The Programme is consistent with national development strategies and regional and international agreements to which the five countries are parties.

The Programme will contribute to long-term social, economic and environmental benefits from avoided human and economic losses and healthier ecosystems in five of the Pacific region's most vulnerable countries. The urgent need to reverse the cycle of decline in ocean health is emphasised in the proclamation of the UN Decade of Ocean Science for Sustainable Development (2021–2030). The Decade will provide a unifying framework to strengthen international cooperation in the study, conservation and sustainable use of the ocean and its resources; and enable countries to achieve all of their ocean-related Agenda 2030 priorities.²⁸⁸ The Programme is fully aligned with the Sustainable Development Goals (SDGs), the Paris Agreement, the Sendai Framework and the SAMOA Pathway as follows:

- i. SDG 13 on urgent action to combat climate change and its impacts and related target 13.1 to “Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries”, which is the focus of this Programme.
- ii. The Paris Agreement, which in Article 7, Sub-paragraph 7(c) calls for “strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making”.²⁸⁹
- iii. The Sendai Framework for Disaster Risk Reduction 2015–2030²⁹⁰, which in paragraph 33 b) stresses that it is important “To invest in, develop, maintain and strengthen people-centred multi-hazard, multisectoral forecasting and early warning systems, disaster risk and emergency communications mechanisms, social technologies and hazard-monitoring telecommunications systems; develop such

²⁸⁷ GCF, 2015. Readiness Proposal with the Ministry of Finance and Economic Management for the Cook Islands. Available from: https://www.greenclimate.fund/documents/20182/466992/Readiness_proposals_-_Cook_Islands_MFEP_NDA_Strengthening.pdf/177c612d-2252-4256-9fca-de8e968b17a1

²⁸⁸ <https://www.oceandecade.org>

²⁸⁹ United Nations, 2015. Paris Agreement

²⁹⁰ United Nations. Sendai Framework for Disaster Risk Reduction 2015-2030

systems through a participatory process; tailor them to the needs of users, including social and cultural requirements, in particular gender; promote the application of simple and low-cost early warning equipment and facilities; and broaden release channels for natural disaster early warning information.”

- iv. The SAMOA Pathway adopted by the Third International Conference on Small Island Developing States in 2014.²⁹¹ This Programme will address the highlighted needs for *increased accessibility to technical assistance for early warning systems, risk assessment and data, observation equipment and disaster risk management; data sharing and networking to strengthen and enable beneficial and durable national, sub-regional, regional and global cooperation; improved baseline monitoring of island systems and to address gaps in capacity for gaining access to and managing climate data/information to raise awareness and share environmental data in an effort to increase resilience to the impacts of climate change*. Resolution A/74/L.3 on the High-Level Midterm Review of the SAMOA Pathway was adopted by the UN General Assembly in October 2019.²⁹² Paragraph 31 (i); specially requests: “[T]he United Nations Environment Programme to further strengthen support to small island developing States, including through dedicated programmes”.

Furthermore, the Programme directly responds to the 2019 Kainaki II Declaration for Urgent Climate Action Now²⁹³ in which the Leaders of the Pacific Islands Forum call for: “(vi) *The international community to immediately increase support and assistance for Pacific-led science-based initiatives intended to improve our understanding of risk and vulnerability, including through support for modelling and risk mapping capabilities, the development of methodologies for understanding, projecting and responding to climate change-related economic and infrastructure impacts, and capacity building support for evidence-based decision-making and project development*”.

B.6. Exit strategy and sustainability (max. 500 words, approximately 1 page)

This Programme is designed to address key barriers to delivering sustainable climate services and impact-based MHEWS for climate resilience in the Cook Islands, Niue, Palau, RMI and Tuvalu. The Programme will create an enabling environment for long-term climate resilience through the integration of climate services and MHEWS into key policies, strategies, plans and budgets, which will provide the foundation for uptake of climate information in decision-making across national, sub-national and community levels in the five Pacific island countries. The Programme’s sustainability will be further ensured through targeted activities for local capacity building, knowledge management and learning, which will also enhance country ownership and responsibility for climate change adaptation and resilience.

The following are key elements of the exit strategy that will ensure sustainability beyond the Programme’s lifespan:

- The Programme is **demand-led**: it responds to long-standing requests from in-country users of climate information. The close engagement in the design process of NMHSs, National Disaster Management Authorities and other agencies who will implement the Programme, and their engagement in adjusting its inputs over its term, will ensure that they continue to be invested in its success. Ongoing demand for information services will be sustained by fine-tuning products over the term of the Programme to ensure that the information being provided is useful and actionable by sectors and communities. For example, more reliable forecasts will be useful for directing existing disaster relief funds through the Programme’s activities on Forecast-based Financing (FbF) under Activity 3.3.
- The Programme is **aligned to established regional coordination and cooperation mechanisms** such as the Pacific Meteorological Council (PMC) in which the Cook Islands, Niue, Palau, RMI and Tuvalu play an active role. It will enhance such mechanisms through joint learning events and knowledge

²⁹¹ <https://sustainabledevelopment.un.org/samoapathway.html>

²⁹² https://www.un.org/ga/search/view_doc.asp?symbol=A/74/L.3&Lang=E

²⁹³ Leaders of the Pacific Forum, 2019. Kainaki II Declaration for Urgent Climate Change Action Now

sharing, such as the establishment of a regional hub and participation of the countries in Regional Climate Outlook Forums. The Programme Coordinator will give presentations on the Programme at SPREP and SPC Council Meetings, biennial PMC meetings, and regional meetings of Pacific Heads of Environment, ministers responsible for meteorological services and climate change ministers. The Programme is based on national and regional priorities and was endorsed by the PMC. NMHSs and associated regional organisations are cooperating in the implementation of the GFCS through the Pacific Islands Meteorological Strategy (PIMS) and the Roadmap for Climate Services 2017 – 2026, with the PMC taking a key role. The strong country and regional ownership are important pre-conditions for long-term institutional sustainability.

- The Programme is **based on a robust knowledge management approach** that will facilitate replicability and sustainability in the long term. Programme Result 4 is entirely dedicated to regional knowledge management and cooperation, with provisions for joint learning and sharing of best practices and lessons not only within the Programme but also with other relevant initiatives and stakeholders. This will be facilitated by the Programme's linkages with the SPREP-WMO Pacific Meteorological Desk Partnership (PMDP), with which the Programme Management Unit will be co-located in Apia, Samoa. At the regional level, lessons will be shared through the PMC and the PMDP regional meetings of Environment Ministers, Ministers responsible for Met services (often the same) and Climate Change Ministers. The permanent stakeholder engagement mechanisms to be established as part of the National Frameworks for Climate Services (NFCSs) and National Climate Outlook Forums (NCOFs) under Programme Result 1 will play a key role in sharing knowledge and lessons learned at the national level.
- The Programme will **strengthen existing NMHSs and disaster management mechanisms in the five countries rather than creating new parallel structures**. It will build on their existing strengths and capacities and be informed by their local knowledge. Sustainability will be supported by the establishment of National Frameworks for Climate Services in all five countries and associated institutional coordination mechanisms to ensure effective governance, coordination and management of national climate services. The Frameworks will institutionalise feedback and review mechanisms in the climate services value chain to ensure that services evolve to match the needs of end-users at all levels as user demands change. This will contribute to long-term sustainability through ensuring that NMHS products and services remain relevant. Climate information services and the institutional coordination mechanisms will support stakeholders to integrate climate risk knowledge into climate-sensitive sectors. The five NMHSs have formally committed to sustaining some of the critical functions to be introduced by the Programme (climatology, oceanography and Operations & Maintenance) after its implementation period.
- The Programme will adopt a **broad multi-stakeholder approach** and bring on board different ministries, agencies, educational institutions, NGOs, private sector actors, communities and others, representing both producers and users of climate information and early warning. National Climate Outlook Forums will be a key mechanism in this regard. Multiple stakeholders will then have interests in the continuance of the Programme's outputs and outcomes. Through capacity development activities, awareness raising and a dedicated knowledge management component, the capabilities of all stakeholders will be enhanced. The holistic approach to climate and oceans services tailored to the needs of the Pacific will be more conducive to sustainability than a sole focus on the provision of technical infrastructure, as many projects have tended to do.
- The focus of Programme Result 1 is on establishing a **new sustainable business delivery model** for the five NMHSs. Amongst others, the Programme will establish National Frameworks for Climate Services (NFCSs) in the five countries to coordinate, facilitate and strengthen collaboration among national institutions for enhanced use of climate information and provision of climate services. The NFCS is based on the Global Framework for Climate Services, which is the principal framework for the delivery of climate services for decision-making on climate change and sustainable development. The NFCS will be supported by stakeholder coordination mechanisms – including **National Climate Outlook Forums**

(NCOFs) – to integrate climate risk knowledge into climate-sensitive sectors. Climate risk-informed investment is essential for technically sound, effective and sustainable development for long-term climate resilience. The benefits resulting from investments in climate services are far greater than the losses they will help prevent. Furthermore, the Programme will conduct **market assessments** (Sub-activity 1.1.2) **to assess private sector engagement** in climate services and identify opportunities for i) development of value-added climate products and services; ii) public-private partnerships in the generation, translation and transfer function; and iii) private sector investment and sponsorship. The Programme will build on the market analyses to develop **national policies for financing climate services** (Sub-activity 1.1.4) to establish a long-term financially sustainable business model. This will include opportunities to develop National Climate Funds that will support future fund capitalisation. The identification of appropriate funding modalities and capitalisation opportunities for climate information services will ensure that NMHSs have the means to sustain and ensure the ongoing operation of their mandated services, including through the Systematic Observations Financing Facility (SOFF), which is being established by WMO and partners to support the Global Basic Observing Network (GBON) as a public good. In addition, the Programme is expected to develop and demonstrate information products that have commercial value to climate-sensitive industries based on detailed market analysis. For example, long-range rainfall forecasts enable tourism operators to ensure that they have adequate potable water supplies, and climate forecasts can enable them to advertise expected particularly good surfing seasons. By the completion of the Programme, some of the five countries are expected to be ready to negotiate cost recovery for new information products. WMO and the New Zealand meteorological services have experience in evaluating the market for cost recovery and will be invited to assist in the development of these strategies.

- The Programme will integrate new and cost-effective hydrometeorological equipment and tools for strengthened observations, monitoring, modelling and prediction into existing NMHSs. Under Result 2, the Programme will **upgrade observation equipment** as required for the five NMHSs to achieve WMO Category 2 (Essential Services). The enhanced accuracy and timeliness of observations will enable NMHSs to develop and communicate **actionable climate information products, forecasts and early warnings**. Through sector engagement (under Programme Result 1) and last-mile delivery (under Programme Result 3), government entities, stakeholders and communities will start to appreciate the **value of better climate information** for safeguarding lives and assets but also for climate-resilient economic development in the longer term. Through dedicated activities in Programme Result 1, this will provide the foundation for potential for **cost recovery for climate services** beyond the lifespan of the Programme. For example, **weather radar data is highly valuable** for generating more accurate and reliable weather forecasts. Thus, building NMHS capacity in weather radar operations (Sub-activities 2.1.1 and 4.1.2) could catalyse investment in more advanced systems for revenue generation beyond the Programme duration. Improved forecasting capacity and enhancing human resources and equipment to operate and maintain climate information services and impact-based MHEWS will create an enabling environment for the generation and use of these services beyond the duration of the Programme, including for Forecast-based Financing (FbF). Regional organisations and donors will further contribute to long-term sustainability of the Programme outcomes through the provision of technical assistance, research and technology transfer.
- The Programme will sustain climate resilience at the last-mile through its emphasis on **community engagement, local capacity building** and the establishment of **multi-channel communications** to reach remote island populations. The Programme will engage with its expected beneficiaries through tailored awareness and education campaigns to enhance understanding and knowledge of risks; and co-development of community-based disaster preparedness plans and Early Action Protocols (EAPs) to ensure that actions taken are realistic to the local context. The establishment and operationalisation of localised coordination mechanisms, SOPs and a localised climate information communication system, and participation of community-based organisations, will anchor interventions at the local level so that they are not dependent on ongoing external support. Timely, accurate and actionable forecasts and well-

developed local response capabilities are highly complementary; if either one is deficient, the promised benefits of an early warning system will not be sufficiently realised.²⁹⁴ The Programme will concurrently address these needs to facilitate that behavioural and attitudinal changes to the use of climate information sustain the value of early warning systems beyond the Programme implementation period.

- The Programme has developed a comprehensive plan for **Operations and Maintenance (O&M)**, which details how specific O&M needs and costs will be addressed and budgeted for both during and post implementation of the Programme. The five countries have assumed responsibility for securing O&M after the Programme implementation period for up to 20 years. The draft plan provided as Annex 21 will be refined during the Programme's inception and implementation. Each National Programme Implementation Manager will ensure that O&M inputs are recorded in annual national budget documents. The costs will be provided as detailed, disaggregated line items at an appropriate point in the financial year to ensure that they are included in budget preparations and to establish an accurate understanding of required expenses. For Palau and RMI, the US NOAA will also support part of the O&M. In addition, SPREP has formally committed to post-project funding of the ICT Officer position as well as associated fees including hosting of the data portal network. Furthermore, the Programme will provide targeted training for O&M over the course of its implementation to build in-country capacity. The Programme will utilise a training of trainers (ToT) approach, which is a strong predictor of sustainability due to its potential for upskilling the workforce rapidly, cheaply and exponentially by developing local educators.²⁹⁵ ToT will ensure that capacity to train new employees is sustained beyond the lifetime of the Programme. Moreover, through the Global Basic Observing Network (GBON) initiative, it has been recognized widely that accurate weather and climate observations required for global Numerical Weather Prediction (NWP) are a global public good that is to be financed in a sustainable and predictable manner. To this end, a Systematic Observations Financing Facility (SOFF) is being established under the umbrella of the Alliance for Hydromet Development (of which GCF, GEF, Multilateral Development Banks and the AE are members). The SOFF will be launched in 2021. The five Programme countries have been confirmed as pilots for the GBON initiative through this Programme. Therefore, they are in a leading position to demonstrate the value of investing in GBON both to protect local communities and benefit local populations, but also as a critical element of regional and global forecasting and climate analyses.²⁹⁶ After the Programme implementation period, support from the SOFF is expected to be available to the countries to continue maintaining GBON standards as needed. As per the standards adopted by the WMO Congress, GBON aims to improve the global availability of the most essential surface-based data by defining the obligation for countries to implement a minimal set of surface-based observations for which international exchange of observational data will be mandatory.
- The Programme will **generate additional climate information datasets of significant value** to the five countries and their development partners. Fisheries, tourism, disaster management and transport industries need reliable data for climate-resilient sustainable development and to avoid waste, maladaptation and the creation of stranded assets. The observed value of improved datasets and regular reporting of these outcomes through Programme communications via public and social media will reinforce support for the ongoing maintenance of observation networks, data management and new functions. Furthermore, the importance to the international scientific community of data covering a large geographical and currently data-sparse area of the Pacific Ocean and its value to global observing

²⁹⁴ Tesiberg, T.J. and Weiher, R.F. 2009. Background Paper on the Benefits and Costs of Early Warning Systems for Major Natural Hazards

²⁹⁵ Mormina, M. and Pinder, S. Globalization and Health. 2018. A conceptual framework for training of trainers (ToT) in global health

²⁹⁶ As formally confirmed by the WMO Director, Infrastructure Department in his message to the AE dated 7 July 2020: "Through this initiative, WMO, in collaboration with the AE and the countries involved has undertaken the review of individual countries' observational gaps based on draft GBON regulatory provisions and current capacity and reporting practice. The resulting proposed activities correspond to an optimal, suitable, and feasible national basic observing network design that responds to country priorities and needs while ensuring consistency with the proposed concept and draft regulatory material for the GBON...".

systems is likely to generate continued support from international development partners beyond the term of the Programme.

Sustainability and replicability of the Programme will be facilitated and supported through key partnerships and its alignment with key frameworks and strategies. The Programme is aligned with the WMO Global Framework for Climate Services (GFCS), designed to facilitate delivery of best practice climate services. In the Pacific, NMHSs and associated regional organisations are cooperating in the implementation of the GFCS through the Pacific Islands Meteorological Strategy and the Roadmap for Climate Services 2017–2026 with the Pacific Meteorological Council (PMC) taking a key role. This Programme is fully anchored in these priorities, ensuring high relevance of activities and enabling uptake and continuation beyond the Programme's duration.

C. FINANCING INFORMATION

C.1. Total financing

As reaffirmed by the UN General Assembly in the 2019 *Political declaration of the High-Level Meeting to Review Progress Made in Addressing the Priorities of Small Island Developing States through the Implementation of the SIDS Accelerated Modalities of Action (SAMOA) Pathway*, SIDS remain a special case for sustainable development as they continue to face the combined challenges arising, in particular, from their geographical remoteness, the small scale of their economies, **high costs and the adverse effects of climate change and natural disasters**.²⁹⁷ The small size, remoteness and insularity of SIDS pose daunting challenges in amongst others transport logistics. For example, domestic inter-island shipping services in many countries of the Pacific region – especially to outer islands – are infrequent, unreliable and expensive. Similarly, air travel in the Pacific often involves long-haul, multi-leg and expensive flights in the absence of direct flight connectivity.²⁹⁸ Therefore, the cost of travel, general logistics and transactions in the Pacific region are comparatively higher than in many other parts of the world.

No direct cash transfers to beneficiaries or grant award schemes will take place under the Programme. GCF grant funds will be utilised towards strengthening the climate monitoring and observation infrastructure/equipment (over 50% of the budget), capacity building, technical assistance and training. Financial management of the Programme will be in line with UN rules and regulations.

(a) Requested GCF funding (i + ii + iii + iv + v + vi + vii)		Total amount		Currency			
		\$47,403,173.51		USD (\$)			
GCF financial instrument		Amount	Tenor	Grace period	Pricing		
(i)	Senior loans	Enter amount	Enter years	Enter years	Enter %		
(ii)	Subordinated loans	Enter amount	Enter years	Enter years	Enter %		
(iii)	Equity	Enter amount			Enter % equity return		
(iv)	Guarantees	Enter amount	Enter years				
(v)	Reimbursable grants	Enter amount					
(vi)	Grants	\$47,403,173.51					
(vii)	Results-based payments	Enter amount					
(b) Co-financing information		Total amount		Currency			
		\$2,530,484.77		USD (\$)			
Name of institution		Financial instrument	Amount	Currency	Tenor & grace	Pricing	Seniority
Government of Cook Islands		In kind	\$340,352.53	USD (\$)	5 years 5 years	Enter%	Options
Government of Niue		In kind	\$538,094.80	USD (\$)	5 years 5 years	Enter%	Options
Government of Palau		In kind	\$837,423.34	USD (\$)	5 years 5 years	Enter%	Options
Government of RMI		In kind	\$237,364.73	USD (\$)	5 years 5 years	Enter%	Options
Government of Tuvalu		In kind	\$427,249.37	USD (\$)	5 years 5 years	Enter%	Options
UN Environment Programme		In kind	\$150,000.00	USD (\$)	5 years 5 years	Enter%	Options
(c) Total financing (c) = (a)+(b)		Amount		Currency			
		\$49,933,658.28		USD (\$)			

²⁹⁷ <https://undocs.org/pdf?symbol=en/A/74/L.3>

²⁹⁸ https://unctad.org/meetings/en/SessionalDocuments/cimem7d8_en.pdf

(d) Other financing arrangements and contributions (max. 250 words, approximately 0.5 page)

The Governments of the five Programme countries in conjunction with Regional Technical Partners will provide co-financing as detailed at the Result level in section C.2. below. This is new and additional financing in addition to the requested GCF Grant resources. Each country has signed Co-Financing Commitment Letters, which can be found in Annex 13.

Co-financing for **all five Programme countries** will be provided through the contribution of staff to activities across the Programme. Additional co-financing will be provided as follows:

- **Niue** will provide co-financing through equipment (office space, climate data management system (CDMS) server hardware, UPS, freight) and professional/contractual services (implementation of customised web services and sector-focused product dashboard).
- **Palau** will provide co-financing through equipment (office space, contribution to Department of Agriculture equipment costs), professional/contractual services (PacIOOS) and travel (contribution to Department of Agriculture travel costs).
- **Tuvalu** will provide equipment (CDMS server hardware, UPS, freight) and professional/contractual services (SPC).
- **United Nations Environment Programme (UNEP)** will provide co-financing through the contribution of staff time for the Programme Management Unit.

Parallel Financing – Total: ~ USD 9 million

The Pacific Community (SPC) is the regional lead in coastal hazard / risk assessment and inundation early warning systems development. SPC will contribute approximately **USD 7 million** in Parallel Finance to the Programme through projects that have a direct contribution to the Programme Results, which are detailed below.

- **Climate Risk and Early Warning Systems (CREWS) and Coastal Inundation Forecasting Demonstration Project (CIFDP)** – SPC is developing innovative swell-driven inundation forecast systems tailored to Pacific island geomorphology and resources available to the NMHSs. These two projects are currently focusing on Fiji, Kiribati and Tuvalu. SPC received first prize at the 2019 Flood Early Warning System (FEWS) conference in Melbourne, Australia for this innovative work. The methodologies developed and lessons learnt will be directly used in the UNEP GCF Programme.

Project budget: ~ USD 800,000

- **Tuvalu Coastal Adaptation Project (TCAP)** – SPC is supporting the collection of Lidar bathymetry and topography data for the nine islands of Tuvalu. The information produced and capacity transferred under the TCAP project will provide an ideal baseline for enhancing the delivery of the UNEP GCF Programme.

Project budget (for relevant components): ~ USD 500,000

- **Pacific Resilience Project Phase 1 (PReP-1)** – SPC is leading a demonstration activity aiming to develop an innovative early warning system for Tropical Cyclone and Tsunami-driven inundation tailored to Pacific island geomorphology and resources available to the NMHSs. The project focuses on Tonga and Samoa. The methodologies and lessons learnt will directly contribute to the successful delivery of the SPC-led activities under the UNEP GCF Programme.

Project budget: ~ USD 1 million

- **Pacific Resilience Project Phase II (PReP-2)** – SPC is leading an integrated coastal risk management programme for Majuro, RMI. This project component includes three major sub-components: i) Coastal inundation hazard assessment; ii) Risk assessment to inform coastal development decisions; and iii) Strengthening of the existing coastal monitoring programme. The coastal hazard assessment work, undertaken in collaboration with the University of Cantabria, aims at tailoring and implementing a state-of-the-art coastal hazard framework (TESLA-flood framework) for Majuro atoll. The project is also considering integrating the hazard and risk knowledge generated into a seasonal inundation forecast product. The lesson learnt, especially on the tailoring of the coastal hazard framework for Pacific islands and strengthening of the coastal monitoring programme, will be readily available to ensure the successful delivery of SPC-led activities under the UNEP GCF Programme.

Project component budget: ~ USD 1.2 million

- **Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI)** – SPC is leading a regional effort to increase risk knowledge and risk assessment capacity in the region. The project aims to: i) Develop regional standards for asset and impact data collection; ii) Update the regional asset database; iii) Develop regional vulnerability functions to convert hazard into risk; and iv) Develop regional risk assessment guidelines for various relevant scales (community / urban / island / country). The improved asset data and risk knowledge developed will provide a critical baseline to convert hazard forecasts into impact-based products.

Project budget: ~ USD 3.5 million

Additional Parallel Financing will be provided as follows:

- The GEF-funded Inform project – implemented by UNEP and executed by SPREP – will contribute Parallel Financing to Activities 2.3 and 4.1 with an estimated amount of USD 1,074,563.
- APEC Climate Center (APCC) will contribute in-kind Parallel Financing estimated as USD 1,052,392.
- The International Federation of Red Cross and Red Crescent Societies (IFRC) will contribute Parallel Financing of ~ USD 112,250 to the Programme through the regional technical position under IFRC. 30% of the person's time will be solely dedicated to providing

Forecast-based Financing technical support to the Programme. The remaining 70% (USD 112,250) is IFRC counterpart.

- China Meteorological Administration (CMA) will contribute Parallel Financing of ~ USD 200,000 to support technical training under Sub-activity 4.1.2.²⁹⁹

TOTAL BUDGET: USD 49,933,658.28

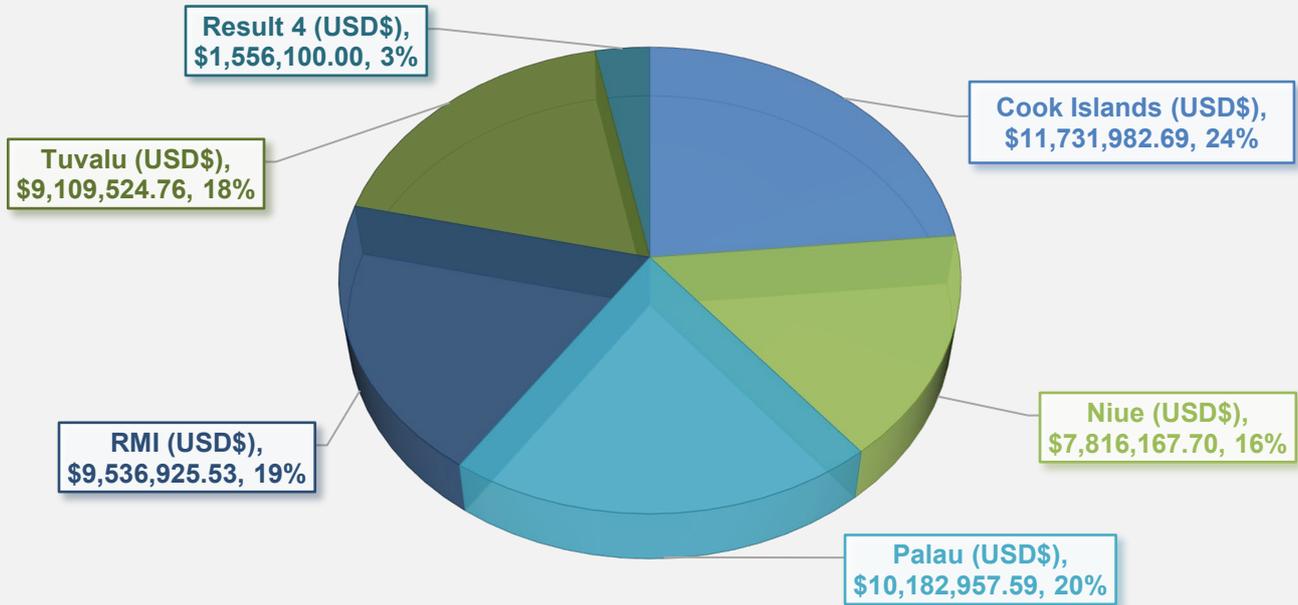


Figure 32. Breakdown of the Programme Budget

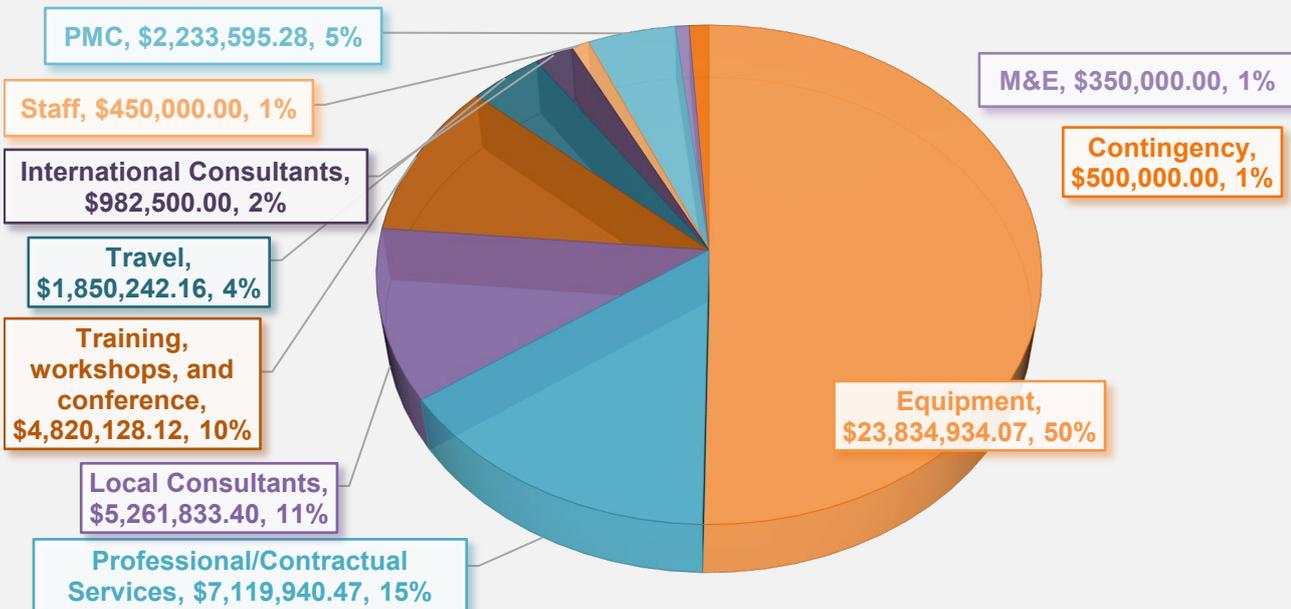


Figure 33. Distribution of the Programme budget by description (see Annex 4)

²⁹⁹ Coordinated by the Chinese Academy of Meteorological Sciences (CAMS)

C.2. Financing by Programme Result							
Programme Result	Country	Indicative cost	GCF financing		Co-financing		
			Amount	Financial Instrument	Amount	Financial Instrument	Name of Institutions
		million USD (\$)	million USD (\$)		million USD (\$)		
1. Strengthened delivery model for climate information services and MHEWS covering oceans and islands	1.1 Strengthen institutional and policy frameworks and delivery models for climate services						
	Cook Islands	\$1,015,169.40	\$1,010,598.00	Grants	\$4,571.40	In kind	Gov of Cook Islands
	Niue	\$773,531.75	\$756,281.00	Grants	\$17,250.75	In kind	Gov of Niue
	Palau	\$1,117,340.00	\$967,340.00	Grants	\$150,000.00	In kind	Gov of Palau
	RMI	\$941,568.00	\$941,568.00	Grants			Gov of RMI
	Tuvalu	\$852,572.00	\$852,572.00	Grants			Gov of Tuvalu
	Total Result 1	\$4,700,181.15	\$4,528,359.00		\$171,822.15		
2. Strengthened observations, monitoring, modelling and prediction of climate and its impacts on ocean areas and islands	2.1 Enhance infrastructure and technical support for observations and monitoring						
	Cook Islands	\$4,963,577.26	\$4,963,577.26	Grants			Gov of Cook Islands
	Niue	\$1,578,292.43	\$1,578,292.43	Grants			Gov of Niue
	Palau	\$1,761,493.36	\$1,761,493.36	Grants			Gov of Palau
	RMI	\$3,097,973.23	\$3,072,773.23	Grants	\$25,200.00	In kind	Gov of RMI
	Tuvalu	\$3,709,410.00	\$3,709,410.00	Grants			Gov of Tuvalu
	2.2 Strengthen ocean and climate modelling and impact-based forecasting						
	Cook Islands	\$4,173,178.86	\$3,888,724.33	Grants	\$284,454.53	In kind	Gov of Cook Islands
	Niue	\$3,319,360.02	\$2,869,528.47	Grants	\$442,507.80	In kind	Gov of Niue
	Palau	\$4,567,103.14	\$4,023,066.79	Grants	\$544,036.34	In kind	Gov of Palau
	RMI	\$2,883,963.24	\$2,671,798.51	Grants	\$212,164.73	In kind	Gov of RMI
	Tuvalu	\$3,105,342.21	\$2,678,092.83	Grants	\$427,249.37	In kind	Gov of Tuvalu
	2.3 Harmonise climate data and information management						
	Cook Islands	\$133,866.00	\$133,110.00	Grants	\$756.00	In kind	Gov of Cook Islands
	Niue	\$217,528.45	\$217,528.45	Grants	\$7,323.75		Gov of Niue
	Palau	\$291,025.00	\$291,025.00	Grants			Gov of Palau
	RMI	\$212,110.00	\$212,110.00	Grants			Gov of RMI
Total Result 2	\$34,021,723.19	\$32,078,030.67		\$1,943,692.52			
3. Improved community preparedness, response capabilities and resilience to climate risks	3.1 Improve warning dissemination and communication						
	Cook Islands	\$263,584.00	\$242,286.00	Grants	\$21,298.00	In kind	Gov of Cook Islands
	Niue	\$377,740.00	\$377,740.00	Grants			Gov of Niue
	Palau	\$721,942.00	\$658,555.00	Grants	\$63,387.00	In kind	Gov of Palau
	RMI	\$358,250.00	\$358,250.00	Grants			Gov of RMI
	Tuvalu	\$288,152.50	\$322,217.50	Grants			Gov of Tuvalu
3.2 Enhance preparedness and response capabilities							

	Cook Islands	\$301,281.10	\$272,008.50	Grants	\$29,272.60	In kind	Gov of Cook Islands
	Niue	\$668,389.00	\$597,376.50	Grants	\$71,012.50	In kind	Gov of Niue
	Palau	\$842,728.00	\$762,728.00	Grants	\$80,000.00	In kind	Gov of Palau
	RMI	\$1,161,735.00	\$1,161,735.00	Grants			Gov of RMI
	Tuvalu	\$272,722.00	\$238,657.00	Grants			Gov of Tuvalu
	3.3 Establish Forecast-based Financing (FbF)						
	Cook Islands	\$234,607.02	\$234,607.02	Grants			Gov of Cook Islands
	Niue	\$234,607.00	\$234,607.00	Grants			Gov of Niue
	Palau	\$234,607.04	\$234,607.04	Grants			Gov of Palau
	RMI	\$234,607.00	\$234,607.00	Grants			Gov of RMI
	Tuvalu	\$234,607.00	\$234,607.00	Grants			Gov of Tuvalu
	Total Result 3	\$6,429,558.66	\$6,164,588.56		\$264,970.10		
4. Enhance regional knowledge management and cooperation for climate services and MHEWS (Result 4)	4.1 Enhance regional data, knowledge management and cooperation	\$1,556,100.00	\$1,556,100.00	Grants			
	Total Result 4	\$1,556,100.00	\$1,556,100.00				
Programme Management Cost	Cook Islands	\$476,719.06	\$446,719.06	Grants	\$30,000.00		UNEP
	Niue	\$476,719.06	\$446,719.06	Grants	\$30,000.00		UNEP
	Palau	\$476,719.06	\$446,719.06	Grants	\$30,000.00		UNEP
	RMI	\$476,719.06	\$446,719.06	Grants	\$30,000.00		UNEP
	Tuvalu	\$476,719.06	\$446,719.06	Grants	\$30,000.00		UNEP
	Total PMC	\$2,383,595.28	\$2,233,595.28		\$150,000.00		
Monitoring and Evaluation Costs	Cook Islands	\$70,000.00	\$70,000.00	Grants			
	Niue	\$70,000.00	\$70,000.00	Grants			
	Palau	\$70,000.00	\$70,000.00	Grants			
	RMI	\$70,000.00	\$70,000.00	Grants			
	Tuvalu	\$70,000.00	\$70,000.00	Grants			
	Total M&E	\$350,000.00	\$350,000.00				
Contingency	Cook Islands	\$100,000.00	\$100,000.00	Grants			
	Niue	\$100,000.00	\$100,000.00	Grants			
	Palau	\$100,000.00	\$100,000.00	Grants			
	RMI	\$100,000.00	\$100,000.00	Grants			
	Tuvalu	\$100,000.00	\$100,000.00	Grants			
	Total Contingency	\$500,000.00	\$500,000.00				
Cook Islands (USD\$)		\$11,731,982.69	\$11,361,630.16		\$340,352.53		
Niue (USD\$)		\$7,816,167.70	\$7,248,072.90		\$538,094.80		
Palau (USD\$)		\$10,182,957.59	\$9,315,534.25		\$837,423.34		
RMI (USD\$)		\$9,536,925.53	\$9,269,560.80		\$237,364.73		

Tuvalu (USD\$)		\$9,109,524.76	\$8,652,275.39		\$427,249.37		
Programme Result 4 (USD\$)		\$1,556,100.00	\$1,556,100.00				
Total (USD\$)		\$49,933,658.28	\$47,403,173.51		\$2,530,484.77		

* The Programme Management Costs at this level are required due to the complexities of coordinating the Programme across the five countries and with multiple Executing Entities as well as Regional Technical Partners. The countries are geographically isolated and consist of numerous small islands/atolls spread across vast ocean areas. High costs will be incurred for travel between the remote islands, which may be exacerbated by expensive and limited internet communications capacity that would necessitate additional inter-island travel.

C.3 Capacity building and technology development/transfer (max. 250 words, approximately 0.5 page)

C.3.1 Does GCF funding finance capacity building activities?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
C.3.2. Does GCF funding finance technology development/transfer?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

The Programme incorporates a significant capacity building approach through its design to “bring about transformation that is generated and sustained over time from within”³⁰⁰ for increased resilience and enhanced livelihoods of the five Pacific countries’ populations to climate change threats.

All four Programme Results include capacity building activities. Result 1 focuses mostly on capacity building at the institutional level of the NMHSs and other government entities through the National Frameworks for Climate Services and National Climate Outlook Forum processes. Result 2 includes capacity building at the institutional and individual levels (e.g. of NMHS staff) for enhanced observations, modelling and forecasting. The Programme recognises the difficulty of recruiting qualified personnel in very small island countries, proposing instead to provide training, development and joint regional activities, which will expand each country’s existing human resource base. Result 3 includes a range of capacity building efforts at the community level as part of early warning schemes aimed at improving preparedness and response capacities. Under this Result, NMHSs and National Disaster Management Authorities (NDMAs) will also strengthen their awareness and outreach capacities for community training and engagement. Result 4 is entirely concentrated on capacity building. Capitalising on the multi-country nature of the Programme, it will focus on regional learning and knowledge management to support the objectives of the Programme and will benefit from mentoring and sharing of experiences, knowledge and lessons learnt.

The Programme also includes funding for mainly observation technologies under Result 2. SPREP, SPC, BoM, NIWA, NOAA and APCC will support the NMHSs in building in-house capacity to manage, use and maintain new and more modern observing equipment. The Programme will complement and contribute incidentally to other ongoing technology transfer activities (data management software, use of software in generating forecasts, etc.) and capacity development through its work on climate forecasting capacity and application.

³⁰⁰UNDP, 2009. Capacity Development: A UNDP Primer

D. EXPECTED PERFORMANCE AGAINST INVESTMENT CRITERIA

This section refers to the performance of the project/programme against the investment criteria as set out in the GCF's [Initial Investment Framework](#).

D.1. Impact potential (max. 500 words, approximately 1 page)

The Programme will directly contribute to *increased climate-resilient sustainable development* in Cook Islands, Niue, Palau, RMI and Tuvalu through the achievement of the following Fund-level impact, as stated in the GCF Performance Measurement Framework (PMF):

A1.0 — Increased resilience and enhanced livelihoods of the most vulnerable people, communities, and regions.

The Programme intends to establish integrated climate and oceans information services and impact-based multi-hazard early warning services (MHEWS) to ensure that the entire population of the five Programme countries has access to accurate, timely and actionable climate information. The proposed interventions aim to improve the resilience of up to 100,038 people (51% male and 49% female). This is the estimated entire population of the Cook Islands, Niue, Palau, the Republic of the Marshall Islands (RMI) and Tuvalu.³⁰¹ The whole population of the five SIDS is at risk from climate-related hazards such as cyclones, storm surges, coastal inundation, floods and droughts. The most vulnerable groups include the populations living in coastal zones (estimated at 90-100% for the five countries³⁰²) and communities in remote island locations. Women, children, elderly people and people with disabilities are particularly at risk from the negative impacts of climate change. The Programme includes targeted interventions tailored to the specific needs of these groups.

The World Risk Index 2018 states that disaster risk – the risk that an extreme natural event will lead to disaster – is at its highest in Oceania.³⁰³ The main contributor to deaths and financial losses in the Pacific region is tropical cyclones.³⁰⁴ As stated in the 2015 UNDRR Global Assessment Report,³⁰⁵ the concentration of assets and essential infrastructure—airports, water storage, sanitation, hospitals and clinics, schools, cyclone shelters, fishing boats, inter-island ferries and often food gardens along the coasts—in Pacific island countries means that risk is heavily influenced by exposure. In relation to annual capital investment, SIDS have very high concentrations of risk. All five Programme countries have assets, infrastructure and crops at risk of being damaged from natural disasters with total replacement costs of over USD 7.6 billion, with buildings at risk contributing the majority of this total (86.5%), infrastructure (13.2%) and cash crops (0.4%).^{306,307} The current average annual losses (AAL) per capita (USD\$2019) are 537 (Cook Islands); 2122 (Niue); 208 (Palau); 119 (RMI); and 336 (Tuvalu).³⁰⁸

The Programme aims to reduce the expected losses of lives and economic assets due to the impact of climate hazards and extreme climate-related disasters and enhance adaptive capacity at national, sub-national and community level. The Programme is expected to achieve an overall reduction in damages and

³⁰¹ Using figures from the Statistics for Development Division of the Pacific Community (SPC)

³⁰² PLOS ONE, 2019. Coastal Proximity of populations in 22 Pacific Island Countries and Territories. 100% of the populations of Tuvalu and Marshall Islands live within 1km of the coast.

93% of the population of Palau lives within 1km of the coast.

91% of the population of Cook Islands lives within 1km of the coast.

Up to 100% of the population of Niue lives within 5km of the coast (estimates range from 83-100%).

³⁰³ Bündnis Entwicklung Hilft and Ruhr University Bochum, 2018, *WorldRiskReport 2018*.

³⁰⁴ Giorgetti, A. (2018). Preliminary Cost-Benefit Analyses of Early Warning Systems for the Mitigation of Natural Disasters. Timor Leste, Papua New Guinea, Solomon Islands, Vanuatu and Fiji. Final Report prepared for WMO, February 2018; Subbiah, A., Bildan and L., Narasimhan, R. (2008). Background Paper on Assessment of the Economics of Early Warning Systems for Disaster Risk Reduction. World Bank Group for Disaster Reduction and Recovery.

³⁰⁵ https://www.preventionweb.net/english/hyogo/gar/2015/en/gar-pdf/GAR2015_EN.pdf

³⁰⁶ See Annex 3a – Economic Analysis

³⁰⁷ "Buildings" include residential, commercial, public and industrial properties. "Infrastructure" includes assets such as major ports, airports, power plants, bridges and roads. See Pacific Catastrophe Risk Assessment and Financing Initiative data and documents. Available from: <http://pcrafi.spc.int>.

³⁰⁸ Pacific Catastrophe Risk Assessment and Financing Initiative adjusted for 2019. <http://pcrafi.spc.int>. See Annex 3b – Cost Benefit Analysis

losses of 15-30%³⁰⁹ through increasing the safeguarding of assets (such as fishing boats and equipment, agricultural land and properties) from climate-related hazards through timely, impact-based multi-hazard early warning services (MHEWS) established by the Programme. A major economic benefit of the Programme will be the availability of accurate weather, climate and oceans information to increase productivity and avoid losses in climate-sensitive sectors. Actionable climate information products for agriculture, fisheries, shipping, inter-island boat operators, search and rescue services will also increase sectoral resilience, reducing the risks from climate-related hazards and thus reducing losses and damage to crops, boats and other assets. Furthermore, the Programme will develop Forecast-based Financing (FbF) mechanisms as an innovative means to ensure that early actions are pre-planned based on credible forecasts and are financed and implemented before a climate shock. These implementation of pre-planned Early Action Protocols (EAPs) will further contribute to reducing expected losses of lives and economic assets caused by climate-related hazards.³¹⁰

Strengthening NMHSs with infrastructure, tools and institutional efficacy, including QMS certification, in all five countries will be a critical factor in enabling them to improve services to the level required to provide the evidence base for smarter adaptation decisions and response actions, resulting in more resilient and sustainable development for the Programme countries and the Pacific region as a whole.

The relevant GCF Fund-level outcomes — against which the contribution to climate-resilient sustainable development can be evaluated (as per the PMF) — are the following:

A6.0 Increased generation and use of climate information in decision-making

The Programme will directly support the increased generation and use of climate and oceans information in decision-making at regional, national, sub-national and community level in the five participating countries. The Programme will substantially expand the geographical coverage of climate observations in the five Pacific island countries and their ocean areas by upgrading observation and communication equipment, including the introduction of innovative and cost-saving technologies (e.g. a localised mobile climate information communication system – Sub-activity 3.1.2); installing weather stations on inhabited outer islands in compliance with GBON; and using weather radar, buoys and ocean drones to collect high-resolution, long-range oceanographic data across the extensive marine Exclusive Economic Zones (EEZs). Furthermore, the Programme will make the additional data available as information to government sector agencies, national climate data portals supported by SPREP, the Pacific Ocean Portal and other relevant platforms.

The Programme will develop tailored information products co-designed and co-produced with communities, climate-sensitive sectors and other key stakeholders. End-users will be supported through targeted training and capacity building interventions to facilitate the mainstreaming of climate considerations into decision-making processes. The Programme will support mutually beneficial partnership between NMHSs and climate information users so that NMHSs understand how sectors and communities want to use information and users understand climate basics. The annual National Climate Outlook Forums that will be established under the Programme will serve as the key vehicles for facilitating the use of climate information in different sectors, such as agriculture, fisheries, tourism and disaster management. The Programme will also directly introduce tailored products to communities at “the last mile” through targeted outreach activities, which will promote the use of climate information by the most vulnerable end-users such as women, children and disabled people.

A7.0 Strengthened adaptive capacity and reduced exposure to climate risks

The Programme will strengthen the adaptive capacity and reduce exposure to risks posed by extreme climate events and variability through the establishment of comprehensive impact-based MHEWS, based on thorough assessment of the existing situation and gaps in the Cook Islands, Niue, Palau, RMI and Tuvalu.

³⁰⁹ See Annex 3a - Economic Analysis

³¹⁰ Australian Red Cross and Red Cross Red Crescent Climate Centre, 2016. Use of Forecast-based Financing in the Pacific: A Scoping Study

This will include the development or enhancement of MHEWS for communities at “the last mile” to build community response capabilities to secure their lives, assets and livelihoods to climate-related hazards. The Programme interventions will incorporate various activities ranging from vulnerability assessment at community level to training and awareness workshops to engage communities on climate early warning systems, and early warning information dissemination to “the last mile”. Furthermore, the Programme will introduce seasonal forecasting utilising long-range oceans data, which will enhance safety of life at sea; generate climate data from remote islands to support local-scale forecasting and monitoring of extreme events in real time; improve communication to and from all communities using robust, reliable technology, including opportunities for introducing wireless communications and Internet of Things (IoT) infrastructure; and install highly valuable low-tech information points in outer islands, such as signboards and compass points. The Programme will increase the adoption of climate and oceans information services from national to community level in the five Pacific island countries, thus enhancing their capacity to make improved climate-resilient decisions in relation to climate adaptation and disaster risk reduction.

A8.0 Strengthened awareness of climate threats and risk-reduction processes

The Programme is expected to significantly increase awareness of climate hazards and disaster risk reduction measures across the populations of the five Pacific island countries. At national, sub-national and community levels, the Programme will use a value chain approach to enhance understanding of climate processes and mainstream climate awareness into policy, planning and decision-making. The Programme will engage with key stakeholders through National Frameworks for Climate Services workshops, annual National Climate Outlook Forums, tailored information products, sector-specific training and workshops. Furthermore, the Programme will work with communities to co-design disaster drills and improve communication through public media with enhanced visualisation software and glossaries of climate and weather terms, which will be integrated into localised mobile climate information communication systems. The Programme will use the traditional climate knowledge held by communities as the entry point for discussion about the way in which NMHS forecasts are generated; as local communities come to understand the physical processes that inform a forecast and how they influence the phenomena that they use to make a seasonal forecast, this will facilitate acceptance of NMHSs’ warnings, and advice will save lives, crops and other assets.

D.2. Paradigm shift potential (max. 500 words, approximately 1 page)

The major paradigm shift the Programme is designed to achieve is towards the use of accurate, timely and actionable climate information in policy, planning and response actions, enabling sectors and communities in the five Pacific Island countries to adapt to increasing climate variability and change. Without the proposed Programme, a “business as usual” scenario is likely to continue, characterised by the poorly coordinated use of insufficient climate data and information. NMHSs will continue to generate basic weather forecasts and useful seasonal rainfall predictions but their information will be based on incomplete data (particularly for ocean areas) and it will not always reach its intended audiences in good time or in a useful form. The roles of agencies responsible for disaster preparation and warnings will remain informal and often unclear. Data critical to adaptation planning will be lost or forgotten, or not collected, and maladaptation may result. Communities will find traditional forecasting systems less and less reliable but will not be able to understand the technically worded information available, or how they should use it.

Potential for scaling-up and replication

Supporting the five Pacific NMHSs’ achievement of WMO standards will have a transformative impact on managing climate and weather risks in in their countries along with a better understanding of long-term climate change impacts. This will have a high potential for being scaled-up across Pacific island countries, facilitated through the existing regional cooperation mechanisms such as the Pacific Meteorological Council (PMC) with whom the Programme will work closely. Moreover, the establishment of community-based MHEWSs on selected islands in Cook Islands, Niue, Palau, RMI and Tuvalu will have a high potential for replicability in other islands communities. Replication will be facilitated through tailoring the collection of

hydro-meteorological data (with a special focus on ocean areas) to address specific climate change threats and tailoring the analysis of data and packaging of information to address the needs of specific end-users at community-level. Programme activities are expected to achieve transformative impacts through innovative approaches such as introducing cost-effective modern technology in NMHSs wherever feasible to reduce costs and increase accuracy of observations; and developing innovative modern communication systems to close the loop between information providers and end-users, which will ensure that the climate information services reach all end-users expeditiously, including end-users in remote island locations. Moreover, the Programme will create an enabling environment for a new innovative business model for providing climate information services by NMHSs to climate-sensitive sectors through National Climate Outlook Forums, which will contribute to long-term sustainability beyond the duration of the Programme.

Potential for knowledge and learning

Knowledge management is a key element in this Programme as the multi-country approach will facilitate learning and knowledge sharing among the five NMHSs and other entities through the dedicated regional knowledge management interventions in Programme Result 4. The Programme's multi-country hub to be established under the UNEP Sub-regional Office for the Pacific, co-located with SPREP, and the new Pacific Climate Change Centre (PCCC) in Samoa will bring together NMHS staff and climate experts for training, mentoring and other capacity development activities, such that they can form supportive networks and learn from each other's progress in implementing changes. The five countries face many similar challenges and even during the consultation process for the development of this proposal have exchanged ideas and novel approaches to the communication of climate science. Furthermore, establishing community-based MHEWS (particularly on remote outer islands) and drawing upon both traditional and modern scientific climate knowledge will allow grassroots communities to base their adaptation decisions and responses to climate-related hazards on reliable and timely information and knowledge. The Programme will progress innovative work on traditional climate knowledge. Significant behavioural changes resulting from these learning processes will, in time, safeguard lives, livelihoods and assets.

Contribution to the creation of an enabling environment

Forging long-term partnerships between the NMHSs, other government entities, universities/colleges, civil society organisations and other stakeholders, will create an enabling environment for sustainable and impactful climate information services. Furthermore, an enabling environment for long-term sustainability will be facilitated through the integration of climate services and MHEWSs into key policies, strategies, plans and budgets, which will provide a foundation for uptake of climate information in decision-making and facilitate sustainable service provision in the long term beyond the Programme duration. The National Frameworks for Climate Services and National Climate Outlook Forums will be critical in this endeavor.

Contribution to the regulatory framework and policies

The Programme will enable countries to formalise the roles of existing government agencies in addressing long term climate change and extreme events and provide a structure for the integration of climate knowledge into the functions of all ministries. It will make the data and information that agencies need to use as they mainstream climate considerations into their functions available through a portal, with in-country assistance as required. The integration of climate information services in key decision making, policies, planning and operational processes of Government entities in the five countries will bring systemic change. This will be facilitated by:

- Revising institutional, policy, planning and regulatory frameworks to optimise coordination between NMHSs, and other governmental institutions;
- Securing long-term funding arrangements for NMHSs to provide tailored climate information services on climate change threats;

- Delivering updated and harmonised vulnerability assessments to assist governments with long-term adaptation planning; and
- Ensuring full compliance of each country with its reporting obligations under the UNFCCC, Paris Agreement and climate-related SDGs targets and indicators.

Overall contribution to climate-resilient development pathways

The development and dissemination of highly tailored and targeted climate information products will be transformational in building the long-term resilience of key economic sectors (such as agriculture, fisheries, shipping, tourism and insurance) to climate risks. Delivered through a suite of outreach, learning and knowledge management activities, information products will catalyse improved, more efficient and more informed approaches and response actions to climate risks and prevent maladaptation. This will be transformational in building long-term resilience of economic sectors to climate risk but also in immediate reduction of losses to assets and livelihoods caused by climate-related hazards. Furthermore, enhanced climate information will enable resilience planning for critical infrastructure impacted by climate change and climate-related hazards, through embedding tailored and actionable climate risk information into their planning, design, construction and management frameworks. The Programme will therefore make it possible for anyone who is planning any development to find, understand and use the information they need to maximise the climate resilience of their proposed projects—for example, building a parliament house, planting a seasonal garden or setting up an ocean conditions warning system for mariners.

D.3. Sustainable development (max. 500 words, approximately 1 page)

This Programme will contribute to long-term social, economic and environmental benefits from avoided human and economic losses and healthier ecosystems in five of the Pacific region's most vulnerable countries. The Programme is fully aligned with the Sustainable Development Goals (SDGs), the Paris Agreement, the Sendai Framework and the SAMOA Pathway. The Programme will contribute to countries' progress towards many of the Sustainable Development Goals in the areas of disaster risk reduction, ecosystem protection, climate change adaptation, health and sustainable economic development. Through the proposed interventions, the project will contribute to 6 out of 17 UN Sustainable Development Goals (SDGs), namely: SDG 3 — Good Health and Well-being; SDG 5 — Gender Equality; SDG 10 — Reduced Inequalities; SDG 13 — Climate Action; SDG 14 - Life Below Water; and SDG 15 - Life on Land. In particular, the Programme will directly contribute to the following SDG targets and indicators:

Target 13.1 *Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries*

- 13.1.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population
- 13.1.2 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030
- 13.1.3 Proportion of local governments that adopt and implement local disaster risk reduction strategies

Target 13.3 *Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning*

- 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula

- 13.3.2 Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions

Target 13.b Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

- 13.b.1 Number of least developed countries and small island developing States that are receiving specialized support, and amount of support, including finance, technology and capacity-building, for mechanisms for raising capacities for effective climate change-related planning and management, including focusing on women, youth and local and marginalized communities.

Furthermore, the proposed interventions will achieve numerous environmental, social and economic co-benefits. These are summarised below.

Environmental co-benefits

The long-term environmental co-benefits of the Programme are expected to be substantial. The increased availability and use of actionable climate information can significantly improve natural resource management, from climate risk-informed policymaking to conservation and arresting biodiversity loss. The establishment of ocean information services – including lagoon health monitoring, habitat mapping and shoreline analysis – will facilitate improved management of coastal habitats and inform sustainable fisheries and tourism practices that minimise environmental impacts. In addition, enhancing coral bleaching forecast skill and warning efficiency will support the protection of coral reef ecosystems, which sustain a vast array of marine life as well as provide a natural buffer against environmental hazards. For example, sea surface temperature monitoring will enable NMHSs to issue alerts when coral reefs are stressed by atypical heat – coral is known to recover better if human activity is temporarily suspended.

The generation of impact-based forecasts, decision-support systems (DSS) and advisories tailored to natural resource-dependent sectors – such as agriculture and fisheries – contribute to the rapid identification of weather and climate hazards that pose environmental risks and consequently inform the safeguarding of natural resources and biodiversity. For example, well-managed agriculture, using rainfall prediction to determine crops most likely to succeed, reduces the pressure to convert forests to marginal arable land as well as increases food security. Furthermore, detail climate information is necessary for comprehensive environmental impact assessments and can inform energy management decisions to improve efficiency and reduce greenhouse gas emissions. At the global scale, the increased generation of data will contribute to enhanced global forecasting accuracy, which in turn improves the ability to predict and mitigate the impacts of impending extreme climate events that may be hazardous to natural environments across the world.

In addition to the environmental benefits of enhancing the availability of climate information, the installation of a renewable energy system during the renovation of the Meteorological Office in Cook Islands will reduce the carbon footprint of the office through reducing reliance on fossil-fuel generated electricity. The Cook Islands depends largely on imported diesel for electricity generation, and electricity costs there are among the highest in the Pacific.³¹¹ Reducing diesel-fuelled generation with renewable energy sources will lower the production cost of electricity, and the amount of diesel imported. This will also contribute to sustainable social and economic development. Among the Cook Islands’ potential renewable energy sources, solar energy rates well due to high sunshine hours.³¹²

Social co-benefits including health impacts

³¹¹ MFEM, 2019. Renewable Energy. Retrieved from Ministry of Finance and Economic Management: <http://www.mfem.gov.ck/312-renewable-energy>

³¹² ADB, 2014. Renewable Energy Sector Project. Retrieved from Asian Development Bank: <https://www.adb.org/sites/default/files/linked-documents/46453-002-ea.pdf>

Several social co-benefits will be derived from the Programme's activities, increasing the liveability of islands in the five Programme countries. In particular, Programme Result 3 has a major focus on interventions to strengthen resilience of island communities to climate-related hazards through the implementation of localised MHEWS and Disaster Risk Reduction, which will significantly enhance their livelihoods and reduce losses of lives and damage to assets. Enhanced response capacities among island communities will also have health benefits as impacts of climate-related hazards on population are reduced. Moreover, the improvement in weather forecasting and the prediction of severe weather events (mainly under Result 2) has wide-ranging social implications, among them better crop management giving better harvests, and improved local climate adaptation planning.³¹³ These co-benefits help avoid economic losses that can otherwise lead to socio-economic related health impacts. Furthermore, this Programme will also lead to employment opportunities for local residents, both in infrastructure building, and monitoring positions. These opportunities will both directly and indirectly improve residents' socio-economic circumstances through local wealth streams.

Economic co-benefits

The Cook Islands, Niue, Palau, RMI and Tuvalu face geographical, institutional and systemic challenges that affect the cost and provision of climate information and knowledge services. Considerable capital injection into the countries will stimulate current slow economic growth and enhance both government capacity and wealth through strengthening natural resources; enhancing knowledge and innovation; and reducing exposure and vulnerability to natural hazards, reaping abundant savings in indirect losses. Administration costs will be decreased through a more streamlined climate approach, which will reduce the vulnerability of the sheer number of small islands and low-lying atolls. Economic growth is heavily shaped by geography and isolation from other large economies. Investments into climate-resilient solutions will develop capital and manpower skills, increase research, further advance legislation, policy and planning frameworks, and build up infrastructure facilities. Moreover, as demonstrated in the Economic Study (Annex 3), without the Programme, economic losses incurred through increased frequency and intensity of natural disasters, such as flooding and tropical cyclones, will be exacerbated, particularly when considering future impact from potential changes in weather patterns.

The Programme is expected to yield significant economic benefits in the five countries both from reduced losses from hydrometeorological hazards, and enhanced productivity of resultant climate risk-informed sectors. The Programme will support the generation and integration of high quality climate and oceans data, multi-hazard risk information and vulnerability assessments into targeted early warning and decision-support systems to enhance the resilience of businesses and household income generating activities. This will be complemented by capacity building for effective disaster preparedness and response actions, which will enable the promised benefits of the early warning systems to be realised.³¹⁴ In particular, the introduction of Forecast-based Financing (FbF) will ensure the funding and implementation of pre-planned disaster response actions. This has been shown to minimise the damage and loss caused by climate-related hazards and reduce the need for humanitarian assistance in the aftermath.³¹⁵

Improved resource management and planning processes are expected to yield economic gains – for example, due to the use of sector-specific impact-based climate products in health services, fisheries and agriculture. In particular, short-term and seasonal forecasts facilitate businesses to implement dynamic management actions (e.g. pre-emptive or within-season adjustments to fishing or harvesting schedules). Coastal management agencies can use long-term climate projections to develop suitable zoning plans. Thus,

³¹³ Sillmann, J., 2017. Understanding, modelling and predicting weather and climate extremes: Challenges and opportunities. *Weather and Climate Extremes* vol 18, 65-74

³¹⁴ Tesiberg, T.J. and Weiher, R.F. 2009. Background Paper on the Benefits and Costs of Early Warning Systems for Major Natural Hazards

³¹⁵ WFP, 2019. Forecast-based Financing Factsheet. Available from: <https://www.wfp.org/publications/forecast-based-financing-factsheet>

businesses that utilise forecasts for information on upcoming environmental conditions can increase their potential to reduce costs and increase profits, relative to no forecast.³¹⁶

Gender-responsive development impact

The Programme will promote gender-responsive development in accordance with GCF policies and guidelines through the following processes: ensuring that expert advice on gender is used in planning and designing frameworks, policies and legislation and in the delivery of workshops, training exercises and capacity development activities; keeping gender disaggregated records of Programme-funded activities and striving for 50/50 participation; using best-practice consultation techniques when co-designing communication methods and information products with communities to ensure the outputs suit end-users, such as rural women with agriculture- and natural resource-dependent livelihoods and women who are first responders during and after climate-related disasters. Culturally informed gender expertise is available in the Pacific region and will be used to introduce key concepts to what can be a gender-blind field, drawing on lessons learnt from related activities.

Annex 8 details the Gender Analysis of the Programme and outlines an Action Plan to ensure that gender-responsive approaches are actively implemented. Gender-responsive indicators will be included in the Monitoring and Evaluation (M&E) framework of the Programme, as detailed in Annex 11.

Impact of COVID-19 on the Global Observing System – a potential co-benefit of the Programme

A comparison of Switzerland to any of the five Pacific island countries illustrates the need to fundamentally change the funding model for developing country observations and particularly for SIDS with vast ocean territories. Switzerland (Area: 41,000 km², GDP USD 700 billion) spends roughly USD 20 million, i.e. less than 0.003% of its GDP, on its observing network. A similar share of GDP spending for observations for Cook Islands (Area: 1,830,000 km², GDP of USD 524.2 million) would amount to ~ USD 15,700; for Niue (Area: 450,000 km², GDP of USD 43 million) would amount to ~ USD 1290; for Palau (Area: 603,978 km², GDP of USD 284 million) would amount to ~ USD 8520; for RMI (Area: 1,990,530 km², GDP of USD 221.3 million) would amount to ~ USD 6640; and for Tuvalu (Area: 749,790 km², GDP of USD 42.59 million) would amount to ~ USD 1280. Therefore, even for Cook Islands with the highest GDP of the five Programme countries, a similar share of GDP spending for observations would cover less than half the cost of sensors for a single Automatic Weather Station. It is not reasonable or equitable to expect the Pacific island countries to cover the full costs of observations. It is also unrealistic to expect that the countries will be able to sustain the provision of observations over their territories or territorial waters on national and “aid” resources alone.

Any lack of observations over one area negatively impact the quality of the forecast and analysis products globally. Whilst a significant portion of the global observing system is either partly or fully automated, some parts have already been severely affected due to COVID-19. Aircraft observations have drastically declined, with an overall reduction in aircraft observations of 75-80 % compared to normal. The decrease is close to 90% in the tropics and Southern Hemisphere, where there are already fewer observations available. The availability of surface data has decreased significantly since the beginning of the COVID-19 crisis. The main suspected cause is reliance on manned observing stations subject to lockdown. For ocean observations, the main impact has been on voluntary ship observations, which are down around 80% compared to the pre-COVID-19 baseline.³¹⁷ Thus, the COVID-19 crisis exemplifies the importance of the Global Basic Observing Network (GBON) and the Systematic Observations Financing Facility (SOFF): i) Transition to automation will improve reporting frequency and resilience; and ii) Increased number of radiosondes will lesson dependence on data of opportunity and improve resilience. Through the development of national policies for financing climate services (Sub-activity 1.1.4), the Programme will engage with SOFF to ensure that the five

³¹⁶ Hobday, A.J. et al. 2016. Seasonal forecasting for decision support in marine fisheries and aquaculture

³¹⁷ WMO, 2020. COVID-19 impacts observing system. Available at: <https://public.wmo.int/en/media/press-release/covid-19-impacts-observing-system>

participating countries can benefit from its support to sustain their systematic basic observations networks as a global public good.

Impact of COVID-19 on lives, livelihoods and assets – a potential co-benefit of implementing Forecast-based Financing (FbF) and integrated disaster risk management

As the Pacific island countries enter their cyclone, drought, heatwaves or monsoon seasons, the potential for an “unprecedented double disaster” of COVID-19 and climate hazards is increasing. The UNDRR Asia Pacific COVID-19 Brief emphasises “the need for countries to focus on a multi-hazard integrated disaster risk management approach that includes high levels of disaster preparedness and accelerated disaster risk reduction across sectors”.³¹⁸ The dual challenge of climate change and a global pandemic highlights the relevance of the proposed Programme; and the urgency required to prioritise disaster risk management efforts and enhance multi-hazard early warning systems. Furthermore, when Forecast-based Financing is combined with early response to a climate shock and resilience or disaster risk reduction activities, the co-benefits are maximised:

- A 2018 return on investment study in Nepal on implementing the approach, found that USD 22 million can be saved when responding to an emergency of an average size (175,000 affected people). Over 20 years, USD 34 and 42 kg of CO₂ emissions can be saved per dollar invested, after deducting the investment cost.³¹⁹
- A 2018 USAID study on Ethiopia, Kenya and Somalia indicates that early response to drought, combined with safety net transfers and resilience-building activities, could over a 15-year period save USD 4.3 billion, or an average of USD 287 million per year.³²⁰
- A 2015 Cost-Benefit Analysis carried out in Sudan and Nigeria shows that using a forecast-based system would lower the cost of an emergency response by 50 percent and that the net cost of a late humanitarian response is four to seven times higher than multi-year resilience-building.³²¹

The above studies exemplify the economic co-benefits of implementing Forecast-based Financing mechanisms proposed under this Programme.

D.4. Needs of recipient (max. 500 words, approximately 1 page)

Pacific Small Island Developing States (SIDS) are among the most vulnerable countries to climate change.³²² The World Risk Index 2018 unequivocally states that disaster risk—the risk that an extreme natural event will lead to a disaster—is at its highest in Oceania.³²³ The high vulnerability to climate change impacts and climate-related hazards of the five Pacific SIDS covered by this GCF Programme (Cook Islands, Niue, Palau, RMI and Tuvalu) arises from:

- Their geography, which maximises their exposure to ocean changes—many islands are less than a kilometre wide and effectively consist of long coastlines. Land mass accounts for only around 2% of the entire Pacific region.³²⁴
- Most people depend on subsistence agriculture and fishing for their livelihoods and their profitable industries, notably tourism, are very climate-sensitive. They are remote from markets and have small populations and narrow resource bases.

³¹⁸ UNDRR, 2020. UNDRR Asia Pacific COVID-19 Brief. Combating the Dual Challenge of COVID-19 and Climate-Related Disasters

³¹⁹ WFP, 2019. Forecast-based Financing in Nepal: A Return on Investment Study

³²⁰ WFP, 2018. Forecast-based Financing: Moving from crisis response to risk management

³²¹ WFP, 2018. Forecast-based Financing: Moving from crisis response to risk management

³²² UNEP, 2014. GEO Small Island Developing States Outlook

³²³ Hans-Joachim Heintze and others, 2018, WorldRiskReport 2018, Bündnis Entwicklung Hilft

³²⁴ http://www.sprep.org/attachments/Publications/PECCO_lr.pdf Page 26

- Their countries are resource-poor, lack resilience to shocks and have small economies with many pressing claims on public funds—a bad year for cyclones can cause damage costing more than a small country’s GDP.
- Effective, timely communication of climate forecasts and extreme weather warnings requires expensive but robust technology and human resources, both in short supply.
- In some countries, women have limited access to or interaction with the public domain and their requirements for information and resources are often overlooked. The prevalence of gender-based violence exacerbates this. The specific needs of old people and people with disabilities are usually invisible.

Limited data on human development indicators are available. The following aggregate figures on population and GDP disguise the inequality in the three countries with high GDP per capita.

Indicator	Cook Islands	Niue	Palau	RMI	Tuvalu
Population	17,459	1,618	21,729	53,127	11,000
Rural population	24.9%	56%	11.9%	26%	38%
Number of islands ³²⁵	15 islands (12 populated)	1 island	340 islands (10 populated)	29 atolls (20 populated) 5 islands (4 populated)	6 atolls and 3 islands
Surface area (km²)	237	261	466	181	26
GDP total (US\$m)	302	20.4	310	220 (2019)	49
GDP per capita (US\$)	16,698	12,945	16,632	3,866	4,421
GDP growth (2018)	7%	N.D.	0.5%	2.5%	4.3%
Secondary schooling ³²⁶	87%	109%	97%	47%	66%
Life expectancy at birth ³²⁷	76.4	76.3	77.8	72.5	66.5

Table 12. Aggregate figures on population and GDP for the five Programme countries

These factors contribute individually and collectively to the very high vulnerability of the populations of the five Programme countries. The country profiles in the Feasibility Study (Annex 2) provide more detail.

Financial, economic, social and institutional needs

Needs of communities and stakeholders are central to this Programme, which has strong elements on climate information products and outreach for informed adaptation actions, as well as MHEWS at national and community levels. The need for these is illustrated by the 2015 UNISDR Global Assessment Report,³²⁸ which highlights that SIDS such as Tuvalu experience significantly larger per capita losses, amounting to four years per person since 1980. The report also indicates that the number of people exposed to floods and tropical cyclones in the Pacific each year is estimated to have increased by around 70% since 1980. Relative to capital investment or social expenditure, SIDS top all of the regional risk rankings. Their combined average annual losses (AAL) is equivalent to 10% of their total annual capital investment, compared to around 1.2% in Europe and Central Asia. Similarly, the AAL in SIDS is equivalent to almost 20% of their total social expenditure, compared to only 1.19% in North America and less than 1% in Europe and Central Asia.³²⁹

³²⁵ <http://thecommonwealth.org/member-countries> downloaded 28 May 2019.

³²⁶ www.spc.int/nmdi/education downloaded 21 Aug 2019

³²⁷ www.spc.int/nmdi/vital_statistics downloaded 21 Aug 2019

³²⁸ https://www.preventionweb.net/english/hyogo/gar/2015/en/gar-pdf/GAR2015_EN.pdf

³²⁹ Ibid.

At the institutional level, the five countries' NMHSs have achieved some progress in institutional capacity, technical meteorological and climatological capacity, project delivery, project management and communication skills during the last ten years, with collegiate support from neighbouring developed country NMHSs and Australia and New Zealand. However, with the resources available to them, they remain far from able to consistently deliver the climate services or any of the national ocean services that their populations urgently need. Nonetheless, the NMHSs have reached a level of competence from which a Programme simultaneously addressing the structural obstacles to end-to-end service provision can effect a lasting systemic change. This can only be achieved through strengthening the institutional capacity of existing national organisations, if the change is to be sustained and self-perpetuating, as this Programme is designed to achieve.

D.5. Country ownership (max. 500 words, approximately 1 page)

This Programme is the outcome of a two-year staged consultation process with the five self-selected partner countries. All five contributed to consultations in the review of the Pacific Islands Meteorology Strategy and their interests and priorities are reflected in the current *PIMS 2017–2026*. The five NMHSs also contributed to the development of the *Pacific Roadmap for Strengthened Climate Services 2017–2026*. The priorities and activities in this Programme address those recorded in the *Roadmap* by each country and are the starting point for the Programme concept.

All five countries have identified climate information, early warning and/or disaster risk reduction as priority areas in their national strategies and plans:

- the Cook Islands' *National Sustainable Development Plan 2016–2020—Te Kavienga Nui*—has as its 5th goal “Strengthen resilience to combat the impacts of climate change and natural disasters.” Its *Joint National Action Plan II (JNAP II)—Are we resilient?* has four key Strategic Areas: governance, monitoring, disaster management and risk reduction and climate change adaptation.
- Niue's *National Strategic Plan* requires its Meteorological Service to provide reliable, timely and quality meteorological and climate services to all residents and ensure the adverse effects of climate change and natural hazards are mitigated and appropriate adaptation programmes are implemented to strengthen Niue's resilience. Its *National Climate Change Policy 2013* and its JNAP 2012 prioritise climate adaptation through better data management and communication.
- Palau's *Climate Change Policy 2015* documents the already measurable effects of climate change and calls on developed countries to prevent further harm. The Palau *Climate Change Policy Framework* addresses climate change adaptation, mitigation and disaster risk management.
- The Marshall Islands' Joint National Action Plan on Climate Change Adaptation and Disaster Risk Management 2014–2018 (JNAP) and its National Climate Change Policy Framework 2011 on Adaptation and Reducing Risks for a Climate Resilient Future also prioritise better data and communication.
- In Tuvalu's *Te Kakeega III—National Strategy for Sustainable Development 2016–2020*, climate adaptation is the first priority. *Te Kaniva—the Tuvalu National Climate Change Policy 2012–2021*—identifies the issues that will be addressed in this Programme.

Details of each country's principal policy documents and strategies relating to climate information services is summarised in its country profile, in the Feasibility Study.

A Concept Note drawing on these documents and other national strategies, policies and agreements was re-submitted to the Green Climate Fund in late 2018 and agreed as the basis for developing the Funding Proposal. In-country consultations were then undertaken in the five countries with a wide range of national stakeholders. This process has ensured that the Programme design is consistent with and complementary to the priorities of national and regional plans and strategies, and with past, current and planned activities. The Summary of Consultations (Annex 7) details engagement with NMHSs, disaster management agencies,

government agencies responsible for climate-sensitive sectors, media organisations, civil society organisations, women's community organisations, UN agencies active in climate adaptation in the Pacific and regional technical organisations.

The consultation process refined the range of potential activities suggested in the Concept Note to align with each country's highest priorities and most practicable inputs. There is a lot of commonality among the countries in the kind of interventions they believe are most likely to succeed and to effect lasting change.

Finally, a validation workshop brought the five NMHS Directors, the Cook Islands NDA and UNEP together and they agreed on a budgeted Programme of activities with each country that will enable them to build their institutional, human resources and infrastructural capacities to provide high quality, well-understood climate services to their governments and populations. The Programme will address national priorities as interlocking components of a functioning system.

Each country has indicated its ownership of the Programme by providing a No Objection Letter and committing to contribute co-financing and resources to its implementation.

In July 2019, UNEP gave a presentation on the agreed Programme at the Fifth Pacific Meteorological Council Meeting to all PMC members, who strongly endorsed it. Country NMHS Directors also referenced and supported the programme during their national presentations.

Consultation with the five NDAs, NMHS Directors and other country representatives has continued throughout the iterative revisions of the Programme proposal, since its first submission to GCF in November 2019.

D.6. Efficiency and effectiveness (max. 500 words, approximately 1 page)

The Governments of Cook Islands, Niue, Palau, the Republic of the Marshall Islands (RMI) and Tuvalu are requesting a GCF grant to enable the efficient and effective delivery of the proposed Programme interventions to achieve the stated outcomes. The requested grant is considered the most appropriate financial instrument to enhance climate and oceans information services in the five Programme countries due to the public good nature of such services and limited availability of government funding as a result of prioritisation of immediate development needs.³³⁰ The investment will directly address financial, technical, capacity and coordination barriers to the effective delivery of climate information and multi-hazard early warning services in the five Programme countries. Although direct revenue will not be an outcome of the GCF investment, the Programme is expected to develop information products with commercial value that will enable cost recovery options and private sector engagement beyond the term of the Programme.

The Cost-Benefit Analysis (CBA) has identified and assessed the costs and benefits of the proposed interventions for each of the five countries and has made inherent trade-offs explicit. The feasibility of the investments was determined by calculating the economic internal rate of return (EIRR) and economic net present value (NPV). A 9% discount rate has been applied as recommended by the Asian Development Bank (ADB 2017). The period of analysis covers 10 years over the lifetime of the proposed components.

The CBA shows that, assuming a 10-year useful life of proposed interventions at a 9% discount rate, all discounted NPV are positive. The economic EIRR exceeds the discount rates in each instance making all proposed investments economically viable. Sensitivity analysis has been used to test uncertainty for key parameters such as a decrease in benefits or an increase in investment costs. Although the EIRR decreased with those simulated cost benefit changes, the EIRR remained above the 9% threshold in all cases, demonstrating that the proposed investment will be both cost-effective and efficient in addition to the delivery of considerable social benefits.

The benefits calculated in the CBA take the form of avoided economic damages and losses. Avoided economic damages include impacts on infrastructure and physical assets, particularly contents, and crops.

³³⁰ See Annex 2 – Feasibility Study

Effective climate services and impact-based MHEWS developed by the Programme have the potential to partially reduce the loss of contents and crop loss. Improved hazard information and dissemination, providing better preparedness and longer lead times to evacuate, move content and harvest crops, are key contributors to these avoided damages. Avoided economic losses represent changes in economic flows arising from the disaster, lasting up to several years. The Programme aims to increase sectoral and community resilience to climate-related hazards and extreme climate events, resulting in improved productivity and avoided losses to agriculture, livestock, fisheries, commerce and tourism.

The Programme will build on existing networks, strengths and planned actions in the five Pacific island countries, such that institutional capacity for climate services will be developed in an efficient, cost-effective and complementary manner. The development and implementation of National Frameworks for Climate Services and climate finance policies in all five Pacific island countries will provide the fundamental framework for effective and sustainable delivery of climate services and adaptation interventions beyond the term of the Programme. The benefits resulting from investing in climate services are far greater than the losses they will help prevent. Climate services investments have an overall cost benefit ratio of one to 10. Evidence also suggests that the benefits of systematic investment in strengthening the operational global regional-national hydrometeorological system required for climate services outweigh the costs by about 80 to one.³³¹ The implementation of a holistic and integrated approach to climate information and early warning services delivery that concurrently addresses the root causes and barriers will have long-term efficiency and effectiveness benefits. Benefits from early warning systems will be maximised by developing them in conjunction with disaster risk management strategies and investments – such as the community level capacity building for disaster risk reduction and Forecast-based Financing. These interventions will also enhance the sustainability of last-mile investments.

Efficiency and effectiveness will be further enhanced through alignment with regional priorities, including the Pacific Island Meteorological Strategy 2017-2026 and the Pacific Roadmap for Strengthened Climate Services 2017-2026. The Programme will deliver coordinated regional interventions (Programme Result 4) to optimise synergies amongst the five Programme countries. Regional knowledge management and training, including sharing of lessons learned and information on best practices, will promote the effective use of data and information, communications and standard operating procedures. The Programme will leverage the specialised knowledge of regional technical partners to ensure that best available technologies and best practices for climate and ocean services and disaster risk management are used in the scope of the Programme. Technical experts will also deliver targeted training in areas that are essential for long-term sustainability of the Programme, including: i) Innovative and cost-saving technologies for observations, monitoring and prediction; ii) Operations and Maintenance; iii) Enhancing institutional effectiveness through Quality Management Systems (QMS) and related certification; iv) Enhancing institutional efficiency through impact-based forecasting and Forecast-based Financing; v) Options for ensuring long-term financial sustainability, including the application of National Climate Funds; and vi) Use of alerts, information exchange and coordination in the first instance after major sudden-onset disasters.

Without the Programme, economic losses incurred through increased frequency and intensity of climate-related disasters, such as flooding and tropical cyclones, will be exacerbated, particularly when considering the negative impacts of potential changes in weather patterns. Climate-resilient sustainable development in the five Pacific island SIDS is impeded by the shortage of development capital and human resource capacity; a chronic under-investment in research; insufficiently advanced legislation, policy, planning and financial frameworks; and inadequate infrastructure facilities. Investment in public services is lacking, and technical expertise and data availability for addressing climate-related risks, particularly in a socio-economic context, is limited and not generally the focus of local governments, who are busy providing basic services and infrastructure. None of the five Programme countries currently conducts systematic, comprehensive economic impact assessments or economic analyses of disaster risk reduction measures or collect climate-

³³¹ WMO, 2019. State of Climate Services Report 2019. WMO-No. 1242

related disaster data. This Programme will implement a multi-pronged approach to address these shortcomings.

In lengthy and detailed planning sessions with the individual meteorological offices, partners and wider stakeholders, the latest state-of-the-art technologies and practices have been considered, evaluated and proposed for application. Partners with an extensive knowledge and understanding, with a strong history in climate related research based in Australia, New Zealand and the Pacific have provided detailed technical terms of reference for the latest innovations showing industry best practices at competitive prices.

Further details can be found in Annex 3: Economic Analysis.

E. LOGICAL FRAMEWORK

This section refers to the project/programme's logical framework in accordance with the GCF's [Performance Measurement Frameworks](#) under the [Results Management Framework](#) to which the project/programme contributes as a whole, including in respect of any co-financing.

E.1. Paradigm shift objectives

Please select the appropriated expected result. For cross-cutting proposals, tick both.

- Shift to low-emission sustainable development pathways
 Increased climate resilient sustainable development

E.2. Core indicator targets

A1.0 Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions.

E.2.1. Expected tonnes of carbon dioxide equivalent (t CO ₂ eq) to be reduced or avoided (mitigation and cross-cutting only)	Annual	Click here to enter text. t CO ₂ eq
	Lifetime	Click here to enter text. t CO ₂ eq
E.2.2. Estimated cost per t CO ₂ eq, defined as total investment cost / expected lifetime emission reductions (mitigation and cross-cutting only)		<p>(a) Total project financing _____ Choose an item.</p> <p>(b) Requested GCF amount _____ Choose an item.</p> <p>(c) Expected lifetime emission reductions _____ t CO₂eq</p> <p>(d) Estimated cost per t CO₂eq (d = a / c) _____ Choose an item. / t CO₂eq</p> <p>(e) Estimated GCF cost per t CO₂eq removed (e = b / c) _____ Choose an item. / t CO₂eq</p>
E.2.3. Expected volume of finance to be leveraged by the proposed project/programme as a result of the Fund's financing, disaggregated by public and private sources (mitigation and cross-cutting only)		<p>(f) Total finance leveraged _____ Choose an item.</p> <p>(g) Public source co-financed _____ Choose an item.</p> <p>(h) Private source finance leveraged _____ Choose an item.</p> <p>(i) Total Leverage ratio (i = f / b) _____</p> <p>(j) Public source co-financing ratio (j = g / b) _____</p> <p>(k) Private source leverage ratio (k = h / b) _____</p>
E.2.4. Expected total number of direct and indirect beneficiaries, (disaggregated by sex)	Direct	Cook Islands – M: 6009 and F: 6265 Niue – M: 586 and F:650 Palau – M: 7571 and F: 6797 RMI – M: 22,188 and F: 21,425 Tuvalu – M: 4394 and F: 4144
	Indirect	Cook Islands – M: 7511 and F: 7832 Niue – M: 733 and F: 813 Palau – M: 9464 and F: 8496 RMI – M: 27,735 and F: 26,781 Tuvalu – M: 5493 and F: 5180 Indirect beneficiaries (including direct beneficiaries) – the entire populations of the five countries are expected to benefit from the strengthening of nationwide climate information services, multi-hazard early warning services and risk-informed decision-making.
<i>More information is provided in Annex 17</i>		

E.2.5. Number of beneficiaries relative to total population (disaggregated by sex)	Direct	At least 80% of the total populations of the five Programme countries: Cook Islands – M: 39.2% and F: 40.8% Niue – M: 37.9% and F: 42.1% Palau – M: 42.2% and F: 37.8% RMI – M: 40.7% and F: 39.3 % Tuvalu – M: 41.2% and F: 38.8%
	Indirect	100% of the total populations of the five Programme countries (including direct beneficiaries): Cook Islands – M: 49.0% and F: 51.0% Niue – M: 47.4% and F: 52.6% Palau – M: 52.7% and F: 47.3% RMI – M: 50.9 % and F: 49.1 % Tuvalu – M: 51.5 % and F: 48.5 %
<i>More information is provided in Annex 17</i>		

E.3. Fund-level impacts

Select the appropriate impact(s) to be reported for the project/programme. Select key result areas and corresponding indicators from GCF RMF and PMFs as appropriate. Note that more than one indicator may be selected per expected impact result. The result areas indicated in this section should match those selected in section A.4 above. Add rows as needed.

Expected Results	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term	Final	
A1.0 Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions	A1.1 Change in expected losses of lives and economic assets (US\$) due to the impact of extreme climate-related disasters	UNDRR Global Assessment Report Supported by further analysis of data from underlying platforms: EM-DAT / DesInventar / Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) / Pacific Damage and Loss	Average annual losses for tropical cyclones ³³² (million USD2019): ³³³ Cook Islands – 11.59; Niue – 3.83; Palau – 5.41; RMI – 7.14; Tuvalu – 4.41. Annual average casualties caused by tropical cyclones (estimated % of total population	Introduction of the early warning system can reduce the annual average damage to economic assets ³³⁵ incurred due to extreme climate-related events by 15% or USD 4.9 million and reduce life losses due to climate-related	Introduction of the early warning system can reduce the annual average damage to economic assets incurred due to extreme climate-related events by 30% or USD 9.8 million and reduce life losses due to	Data for losses of lives and economic assets is available and credible

³³² Baseline annual average losses and casualties caused by other extreme climate-related disasters (e.g. floods, drought and storm surge); and disaggregation of loss data by type of economic asset to be determined in the Programme inception phase – where records exist.

³³³ Adapted from Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) data and adjusted to 2019 for inflation, asset growth and underestimates. See Annex 3 – Economic Analysis Report

³³⁵ Economic assets are defined as buildings, infrastructure and cash crops. "Buildings" include residential, commercial, public and industrial properties. "Infrastructure" includes ports, airports, power plants, bridges and roads. See Pacific Catastrophe Risk Assessment and Financing Initiative data and documents. Available from: <http://pcrafi.spc.int>

		(PDaLo) information system	provided in brackets): ³³⁴ Cook Islands – 79 (0.51%); Niue – 13 (0.84%); Palau – 3 (0.02%); RMI – 16 (0.03%); Tuvalu – 12 (0.11%).	events to less than 50% or 62 persons. ³³⁶	extreme climate-related events to less than 80% or 98 persons.	
<i>A1.0 Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions</i>	<i>A1.2 Number of males and females benefiting from the adoption of diversified, climate resilient livelihood options (including fisheries, agriculture, tourism, etc.)</i>	Surveys conducted by the Programme among target beneficiaries in the 5 countries (in years 3 and 5 of the Programme) Community consultation reports National Programme Implementation progress reports	Estimated 5% of each country's population belong to households practising climate-resilient livelihoods (including fisheries, ³³⁷ agriculture ³³⁸ and/or tourism ³³⁹): Cook Islands – M:376 and F:392; Niue – M:37 and F:41; Palau – M:473 and F:425; RMI – M:1387 and F:1339; Tuvalu – M:275 and F:259. ³⁴⁰	At least 10% of each country's population belong to households practising climate-resilient livelihoods (including fisheries, agriculture and/or tourism): ³⁴¹ Cook Islands – M:751 and F:783; Niue – M:73 and F:81; Palau – M:946 and F:850; RMI – M:2774 and F:2678; Tuvalu – M:549 and F:518. ³⁴²	At least 50% of each country's population belong to households practising climate-resilient livelihoods (including fisheries, agriculture and/or tourism): Cook Islands – M:3,756 and F:3,916; Niue – M:367 and F:407; Palau – M:4,732 and F:4,248; RMI – M:13,868 and F:13,391;	Populations are willing to adopt climate-resilient livelihood options Data for population belonging to households practicing climate-resilient livelihoods is credible

³³⁴ Adapted from PCRAFI data and adjusted to 2019 for inflation, asset growth and underestimates. See Annex 3 – Economic Analysis Report

³³⁶ Absolute values for the annual average losses and damage will be refined according to the baseline figures obtained for other extreme climate-related disasters (e.g. floods, drought and storm surge) determined in the Programme inception phase – see earlier footnote.

³³⁷ Climate-resilient fisheries utilises integrated dynamic-adaptive-fixed management approaches on short-, medium- and long-term timescales in response to environmental change. Refer to: Holsman, K.K. *et al.* 2019. ICES Journal of Marine Science. Towards climate resiliency in fisheries management

³³⁸ Climate-resilient agriculture utilises practices that sustainably increase productivity and resilience, reduce and/or remove greenhouse gas emissions where possible and enhances the achievement of food security and development goals. Refer to CGAIR Climate Resilient Agriculture module – available at:

https://cgspace.cgair.org/bitstream/handle/10568/45955/Part4_Climate%20resilient%20agriculture%20module.pdf

³³⁹ Climate-resilient tourism involves undertaking a set of activities to reduce the vulnerability of the industry to the impacts of climate change. These solutions range from supply chain management, climate risk insurance and corporate social responsibility to legal frameworks and capacity building. Refer to Oxford Policy Management, 2019. The path to climate-resilient tourism in Nepal. Available at: <https://www.opml.co.uk/blog/path-to-climate-resilient-tourism-in-nepal>

³⁴⁰ Based on population projections for 2021 from SPC Statistics for Development Division. Available at: <https://sdd.spc.int>. Provisional estimate to be refined in the Programme inception phase.

³⁴¹ Recommended climate-resilient livelihood options and actions will be outlined in the Climate Sector Action and Communication Plans – to be developed under Activity 1.1.

³⁴² Based on population projections for 2021 from SPC Statistics for Development Division. Available at: <https://sdd.spc.int>

					Tuvalu – M:2,747 and F:2,590. ³⁴³	
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E.4. Fund-level outcomes

Select the appropriate outcome(s) to be reported for the project/programme. Select key expected outcomes and corresponding indicators from GCF RMF and PMFs as appropriate. Note that more than one indicator may be selected per expected outcome. Add rows as needed.

Expected Outcomes	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term	Final	
A5.0 Strengthened institutional and regulatory systems for climate-responsive planning and development	<i>A5.1 Institutional and regulatory systems that improve incentives for climate resilience and their effective implementation</i>	National Coordination Committee reports National Programme Implementation progress reports Review of meteorological strategies and acts	3 countries have national meteorological legislation/strategies in place (Cook Islands, Niue, Tuvalu)	1 additional country has national meteorological legislation/strategy in place (Palau)	2 additional countries have national meteorological legislation/strategy in place (Palau and RMI)	Governments of Palau and RMI are willing to adopt new strategies/legislation on meteorological services
A5.0 Strengthened institutional and regulatory systems for climate-responsive planning and development	<i>A5.2 Number and level of effective coordination mechanisms</i>	Reports from annual National Climate Outlook Forums National Coordination Committee reports National Programme Implementation progress reports	Zero: no National Framework for Climate Services (NFCS) and related coordination mechanism established in any of the countries	National Framework for Climate Services (NFCS) coordination mechanism established in 2 countries	National Framework for Climate Services (NFCS) coordination mechanism established in all 5 countries	National government entities and sector representatives are willing to engage in NFCS establishment processes
A6.0 Increased generation and use of climate information in decision-making	<i>A6.1 Use of climate information products/services in decision-making in climate sensitive sectors</i> ³⁴⁴	Reports from annual National Climate Outlook Forums National Coordination Committee reports National Programme Implementation progress reports	Climate information products and services are not used in decision making in climate-sensitive sectors (e.g. agriculture, fisheries, disaster management, tourism) ³⁴⁵	Use of climate information for decision making and prioritisation in climate-sensitive sectors (e.g. agriculture, fisheries, disaster management, tourism) through implementation of Climate Information Services Action and	Use of climate information for decision making and prioritisation in climate-sensitive sectors (e.g. agriculture, fisheries, disaster management, tourism) through implementation of Climate Information Services Action and	Sectors are willing to make operational changes based on climate information

³⁴³ Based on population projections for 2021 from SPC Statistics for Development Division. Available at: <https://sdd.spc.int>

³⁴⁴ The AE recognises that this indicator should be A6.2 but this indicator is not available to select in the dropdown menu in the GCF Funding Proposal template.

³⁴⁵ To be re-confirmed at the climate services workshop in Year 1

				Communication Plans and training of sectoral officers under the Sector Specific Climate Training Programme in 2 countries	Communication Plans and training of sectoral officers under the Sector Specific Climate Training Programme in 5 countries	
A7.0 Strengthened adaptive capacity and reduced exposure to climate risks	<i>A7.1 Use by vulnerable households, communities, businesses and public-sector services of Fund-supported tools instruments, strategies and activities to respond to climate change and variability</i>	Surveys conducted by the Programme among target beneficiaries in the 5 countries (in years 3 and 5 of the Programme) National Programme Implementation progress reports	Zero	Use of EWS services, forecasts, advisories, etc. and implementation of recommended preparedness and response actions to climate-related hazards by 10% of female-headed households and 10% of male-headed households in the 5 countries	Use of EWS services, forecasts, advisories, etc. and implementation of recommended preparedness and response actions to climate-related hazards by 50% of female-headed households and 50% of male-headed households in the 5 countries	Households, communities and individuals are receptive to EWS services and willing to adopt behavioural change
A7.0 Strengthened adaptive capacity and reduced exposure to climate risks	<i>A7.2 Number of males and females reached by [or total geographic coverage of] climate-related early warning systems and other risk reduction measures established/strengthened</i>	Surveys conducted by the Programme among target beneficiaries in the 5 countries (in years 3 and 5 of the Programme) National Programme Implementation progress reports	Zero (to be re-confirmed at the climate services workshop in Year 1 Q2)	Introduction of the early warning system, which holistically addresses i) disaster risk knowledge; ii) detection, monitoring, analysis and forecasting; iii) dissemination and communication; and iv) preparedness and response capabilities, covers 10% of the population of the 5 countries: Island populations reached by EWS and other risk reduction	Introduction of the early warning system, which holistically addresses i) disaster risk knowledge; ii) detection, monitoring, analysis and forecasting; iii) dissemination and communication; and iv) preparedness and response capabilities, covers 50% of the population of the 5 countries: Island populations reached by EWS and other risk reduction	Island communities are receptive to EWS services based on enhanced NMHS data

				measures increased to at least 10% of each country's population: Cook Islands – M:751 and F:783; Niue – M:73 and F:81; Palau – M:946 and F:850; RMI – M:2774 and F:2678; Tuvalu – M:549 and F:518. ³⁴⁶	measures increased to at least 50% of each country's population: Cook Islands – M:3,756 and F:3,916; Niue – M:367 and F:407; Palau – M:4,732 and F:4,248; RMI – M:13,868 and F:13,391; Tuvalu – M:2,747 and F:2,590. ³⁴⁷	
A8.0 Strengthened awareness of climate threats and risk-reduction processes	<i>A8.1 Number of males and females made aware of climate threats and related appropriate responses</i>	Surveys conducted by the Programme among target beneficiaries in the 5 countries (in years 3 and 5 of the Programme) National Coordination Committee reports National Programme Implementation progress reports	Zero (to be re-confirmed climate services workshop in Year 1 Q2)	Island populations aware of climate threats and related appropriate responses increased to at least 10% of each country's population: Cook Islands – M:751 and F:783; Niue – M:73 and F:81; Palau – M:946 and F:850; RMI – M:2774 and F:2678; Tuvalu – M:549 and F:518. ³⁴⁸	Island populations aware of climate threats and related appropriate responses increased to at least 50% of each country's population: Cook Islands – M:3,756 and F:3,916; Niue – M:367 and F:407; Palau – M:4,732 and F:4,248; RMI – M:13,868 and F:13,391; Tuvalu – M:2,747 and F:2,590. ³⁴⁹	Households, communities and individuals are able to access and understand new information on climate risks and preparedness and response actions Information on climate risks and preparedness and response actions is tailored to the needs and capacities of different end-users (e.g. language requirements, literacy levels, level of access to resources and assets)

E.5. Project/programme performance indicators

³⁴⁶ Based on population projections for 2021 from SPC Statistics for Development Division. Available at: <https://sdd.spc.int>

³⁴⁷ Based on population projections for 2021 from SPC Statistics for Development Division. Available at: <https://sdd.spc.int>

³⁴⁸ Based on population projections for 2021 from SPC Statistics for Development Division. Available at: <https://sdd.spc.int>

³⁴⁹ Based on population projections for 2021 from SPC Statistics for Development Division. Available at: <https://sdd.spc.int>

The performance indicators for progress reporting during implementation should seek to measure pre-existing conditions, progress and results at the most relevant level for ease of GCF monitoring and AE reporting. Add rows as needed.

Expected Results	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term	Final	
Result 1: Strengthened delivery model for climate information services and MHEWS covering oceans and islands	Number of countries that institute an enhanced delivery model for climate services ³⁵⁰	Documents establishing a National Framework for Climate Services (NFCS) in the 5 Programme countries Reports of meetings between NMHSs and other government services on the establishment of NFCSs in the 5 Programme Countries National Coordination Committee reports National Programme Implementation progress reports National Climate Outlook Forum (NCOF) reports	5 Programme countries at level 1 on a scale for effectiveness of national climate services ³⁵¹ None of the countries has a National Framework for Climate Services (NFCS)	3 Programme countries at level 3 on a scale for effectiveness of national climate services	3 Programme countries at level 5 on a scale for effectiveness of national climate services	Governments are committed to the development of climate information services and mainstreaming climate information into policy and planning Government, private agencies and local councils will participate and coordinate the inputs of each sector NMHSs will engage with end-users and ensure that their inputs are reflected Stakeholders and partners are willing to adopt new governance, institutional and regulatory mechanisms Sectors are willing to utilise climate and oceans information to make their businesses more efficient and resilient to climate change impacts

³⁵⁰ Aligned with SDG indicator: 13.3.2 *Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions*

³⁵¹ Scale for effectiveness of national climate services: 1: Country has no NFCS, NCOF or policy for financing climate services; 2: Country has designed an NFCS; 3: Country has established an NFCS; 4: Country has established an NFCS and initiated an NCOF process; 5: Country has established an NFCS, operationalized an NCOF and developed a policy for financing climate services

<p>Result 2: Strengthened observations, monitoring, modelling and prediction of climate and its impacts on ocean areas and islands</p>	<p>Number of countries with enhanced observing network density³⁵²</p>	<p>Review of data inventory from the new meteorological stations Country reports to the Pacific Meteorological Council (PMC) Country inputs to the WMO Integrated Global Observing System (WIGOS) National Coordination Committee reports National Programme Implementation progress reports Review of Training certifications</p>	<p>5 Programme countries at level 1 on a scale for enhanced climate and ocean observations networks³⁵³</p>	<p>4 Programme Countries at level 3 on a scale for enhanced climate and ocean observations networks</p>	<p>5 Programme Countries at level 5 on a scale for enhanced climate and ocean observations networks</p>	<p>NMHSs are able to install and maintain new observing equipment with the support of partners Skills building training does not result in high staff turnover NMHSs can recruit local climate and ocean experts with required qualifications and skills</p>
<p>Result 3: Improved community preparedness, response capabilities and resilience to climate risks</p>	<p>Increased use of climate information and early warning messages in preparedness and response measures by island communities³⁵⁴</p>	<p>Surveys conducted by the Programme among target beneficiaries in the 5 countries (in years 3 and 5 of the Programme) Reports from consultations with island communities on establishing and operating MHEWSs EWS protocols, disaster risk reduction plans, FbF Roadmap documents</p>	<p>There is limited or no capacity for communities to understand climate information and early warnings and take appropriate actions There is limited capacity at NMHSs to disseminate climate and oceans information to communities (Facebook is most commonly used)</p>	<p>Use of enhanced climate information enshrined in last-mile EWS protocols, disaster risk reduction measures and FbF roadmaps in 2 Programme Countries</p>	<p>Use of enhanced climate information enshrined in last-mile EWS protocols, disaster risk reduction measures and FbF roadmaps in 5 Programme Countries</p>	<p>Government, private agencies and local councils cooperate and coordinate effectively to implement EWS protocols and disaster risk management measures Communities and relevant stakeholders are motivated to act on the information and early warning</p>

³⁵² Aligned with Paris Agreement Article 7, 7c: *Strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making*)

³⁵³ Scale for enhanced climate and ocean observations networks: 1: Country has significant gaps in network coverage and no ocean information services; 2: Country has designed strengthened observation and monitoring network to fill most critical gaps in coverage; 3: Country has designed strengthened observation and monitoring network and ocean information services to fill most critical gaps in coverage and meet GBON standards; 4: Country has upgraded and expanded observation and monitoring network to fill most critical gaps in coverage; 5: Country has upgraded and expanded observation and monitoring network to fill most critical gaps in coverage, meet GBON standards and established ocean information services.

³⁵⁴ Aligned with Sendai Framework Priority 1 (Understanding Disaster Risk), 24 (o): *To enhance collaboration among people at the local level to disseminate disaster risk information through the involvement of community-based organizations and nongovernmental organizations; and with SDG Target 13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning*)

		National Programme Implementation progress reports National Climate Outlook Forum reports	There is limited capacity for the general public to understand and apply climate and oceans information None of the countries has a Forecast-based Financing (FbF) mechanism			messages provided to them
Result 4: Enhanced regional knowledge management and cooperation for climate services and MHEWS	Number of NMHSs that implement the climate information tools and methodologies promoted by the Programme ³⁵⁵	Reports from knowledge sharing and learning events organized by the Programme Surveys among participants of knowledge sharing and learning events organized by the Programme Regional Climate Outlook Forum reports National climate data consultants' progress reports for SPREP	Programme countries have no national climate data and information portals or national plans for climate data There is no synergy or standard for managing or accessing sectoral data and information between national agencies	2 NMHSs of Programme countries using their national climate data and information portal for reporting to the annual Regional Climate Outlook Forum (RCOF)	5 NMHSs of Programme countries using their national climate data and information portal for reporting to the annual Regional Climate Outlook Forum (RCOF)	Countries are willing and able to strengthen regional cooperation, knowledge management and training for climate services

E.6. Activities

All project activities should be listed here with a description and sub-activities. Significant deliverables should be reflected in the implementation timetable. Add rows as needed.

Activity	Description	Sub-activities	Deliverables
1.1 Strengthen institutional and policy frameworks and delivery models for climate services	This Activity will establish comprehensive institutional and policy frameworks and delivery models for strengthened climate services, including the development of a National Framework for Climate Services (NFCS) in all five countries and national meteorological strategies and legislation in Palau and RMI. The frameworks will be supported by effective coordination mechanisms to mainstream climate risk knowledge into the decision making of climate-sensitive sectors. Moreover, each country will conduct a climate services market assessment and develop a policy for sustainable financing and delivery of	1.1.1. Develop National Frameworks for Climate Services 1.1.2. Conduct market assessments to explore viable opportunities for climate information services in sectors and business segments 1.1.3. Mainstream climate risk knowledge into sectors 1.1.4. Develop national policies for financing climate services	<ul style="list-style-type: none"> • Consultation workshops on climate services in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> (Year 1) • NFCS review workshop in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> (Year 5) • National Framework for Climate Services (NFCS) for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Meteorological Act for <i>RMI</i>

³⁵⁵ Aligned with SDG indicator 13.b.1 *Number of least developed countries and small island developing States that are receiving specialized support, and amount of support, including finance, technology and capacity-building, for mechanisms for raising capacities for effective climate change-related planning and management, including focusing on women, youth and local and marginalized communities*

	<p>climate services. Amongst others, engagement with the development of national budgets will enable justification of the value of climate services, strengthen existing funding for disaster relief and contribute to the identification of long-term sources of funds.</p>		<ul style="list-style-type: none"> • National Meteorological Strategies for <i>Palau and RMI</i> • Climate services market assessment for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • National Climate Outlook Forum (NCOF) conducted annually in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Climate Sector Action and Communication Plans for Disaster Management and other relevant sectors in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Sector Specific Climate Training Programmes for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Train the Trainers Workshops for sectors in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Comprehensive information on all the dimensions of disaster risk, including hazards, exposure, vulnerability and capacity utilised in climate sensitive sectors in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> – e.g. climate risk assessment and incremental climate change costing to inform the National Infrastructure Investment Plan in <i>Cook Islands</i>; annual Parliamentary Ministers' climate briefing workshop in <i>Niue</i>; crop climate change risk assessment in <i>Tuvalu</i> • Comprehensive policy for financing climate services for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i>
<p>2.1 Enhance infrastructure and technical support for observations and monitoring</p>	<p>This Activity will strengthen infrastructural and in-country technical capacity to enhance observations and monitoring networks in all five countries. Amongst others, this will be achieved through the installation of new and upgraded infrastructure and</p>	<p>2.1.1 Enhance national observations and monitoring networks to GBON standards and establish QMSs</p>	<ul style="list-style-type: none"> • Land-based observation station network measuring atmospheric pressure, temperature, humidity, horizontal wind and precipitation in compliance with GBON

	<p>equipment to strengthen the network and extend the geographical coverage of climate and weather observations in compliance with WMO Global Basic Observing Network (GBON) standards; training and support for observations, monitoring and maintenance; and establishment of robust Quality Management Systems (QMSs).</p>		<p>requirements established in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i></p> <ul style="list-style-type: none"> • Observation station network and density improved according to national requirements – e.g. 4 new/upgraded AWS and 9 new/upgraded AWOS stations installed, upper air land-based consumables, DigiCORA receiver and hydrogen proton generator in <i>Cook Islands</i>; 2 new/upgraded AWS and 1 new/upgraded AWOS station installed in <i>Niue</i>; 8 new/upgraded AWS and 1 new/upgraded AWS station installed in <i>Palau</i>; 20 new/upgraded AWS and 4 new/upgraded AWOS stations installed in <i>RMI</i>; 8 new/upgraded AWS and 1 new/upgraded AWOS station installed in <i>Tuvalu</i> • Low-cost weather radar systems installed and operational in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Very Small Aperture Terminal (VSAT) satellite communications system to ensure robust communications during severe weather installed in <i>Tuvalu</i> • Compliance with WIGOS regulatory and guidance material enhanced in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Data and data management enhanced so that historical as well as real-time land, ocean and atmospheric observations of Essential Climate Variables (ECVs) are exchanged freely for use in RCCs for at least one Global Surface Network site in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i>
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			<ul style="list-style-type: none"> • Strategy for data archival processes and systems, including vision and operating manual for ensuring security, integrity, retention policy and technology migration, implemented in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Generic monitoring products (i.e. drought monitoring, climate watch, etc.) for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Value-added products, such as graphs, maps and reports to explain climate characteristics and evolution, according to the needs of specific sectors (e.g. health, agriculture, water and disaster risk management) generated in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Basic Information Package Meteorological Training (BIP-MT) to support cost-effective and consistent data collection in alignment with WMO requirements in <i>Niue and Tuvalu</i> • QMS system established to enhance the quality of NMHS activities, including streamlining and optimising the processes and procedures applied and the products and services provided, with the aim of obtaining certification of compliance with relevant ISO standards in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i>
<p>2.2 Strengthen ocean and climate modelling and impact-based forecasting</p>	<p>This Activity will establish end-to-end ocean services and strengthened climate information and early warning systems in all five countries in recognition of the fact that Pacific island countries are custodians of 20% of global Exclusive Economic Zones (EEZs), where ocean space exceeds land area by an average factor of 300</p>	<p>2.2.1 Establish ocean information services</p> <p>2.2.2 Enhance climate information and impact-based forecasting</p>	<ul style="list-style-type: none"> • Ocean observation and monitoring established – e.g. installation and/or maintenance of wave and environmental buoys, water quality and/or pressure sensors in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i>;

	<p>to 1, and which are rich in biodiversity and natural resources. The Programme will develop a new ocean modelling framework, along with web-based portals for climate and oceans data. Furthermore, the Programme will enhance NMHS capacity to use the data to develop tailored, location-specific climate services and products relevant to climate-sensitive sectors from government agencies to community level, including through the establishment of in-house impact-based forecasting capacity.</p>		<p>deployment of an unmanned aerial vehicle to quantify 3D shoreline change in <i>Cook Islands, Niue and Tuvalu</i>; deployment of an unmanned deep ocean observing vehicle in <i>Cook Islands</i>; new AWSs on four inter-island ships in <i>Cook Islands</i> (installed under Sub-Activity 2.1.1); establishment of HF radar in <i>Niue</i>; deployment of an automated current profiler and wave directional system in <i>Palau</i></p> <ul style="list-style-type: none"> • Training on remote sensing derived observations (e.g. water quality mapping, habitat mapping and shoreline change analysis) and integration of site monitoring data to calibrate satellite-derived ocean observations to improve understanding of local impacts and establish proxy relationships between ocean drivers and coastal impacts for NMHSs in <i>Cook Islands, Niue and Tuvalu</i> • Capacity for ocean modelling and prediction built – e.g. ocean modelling framework established and supported by the Copernicus Marine Service in <i>Cook Islands, Niue and Tuvalu</i>; advisory and training for Pacific Islands Ocean Observing System (PacIOOS) ocean modelling in <i>Palau</i>; support for ocean modelling and prediction for coral bleaching forecasts in <i>RMI</i> • National stakeholder workshop for forecasting professionals, coral reef and fisheries scientists, natural resource managers and other
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			<p>stakeholders focused on improving coral bleaching model forecasting skill and warning efficacy in <i>RMI</i> (Representatives from <i>Cook Islands, Niue, Palau and Tuvalu</i> will be invited to participate virtually for the purpose of knowledge transfer)</p> <ul style="list-style-type: none"> • Ocean information products and services developed – e.g. decision-making tools including graphical user interfaces with the capacity to generate automated reports tailored to stakeholder needs, impact-based ocean outlook and multi-variate forecasting tool, HF radar data-derived tailored products, Sentinel-2 satellite-derived lagoon health monitoring tool, and high-resolution circulation models and particle tracking available to NMHSs in <i>Cook Islands, Niue and Tuvalu</i>; PacIOOS multi-component service (including 7-day high resolution atmospheric forecasts; 7-day high resolution wave forecast; ocean circulation models; and 6-day inundation forecast tools) for <i>Palau</i>; • Quality-controlled data made directly available to NMHSs via local servers in near real-time and integrated into existing local databases and regional interfaces including the Pacific Ocean Portal to facilitate public access, understanding and application in <i>Cook Islands, Niue and Tuvalu</i> • National Ocean Portal / web-based dashboard developed that provides location-specific and relevant climate information, including (where available) real-
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			<p>time observations, climatologies, seasonal to interannual forecasts and long-term trends for <i>Palau and RMI</i></p> <ul style="list-style-type: none"> • Training exercise to present ocean portals / dashboards and train users on how to make best use of the information conducted at the PICOF for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Training and workshops on forecasting, use of data and information to prepare for the tropical cyclone season and climate extremes, seasonal prediction (ACCESS-S) and multi-model ensemble prediction (PICASO), and satellite data applications conducted in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Value-added products, such as graphics, maps and reports, to explain climate forecasts and climate model information created in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Capacity for impact-based forecasting, generation of impact-based ocean outlooks and forecasts, and effective communication of forecasts, warnings and local-scale impact-based advice established in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Training and mentoring attachments to enhance capacity for climate science and analysis – including highly in-depth technical training through a customised Young Scientist Support Program – provided for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i>; short course in climatology to enhance
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			<p>knowledge and expertise of NMHS staff in <i>Niue</i></p> <ul style="list-style-type: none"> • Stakeholder uptake of impact-based forecasts and information through the development of tailored products and services for climate-sensitive sectors – e.g. Climate Risk Early Warning System (CREWS) and Early Action Rainfall Watch (EAR Watch) workshops conducted in <i>Niue, Palau and Tuvalu</i>; customised climate early warning systems for health and drought in <i>Palau and RMI</i>; climate and sector data made available and harmonised between the NMHS and the Ministry of Health and the Fisheries Department, in the context of developing data and information products that will be useful to those sectors in <i>Tuvalu</i> • Enhanced existing hybrid multi-model ensemble prediction system (PICASO) to generate local station-based temperature outlooks, provide monthly forecast data and be equipped with the ability to generate flexible sector-tailored climate information and variables upon request in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Customised products, reports and advisories for early warning reporting generated to provide up-to-date information to key risk managers for early action decision making in <i>Niue and Tuvalu</i> • All historical climate observation records on paper digitised and climate records held in NIWA's database compatible with the existing CDMS for <i>Tuvalu</i>
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<p>2.3 Harmonise climate data and information management</p>	<p>This Activity will integrate climate data and information into decision-making and planning in climate-sensitive sectors through the development and implementation of climate data and information strategies in Cook Islands, Niue, Palau and RMI.</p>	<p>2.3.1 Establish and implement national climate data and information strategies</p>	<ul style="list-style-type: none"> • National climate data and information strategies and/or plans developed and implemented in <i>Cook Islands, Niue and RMI</i> • National data, research and information relevant to climate change collated in previously established Environmental Data Portals, in cooperation with National Statistics Offices and other data custodians in <i>Cook Islands, Niue and RMI</i> • National and sector-specific climate data collated, validated and shared amongst key stakeholders in <i>Palau</i>
<p>3.1 Improve warning dissemination and communication</p>	<p>This Activity will enhance the dissemination and communication of climate risk information and early warnings based on the enhanced data generated under Result 2. The Programme will particularly focus on strengthening last-mile communication systems to ensure that people and communities in remote locations receive warnings in advance of impending hazard events. NMHSs will be supported to develop a range of communications products tailored to end-users at the community level. National Disaster Management Authorities, Red Cross Red Crescent National Societies and community-based organisations will play a key role in enhancing preparedness and response capabilities.</p>	<p>3.1.1 Strengthen EWS organisational and decision-making processes</p> <p>3.1.2 Strengthen communication systems to reach the last-mile</p> <p>3.1.3 Communicate early warnings to island communities</p>	<ul style="list-style-type: none"> • In-country deep dive study on gender and community stakeholders conducted in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • EWS organisation and decision-making processes defined for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Early warning communication strategies and community feedback mechanisms developed for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • SOPs for EWS established for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Strategies for last-mile communication tailored to the needs of specific groups developed for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Communications infrastructure maintained and upgraded – e.g. Emergency Sign Boards and village “compass” posts in <i>Niue and Tuvalu</i>; backup systems using PACTOR modem and HF radio for eight islands in <i>Tuvalu</i>; maritime safety network established to

			<p>fulfil SOLAS obligations in <i>Palau</i></p> <ul style="list-style-type: none"> • Climate and ocean EWS information products developed – e.g. educational video and information materials on understanding climate and weather information for adaptation developed for <i>Cook Islands</i>; mobile applications to disseminate up to date climate and ocean conditions developed and NMHS websites upgraded with a user-friendly interface for <i>Niue, and Palau</i>; web-based dashboard to improve accessibility and understanding of coral reef-related information developed for <i>RMI</i>; glossary of climate and weather terms in local languages for <i>Tuvalu</i> • Localised mobile climate information communication system to support disaster risk management developed for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Opportunities to utilise private sector resources (e.g. mobile, television, radio, social media) for EWS identified for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Impact-based early warning information products, tailored to the different risks and needs of subpopulations, developed for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> – including outer-island training and capacity building materials for <i>Cook Islands</i>; educational video using a Sign Language interpreter on climate change early warnings in Marshallese with English captions in <i>RMI</i>; establishment of a National Coordination Team to engage with and
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			address the priorities of vulnerable groups in <i>Tuvalu</i>
<p>3.2 Enhance preparedness and response capabilities</p>	<p>This Activity will engage with communities at the last mile to enhance preparedness and response actions at the local level. This will be facilitated by the development of community-based disaster risk reduction and disaster risk management plans, community level vulnerability assessments, and training and awareness workshops to enhance awareness of climate hazards and risks.</p>	<p>3.2.1 Enhance disaster preparedness and response measures</p> <p>3.2.2 Conduct public awareness and education campaigns on climate hazards and risks</p> <p>3.2.3 Integrate traditional knowledge into early warning services</p>	<ul style="list-style-type: none"> • Community-based disaster preparedness plans developed – e.g. Climate Adaptation Plans for eight villages in Niue; Drought Management Plans for seven outer islands in <i>Tuvalu</i> • Multi-hazard risk and vulnerability assessments utilised to develop disaster risk reduction products – e.g. Hazard maps, NEOC Operation Dashboard, Damage Assessment Tools for <i>Cook Islands</i> • Capacity building training and workshops on disaster risk management and responses – e.g. People’s Empowerment Project training for women’s organisations on community and individual needs and responses before, during, and after a disaster or single incident emergency in <i>Palau</i>; 70 outer island Emergency Response Teams established and/or trained in <i>RMI</i> • Disaster warning drills conducted – e.g. disaster drills conducted in seven outer islands in <i>Tuvalu</i> • Climate change and disaster risk management awareness training and activities conducted in communities – including Au Vaine Kumiti community awareness programme on climate change and disaster risk management delivered in <i>Cook Islands</i>; community-based and youth climate awareness activities and emergency response education campaigns in <i>Niue</i>; climate awareness training in outer islands of <i>Palau</i>; climate awareness training in 24 outer

			<p>islands in <i>RMI</i>; climate and ocean awareness workshops in seven outer islands of <i>Tuvalu</i></p> <ul style="list-style-type: none"> • Two Climate Information Centers to support awareness raising and education campaigns on climate hazards and risks among communities and youth established in <i>Niue</i> • Communications products on climate hazards and risks developed and disseminated – including Educational video using a Sign Language Interpreter on climate change early warnings in Marshallese with English captions in <i>RMI</i> (developed under Sub-Activity 2.1.2) • Training and resources for international best practice collection of TK on weather, climate and geo-hazards in <i>Niue, Palau and RMI</i> • Traditional climate and weather indicators collated and verified in <i>Tuvalu</i> • In-country and regional capacity to collect, store and build products and services that incorporate traditional knowledge, including Early Warning Systems in <i>Niue, Palau and RMI</i> • Educational and communication products on climate, hazards and responses (e.g. climate glossaries, seasonal or crop calendars, ENSO impact and response booklets) in <i>Niue, Palau and RMI</i>
<p>3.3 Establish Forecast-based Financing (FbF)</p>	<p>This Activity will establish Forecast-based Financing (FbF) in Cook Islands, Niue, Palau, RMI and Tuvalu as an innovative mechanism whereby early actions are pre-planned based on credible forecasts, and are funded and implemented before a climate shock to minimise losses and damages caused</p>	<p>3.3.1 Develop FbF Roadmaps defining thresholds and triggers</p> <p>3.3.2 Build capacity for FbF</p> <p>3.3.3 Support development of Early Action Protocols (EAPs)</p>	<ul style="list-style-type: none"> • Forecast-based Financing (FbF) Roadmap developed for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • FbF capacity built through the development and execution of up to five

	<p>by climate-related hazards and reduce the need for humanitarian assistance in their aftermath.³⁵⁶ The combination of FbF mechanisms with impact-based forecasting (Activity 2.2) can be a transformative means of improving disaster preparedness and enabling more efficient management of government budgets to promote the shift from traditional post-disaster response to pre-event early action.³⁵⁷</p>		<p>“next steps” per country, as identified in the Roadmaps for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> – e.g. technical support to enhance stakeholder buy-in; technical support to connect with existing regional systems / mechanisms / priorities; table-top exercise to discuss a historical extreme event and what could have been done to prevent impacts; and round-table discussion on potential FbF financing mechanisms.</p> <ul style="list-style-type: none"> • Technical working groups established through the engagement of multiple stakeholders to discuss and prioritise suitable forecast-based actions for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • EAPs outlining which forecast will trigger which action, where to act, and implementation responsibilities developed by national lead agencies in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i>
<p>4.1 Enhance regional data, knowledge management and cooperation</p>	<p>This Activity will enhance coordination and knowledge sharing among the five countries to improve data and knowledge management, including establishment of an interactive ICT platform and regional data centre. The organisation of joint learning, mentoring and training events through existing WMO, USP and other centres to facilitate sharing of successes and lessons learned will further strengthen climate and ocean information services across the region.</p>	<p>4.1.1 Establish interactive ICT platform 4.1.2 Organise learning, mentoring and training</p>	<ul style="list-style-type: none"> • Interactive ICT platform for climate data, information and knowledge management including a regional data centre fed by national data centres established for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Climate-related data made available in national portals and the regional Pacific Environmental Portal in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • National climate data consultant and NMHS staff trained on climate data management, applications of ICT in NMHSs and introduction

³⁵⁶ WFP, 2019. Forecast-based Financing Factsheet

³⁵⁷ IFRC, 2018. DRR in Action Case Study. Forecast-based Financing: Effective early actions to reduce flood impacts

			<p>of new methods and systems (e.g. wireless communications and Internet of Things) in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i></p> <ul style="list-style-type: none"> • National reports for climate-related agreements (e.g. NDCs, VNRs, National Communications to UNFCCC, State of Environment), including climate impacts on all indicators, clearly documented and illustrating climate impacts, prepared for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Regional learning events organised for exchanging knowledge and sharing experiences and lessons learned in strengthening climate information services and MHEWS for <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i> • Targeted training on key areas essential to the Programme's impact and sustainability – e.g. Forecasting and Numerical Weather Prediction (NWP); Operations and Maintenance (O&M); wireless communications and Internet of Things (IoT); weather radar operations; Quality Management Systems (QMS); impact-based forecasting; Forecast-based Financing; national climate financing and cost-recovery; and use of the Global Disaster Alert and Coordination System (GDACS) – provided through existing training centres in the WMO network, University of the South Pacific (USP), the International Centre for Theoretical Physics and others for NMHS staff in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i>
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			<ul style="list-style-type: none"> • Mentoring and technical advisory services embedded in the WMO/SPREP Pacific Met Desk Partnership provided to NMHSs in <i>Cook Islands, Niue, Palau, RMI and Tuvalu</i>
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E.7. Monitoring, reporting and evaluation arrangements (max. 500 words, approximately 1 page)

The AE will engage a consultant to design a performance monitoring and evaluation framework to track the Programme’s progress towards achieving its targets. The Programme Coordinator in the PMU, under the oversight of the UNEP Task Manager, will be responsible for monitoring progress during Programme implementation as outlined in the monitoring and evaluation framework. This will be achieved by: i) measuring the indicators to assess the progress of the Programme in coordination with national EEs; ii) reporting the Programme’s performance to the PSC and PMU based on inputs from national EEs. At key points (i.e. baseline, annual performance reports, mid-point and end of Programme) the PMU will coordinate evidence-gathering exercises to verify this progress. Programme targets³⁵⁸ and results will be triangulated with baseline surveys that will be completed in the Programme’s first year. All data collected for monitoring, reporting and evaluation processes will be sex- and age-disaggregated, where possible and/or relevant. Specific attention will be paid to ensuring gender responsiveness, uptake of climate and early warning information, and environmental and social safeguards (ESS). In addition to the Programme monitoring and evaluation undertaken by the PMU team, activities will be monitored by the national EEs in each country. The PMU will support the five countries in enhancing human resources and expertise, aiming to have fully operational implementation units in each country within six months of the Programme’s inception.

The PMU will then organise training for EEs in data collection and analysis, and on the Programme cycle, particularly on effective monitoring and reporting of activities. All training should take a strengths-based approach, both in the training process and in the principles and practices taught. These skills will be reinforced by follow-up training at least annually, to ensure that monitoring activities are collecting meaningful information and that the information is able to be used both for adjusting inputs throughout the implementation phase and for continuous evaluation of progress. This will include monitoring i) uptake of the information from the early warning systems and the changes that occur in the communities; ii) implementation of the Environmental and Social Action Plan (ESAP); and iii) implementation of the Gender Action Plan (GAP). During the Mid-Term Evaluation and Terminal Evaluation an evaluation consultant will validate a sample of the data collected through these monitoring tools.

EE field staff and programme-hired local consultants will also be trained to help implementing partners in their countries to assess the impact of their activities using methods that measure change over time and produce meaningful information. Some agencies and some staff members will have these skills, but in very small countries it should be assumed that all staff and local consultants will need professional development in monitoring and reporting with at least annual follow up training to reinforce learning.

EEs will submit semi-annual progress reports and quarterly financial statements to the PMU and the PMU will consolidate the reports and submit them to UNEP as the AE. In turn, UNEP will submit annual performance reports and semi-annual financial reports to GCF. The detailed reporting timelines are as follows:

Under the PCAs, each EE is to report to UNEP as follows:

- a. Progress reports: by 30 July for January to June;

³⁵⁸ For indicator A1.2, monitoring of the Mid-term and Final Targets will take into account uptake and implementation of recommended climate-resilient livelihood options and actions will be outlined in the Climate Sector Action and Communication Plans (to be developed under Activity 1.1).

- b. Annual Performance reports on or before 1 February;
- c. Quarterly financial reports by 15 January, 15 April, 15 July, and 15 October;
- d. Annual audited statements by 30 April;
- e. Final report: within 3 months of Programme completion.

UNEP (AE) reports to the GCF:

- a. Annual Performance Reports by 1 March;
- b. Semi-annual Financial Information by 1 March and 30 September;
- c. Mid-Term Evaluation report: halfway through Programme;
- d. Final APR: within 6 months of Programme completion;
- e. Terminal Evaluation report: within 12 months of Programme completion.

Monitoring will also be undertaken by the AE through supervision visits and field missions to track implementation progress and challenges and strategically plan the way forward. The Programme reporting relationships, including frequency of reporting, between AE (UNEP) and EEs and other partners in the Programme, are described in section B.4. UNEP will be responsible for managing the Mid-Term Evaluation and the Terminal Evaluation (TE). The Task Manager will oversee the process of hiring an external consultant to carry out the Mid-Term Evaluation, which will provide an assessment of programme performance at the Programme's mid-point. This will be a formative exercise and will cover whether the Programme is on track, what problems and challenges the Programme is encountering, and what corrective actions are required so that the Programme can achieve its intended outcomes by Programme completion in the most efficient and sustainable way. The Programme Steering Committee (PSC), National Coordination Committee (NCC) and the five National EEs will participate in the Mid-Term Evaluation process and contribute to a management response to the Review's recommendations, with an implementation plan. The PMU will monitor the implementation of agreed recommendations during the remainder of the Programme's implementation. It is the responsibility of the UNEP Task Manager to monitor whether the agreed recommendations are being implemented during the remainder of the Programme's operational life.

UNEP's Evaluation Office (EO) will be responsible for undertaking the independent Terminal Evaluation (TE) at the end of Programme implementation, which is a summative evaluation, and will liaise with the UNEP Task Manager throughout the process. An independent assessment of programme performance against standard evaluation criteria (e.g. strategic relevance, effectiveness, efficiency, likelihood of impact and sustainability) will be made based on documentary evidence, stakeholder interviews and, if possible, a field mission. Each evaluation criterion will be rated using a six-point rating scheme. and a weighted average will be determined to provide an overall performance rating for the Programme as a whole. Where there are any differences in ratings between the independent evaluation consultant and the Evaluation Office a final determination will be made by the Evaluation Office when the Terminal Evaluation report is finalised. The draft TE report will be sent to Programme stakeholders during a commenting process managed by the Evaluation Office. Formal comments on the report will be shared by the Evaluation Office in an open and transparent manner. This evaluation report will be publicly disclosed and will be followed by a recommendation compliance process.

The costs for results monitoring and performance evaluation are included in the Programme budget.

F. RISK ASSESSMENT AND MANAGEMENT

F.1. Risk factors and mitigations measures (max. 3 pages)

Selected Risk Factor 1

Category	Probability	Impact
Technical and operational	Medium	Medium

Description

Limited interaction between NMHSs and the end-users.

Mitigation Measure(s)

The National Frameworks for Climate Services to be established in each country will generate regular liaison between NMHSs and the government agencies responsible for climate sensitive sectors, with dedicated programme-hired local consultants to ensure that climate information is integrated into the functions of each sector. Sector-specific training in basic climate science will begin a process of mainstreaming the consideration of climate change into their policy making and planning. Annual National Climate Outlook Forums will provide a platform for regular feedback on collaboration with government agencies. The monitoring undertaken by departmental liaison officers and the national climate data consultants will also provide feedback.

Limited human resources currently oblige NMHSs to work through government ministries and departments and national agencies such as disaster management organisations to deliver their products and information to communities. This Programme enables NMHSs to work directly with NGOs, CSOs, Red Cross Red Crescent National Societies, local councils, government extension officers, national women's groups and communities in delivering training and awareness workshops on climate and ocean information products and disaster risk management. These organisations have been extensively consulted during the design process and their contributions have informed the identification of activities and Programme methodology.

The Programme will strengthen capacity to ensure the NMHSs have resources to work with communities and to monitor the effectiveness of activities through structured feedback mechanisms. NMHS, NGOs, CSOs, local government councils, and representatives from other participating local committees will be members of the National Coordination Committee.

These measures will reduce the risk to Low.

Selected Risk Factor 2

Category	Probability	Impact
Technical and operational	High	Medium

Description

Countries unable to maintain new and upgraded climate and ocean monitoring equipment.

Mitigation Measure(s)

The costs for operation, maintenance and spares for new equipment have been factored into the Programme budget, and maintenance and calibration regimes have been agreed with the participating countries. Wherever possible, low maintenance equipment has been considered. The Cook Islands, Palau and RMI already have trained observers in place who will maintain their new sites, and Niue and Tuvalu have budgeted training programs for observers, programme-hired local consultants, entry level staff and technicians. The Programme will also engage technical partners to support all essential training on equipment, AWSs, calibration etc. Training and calibration manuals/information will also be provided by the

technical partners. For some highly technical equipment such as wave buoys, relevant partners will maintain the items over the Programme lifetime while building national capacity to take over this function. The value of the data collected from such equipment is likely to generate funding for its maintenance beyond the term of the Programme. The new Systematic Observations Financing Facility (SOFF) being established by WMO and partners for the Global Basic Observing Network (GBON) is a likely and probable source of ongoing maintenance support. Furthermore, the five Programme countries have committed formally to ensuring Operation and Maintenance (O&M) for up to 20 years after the Programme's implementation period. SPREP has formally committed to post-project funding of the ICT Officer position as well as associated fees including hosting of the data portal network.

These measures will reduce the risk to Low.

Selected Risk Factor 3

Category	Probability	Impact
Technical and operational	High	Medium

Description

There may be limited local expertise to fill some of the technical positions in the EEs and NMHSs, which could delay the implementation of the Programme.

Mitigation Measure(s)

Cook Islands, Niue and RMI have existing national project management units or offices that will provide the basis for their National Coordinating Committees (NCCs) for this Programme.

Technical positions for climate and ocean services local consultants will be advertised within the country and the Programme will provide focused on-site training, short-term courses, mentoring and attachment training in-country and at regional technical agencies and institutions. The Programme has factored in targeted and repeated in-country and regional training of programme-hired local consultants and current staff over the five years in the full range of required skills, including maintenance of the new technology, workshop facilitation, effective consultation, communication with non-scientists and service beyond the programme's lifetime.

These measures will reduce the risk to Low.

Selected Risk Factor 4

Category	Probability	Impact
Other	Medium	Medium

Description

Communities do not respond to interventions promoting behavioural change.

Mitigation Measure(s)

The paradigm shift to science-informed, evidence-based adaptation is a key measure of Programme success, both by government agencies and by island communities.

The Programme includes a range of activities directed at changing community behaviour—careful, methodical introduction of seasonal forecasting and its application to subsistence farming, the use of intensive discussions of traditional climate knowledge and its congruence with NMHSs' forecasting methods, Forecast-based Financing and co-development of Early Action Protocols (EAPs), practice drills for responding to disaster warnings, exercises with children and youngsters, improving the accessibility of NMHSs' advice through use of local terms and clear language.

Behavioural change is very difficult to achieve and will progress incrementally over the Programme's five years. Any change in acceptance of advice and warnings will constitute a worthwhile achievement. The Programme's approach to sustainability beyond its five year term will help to ensure that trust in scientific forecasting will continue, with benefits in lives, livelihoods and assets saved.

These measures will reduce the risk to Low.

Selected Risk Factor 5

Category	Probability	Impact
Technical and operational	Medium	Medium

Description

The Programme will be complex from both a technical and operational perspective, with involvement of multiple countries, regional and national stakeholders, which may cause difficulties during implementation.

Mitigation Measure(s)

As outlined in Section B.4, at Programme level, a Programme Steering Committee (PSC) will be established to provide high level oversight and guidance towards achieving Programme objectives. A Programme Management Unit (PMU) will be established to provide oversight and support to the implementation of each national programme. The PMU will also contract, coordinate, manage, oversee and report on deliverables from regional technical agencies, including on their procurement activities for the Programme. The PMU will provide guidance and source expertise as needed on Programme management, financial management, procurement and technical issues. It will consolidate reports from all EEs and prepare the six-monthly progress report and quarterly financial reports to UNEP, enabling UNEP to report to the GCF in line with GCF requirements. If necessary, the PMU will draw upon the UNEP Task Manager for support.

At national level, the National Coordination Committee (NCC) in each country will guide the overall implementation of the Programme. It will coordinate national planning, budgeting, small country-specific procurements, progress and expenditure reporting. It will facilitate cooperation among the implementing organisations, address any issues passed up to it by national partners and stakeholders and manage any conflicts or overlaps.

These measures will reduce the risk to Low.

2. AML/CFT* and Prohibited Practices compliance due diligence assessment

Category	Probability**	Impact***
ML/TF	Low	LOW (<5% OF PROJECT VALUE)
Sanctions	Low	LOW (<5% OF PROJECT VALUE)
Prohibited Practices	Low	LOW (<5% OF PROJECT VALUE)

*Anti-Money Laundering/Countering the Financing of Terrorism

**H: High (has significant probability), M: Medium (has moderate probability), L: Low (has negligible probability)

*** H: High (has significant impact), M: Medium (has moderate impact), L: Low (has negligible impact)

¹ ML/TF: Money Laundering/Terrorist Financing

² Sanctions: Sanctions prohibitions of the United Nations, or other relevant sanctioning authorities (including the World Bank Debarred List)

³ Reputational: In the context of Money Laundering/Terrorist Financing and Prohibited Practices

⁴ Prohibited practices: Abuse, Conflict of Interest, Corrupt, Retaliation against Whistleblowers or Witnesses, as well as Fraudulent, Coercive, Collusive, and Obstructive Practices

The risk of GCF proceeds being utilised towards money laundering or terrorist financing is Low.

The five Programme countries – Cook Islands, Niue, Palau, Marshall Islands and Tuvalu have all acceded and/or ratified the United Nations Convention Against Corruption (UNCAC).³⁵⁹

- **Cook Islands** – The Cook Islands has a reputation as a sound and well-regulated jurisdiction. It is essential for the country to maintain this reputation in order to continue attracting legitimate investors with funds and assets that are untainted by criminality. The Financial Transactions Reporting Act 2017 along with the Financial Transaction Reporting Regulations 2017 provide the legal framework in which reporting institutions must have in place compliance systems to assist with the prevention, detection and prosecution of financial misconduct. The Ministry of Finance and Economic Management (MFEM) is a low risk organisation in terms of its financial transactions, given that its transfer of funds into the country is only from development partners, who are governments and multilateral organizations already committed to combat money laundering and counter terrorism financing. The Anti Money Laundering and Counter Terrorism Financing Policy 2018³⁶⁰ outlines the perspective of the MFEM on money laundering and financing terrorism and the actions that it will undertake to prevent it. The Antifraud and Anticorruption Policy 2018³⁶¹ sets out the Government of Cook Islands' policy objectives to promote and strengthen anti-corruption measures and practices.
- **Niue** – The Financial Transactions Reporting Act 2006 (FTR)³⁶² details Niue's framework for combating money laundering and terrorist financing. A division of the Niue Crown Law Office acts as the Financial Intelligence Unit (FIU). The following government agencies are also involved in AML/CFT control measures: the Police (including immigration and transactional crimes liaison post); the Treasury (including Tax and Customs); and the Niue Bank and Monetary Board. The Terrorism Suppression and Transnational Crimes Act 2006 implements the United Nations Council Resolution 1373 and Conventions dealing with terrorism and transnational crime.³⁶³ The Proceeds of Crime Amendment Act 2007 is part of the Proceeds of Crime Act 1998 and amends it to strengthen it; ensure that the Act is aligned more closely with international standards for comparable legislation; and ensure that it does not duplicate the FTR 2006.³⁶⁴
- **Palau** – The Financial Intelligence Unit (FIU) of the Republic of Palau is authorised to issue and enforce regulations under Sections 3312(d), 3313, 3314(d), 3315(c), 3316(b), 3318(a) 3321(d), 3322, 3328(b) and 3329(d)(h) of the Money, Laundering and Proceeds of Crime Act 2001, Act [17 PNCA Chapter 38] as amended (MLPCA). Furthermore, the Financial Institutions Commission (FIC) of the Republic of Palau is authorised to promulgate regulations under Sections 1019 and 10.133 of the Financial Institutions Act of 2001 [26 PNCA Chapter 10] as amended (FIA). This Application applies to all Palau banks and the branches of foreign banks, credit institutions and Alternative Remittance Services (ARS) in the Republic of Palau. The regulation addresses obligations placed on reporting institutions under the MLPCA and the FIA in relation to anti-money laundering and combating the financing of terrorism. The Palau Anti Money Laundering Act 2014 and the Financial Intelligence Unit Regulation on Anti Money Laundering Reporting Requirements are provided in the footnote link.³⁶⁵

³⁵⁹ United Nations Office on Drugs and Crime, 2020. Signature and Ratification Status. Available at:

<https://www.unodc.org/unodc/en/corruption/ratification-status.html>

³⁶⁰ Government of the Cook Islands, 2018. Policy on Anti Money Laundering and Counter Terrorism Financing 2018. Available at: http://www.mfem.gov.ck/images/Development/MFEM_Anti_Money_Laundering_and_Counter_Terrorism_Financing_Policy.pdf

³⁶¹ Government of the Cook Islands, 2018. Antifraud and Anticorruption Policy 2018. Available at:

http://www.mfem.gov.ck/images/Development/MFEM_Antifraud_Anticorruption_Policy.pdf

³⁶² Government of Niue, 2006. Financial Transactions Reporting Act 2006. Available at:

<http://www.gov.nu/wb/media/Act%20278%20Financial%20Transactions%20Reporting%20Act%202006.pdf>

³⁶³ Government of Niue, 2006. Terrorism Suppression and Transnational Crimes Act 2006. Available at:

[http://www.gov.nu/wb/media/Act%20280%20Terrorism%20Suppression%20and%20Tansnational%20Crimes%20Act%202006%20\(2\).pdf](http://www.gov.nu/wb/media/Act%20280%20Terrorism%20Suppression%20and%20Tansnational%20Crimes%20Act%202006%20(2).pdf)

³⁶⁴ Government of Niue, 2007. Proceeds of Crime Amendment Act 2007. Available at:

<http://www.gov.nu/wb/media/Act%20291%20Proceeds%20of%20Crime%20Amendment%20Act%202007.pdf>

³⁶⁵ <https://www.dropbox.com/sh/7rn0j221zvjq7wp/AACvBfQ7X9qzn8-ZRQUf-bGla?dl=0>

- **Marshall Islands** – The Republic of the Marshall Island Banking Commission is the lead agency for AML/CFT in RMI on Majuro Atoll. The Banking Commission has the powers of a Financial Intelligence Unit (FIU), as a law enforcer over licensed banks, and as an AML/CFT supervisor of banks, financial institutions, and cash dealers. The Office of the Banking Commission (Commission) was established under Title 17 Chapter 1 Banking Act 1987 to ensure the safety and soundness of the RMI banking sector and also deter money laundering and terrorist financing in the financial system. Pursuant to Section 104 of the Act, the Commissioner of Banking reports to the Minister of Finance, Banking and Postal Services. One of the key responsibilities of the Commissioner of Banking under Section 167 is to receive from banks and financial institutions certain financial reports. Financial information from such reports are analysed and disseminated to law enforcement when there are reasonable grounds of money laundering activity within a bank, financial institution, or cash dealer. The Republic of Marshall Islands Office of the Banking Commission issues an Annual Report.³⁶⁶

The Financial Institution Supervision (FIS) division is responsible for the licensing and supervision of banks, other non-bank financial institutions, and cash dealers as defined under Section 102 of the Banking Act 1987 to ensure their safety and soundness and full compliance with AML statutes and regulations. The FIS is also a member of the Regulatory Policy Review Committee (RPRC), which was recently established in the formulation and revision of new operating policies and procedures, including new regulations and guidelines for licensed banks and other reporting entities. In addition, the Marshall Islands Police Department (MIPD) houses INTERPOL's National Central Bureau (NCB) in Majuro as the central point of contact for investigations involving RMI and the international police community.³⁶⁷

- **Tuvalu** – Tuvalu acceded to the United Nations Convention Against Corruption on 4 September 2015 and deposited its instrument of ratification with the Secretary General on the same date. The Convention entered into force for Tuvalu on 4 October 2015. Several institutions are responsible for the fight against corruption, including the Attorney General, the Police Force, Ombudsman, Auditor General, Public Service Commission and Central Procurement Unit. Tuvalu's three financial institutions are National Bank of Tuvalu, Tuvalu National Provident Fund and Development Bank of Tuvalu. The United Nations Office on Crime and Drugs published its periodic review of the implementation by Tuvalu of the United Nations Convention against Corruption in 2017.³⁶⁸

Furthermore, the Project Cooperation Agreement between UNEP and National Executing Entities will include warranties and caveats by the National Executing Entities to *inter alia* ensure compliance with the Anti-Fraud and Anti-Corruption Framework of the United Nations Secretariat, as well as the Green Climate Fund Policy on Prohibited Practices.

There are no sanctions by the United Nations Security Council currently in force against Cook Islands, Niue, Palau, the Republic of the Marshall Islands or Tuvalu.

³⁶⁶ RMI Office of the Banking Commission, 2018. Annual Report Fiscal Year 2017. Available at: <http://www.rmibankingcomm.org/wp-content/uploads/2018/06/RMIBC-Annual-Report-2017.pdf>

³⁶⁷ Interpol, 2020. Marshall Islands. Available at: <https://www.interpol.int/en/Who-we-are/Member-countries/Asia-South-Pacific/MARSHALL-ISLANDS>

³⁶⁸ UNODC, 2017. Country Review Report of Tuvalu. Available at:

https://www.unodc.org/documents/treaties/UNCAC/CountryVisitFinalReports/2017_02_28_Tuvalu_Final_Country_Report.pdf

G. GCF POLICIES AND STANDARDS

G.1. Environmental and social risk assessment (max. 750 words, approximately 1.5 pages)

The purpose of the Environmental and Social Safeguards Screening (ESS) is to identify the risk category that the components of the proposed Programme will fall into. The scope and depth of the environmental and social assessment is proportional to the level of risks and impacts determined in the screening as per ESS standards and GCF policies.

An initial screening by UNEP indicated that this Programme was likely to be categorised as Category C. This initial screening result was confirmed through the ESS carried out by Envenco Ltd. As per GCF policies, any proposal rated as Category C does not require an Environmental and Social Impact Assessment (ESIA) or Environmental and Social Management Plan (ESMP). However, an Environmental and Social Action Plan (ESAP) has been included in Annex 6b. Category C activities are not expected to have significant environmental or social impacts.

The activities of the proposed Programme that potentially hold environmental or social risks involve improving meteorological and climate observation, monitoring, modelling and prediction capabilities across the five Pacific island nations in question. These improvements aim to give better response capability and community resilience to climate risks.

The improvements are centred around infrastructure-building, expansion of observation abilities and scope, and training and education. The latter, people-based activities carry no negative environmental or social impacts, and the deployment of new monitoring hardware and instruments uses modern technology with very little physical footprint or impact. This leaves the infrastructure activities as the remaining potential risk.

All five countries will gain dual-polarisation X-band Doppler weather radar units that will greatly increase weather forecasting and real-time monitoring of weather event intensity. Land-based observation stations will be upgraded or installed to strengthen the monitoring network towards compliance with the provisions of the WMO Global Basic Observing Network (GBON). The physical interventions involve installing sensors and measurement equipment in various locations, the upgrade of an existing meteorological office, and construction of small meteorological offices on several islands.

Across all of the potential impacts identified, none are expected to have significant negative environmental and social impacts. The construction interventions are not of significant size and do not raise flags by their nature or location, and land clearance and earthworks will not be extensive. No special mitigation will be required for any of the interventions described beyond industry best practice. All land use is limited to government land, as formally indicated by the Directors of the five NMHSs, and no persons will be displaced. No other adverse social impacts are forecast.

Upon evaluation of the checklist from the initial screening done for UNEP in March and April of 2018, the only variation from the original assessment is in Safeguard Standard 7: Cultural Heritage. The variation specifies that some land clearance and earthworks will be necessary, in Tuvalu, for the five new observation stations. This construction also relates to an additional safeguard noted for GCF funded projects, per the design and construction of new buildings. However, the size and location of these new buildings means that the impacts relating to earthworks and construction are not likely to be significant or long-lasting, provided that industry best practice is followed during their construction.

In order to protect local and indigenous peoples, a Grievance Redress Mechanism has been included in Annex 6b. This describes the procedures and timescales associated with submissions of any complaints or concerns around the execution of this proposed Programme. A disclosure statement has also been prepared per GCF requirements and a link to the ESS will be included once it has been posted on the Accredited Entity's website. The Programme will develop appropriate ESS, anti-corruption, anti-nepotism, child protection, human rights, etc. disclosure forms to be filled/signed by new staff, consultants and contractors before engagement in Programme activities.

G.2. Gender assessment and action plan (max. 500 words, approximately 1 page)

This Funding Proposal includes a Gender Assessment and Action Plan in Annex 8, informed, analysed and compiled with the following methodology:

- The content of this Annex draws from a comprehensive desk-review and ex-post gender analysis of Feasibility Studies conducted for each country. Actions suggested through the action plan, and beneficiary identification (and enumeration), therefore are indicative only.
- The desk-review to collect data and information was conducted on existing literature drawn from: research reports from international organizations or platforms (the Pacific Community – SPC, United Nations Development Programme – UNDP South Pacific, United Nations Economic and Social Commission for Asia and the Pacific – UNESCAP, etc.); multilateral development banks (the World Bank and the Asian Development Bank – ADB); journals (Gender and Development, Journal of Coastal Research, etc.); and grey literature (government reports and policies).

These are the main gender-responsive inputs included in the design and preparation of the Programme, to be further defined in the later stages of the Programme:

Mainstream Gender within Climate Information Services in Pacific Island Countries

Impacts of and exposure to climate change and weather variations compound with current prevalence of hardship, gender inequality and lack of access to social safety networks to disproportionately affect the poorer and more vulnerable demographics – determined by the needs, opportunities and risks facing men and women. In this context, gender-responsive climate information services will play a unique and positive role in increasing adaptability and resilience of communities towards climate-related risks and hazards; bolstering national meteorological institutions (NMHSs) and climate data collection, analysis and interpretation; and strengthening early warning services.

Gear Products towards End Users in Climate-Vulnerable Sectors

A World Bank report and a CGIAR report (see Annex 8 – Section 4.2) reiterate the importance of climate information services for the Pacific island countries, and how these cannot simply be limited to technical capacities and tools, particularly because expected and unavoidable variations in climatic patterns, climate-induced disasters and hazards, and unpredicted climate change risks will create different exposure patterns among communities. In order to address these differential exposure patterns, climate service products, such as impact-based forecasting (analysing and disseminating implications of the forecast and specific uses of the forecast information) and nowcasting (short range weather forecasting, particularly from ground-based remote sensing systems, radars, wind profilers) etc., have to be geared towards end users, particularly those with low access in vulnerable sectors such as agriculture, fishing and pearl farming.

Utilise Community Information Channels and Local Knowledge

A complementary approach to creating user-friendly and gender-responsive climate service products is sourcing local expertise, artisanal practices and traditional knowledge to inform these outputs. Despite the vulnerability of Pacific islands to disaster and climate change variability, research shows that men and women of Pacific island communities have been successfully using knowledge of their surrounding environments to mitigate impacts and risks for generations. Through a variety of traditional practices and unique coping mechanisms maintained through informal education across generations, Pacific societies have managed climate and disaster loss burdens. These methods include both community-based practices: traditional systems of exchange/warning, management of natural resources, weather pattern interpretation and information dissemination, and intra-household practices: food preservation, housing construction, etc. Conducting mapping exercises, informed by participant observation and consultative approach, will be key to understanding how local information and warning systems work; identifying community engagement and decision-making groups; and, investing in gender-relevant or women's groups. These exercises will assist in empowering women in their roles as key actors in climate-vulnerable sectors; encourage active

participation and involve them as information producers; and draw out valuable inputs for the design of climate information products.

Create Opportunities for Women to Overcome Gendered Barriers

Section 3.2 in Annex 8 presents different statistics related to poverty and hardship, labour and education, and health and social indicators to demonstrate the gendered realities of the Pacific islands under the purview of this Programme. To further the analyses, it is important to consider the intra-household dynamics between men and women pertaining to culture- and faith-based socioeconomic practices. Particularly it is important to consider time poverty and GBV in the Pacific, and how these can impair climate change adaptation and resilience.

G.3. Financial management and procurement (max. 500 words, approximately 1 page)

The financial management and procurement within the Programme will be guided by UN financial regulations, rules and practices, as well as UNEP's programme manual. The financial rules of UNEP, which follow International Public Sector Accounting Standards (IPSAS), are promulgated pursuant to the Financial Regulations and Rules of the UN. Within this context, funding allocation mechanisms are managed in accordance with UN rules and procedures, including eligibility criteria, proposal evaluation processes, quality assurance and control, project monitoring and supervision. UNEP is audited annually by the UN Board of Auditors and has established dedicated trust funds for Green Climate Fund resources.

In line with UNEP reporting procedures outlined in section E.7, reports to summarise the disbursement and projected demands for Programme funding will be prepared and submitted to a UNEP Programme Officer who will conduct Programme supervision, in line with reporting standards and methodologies applied in past projects, such as those implemented using GEF modalities.

UN financial regulations and rules require the segregation of duties and safeguards to ensure compliance with UN financial rules and regulations. All procurement will be undertaken in line with UN procurement regulations, rules and policies. UNEP's modality for project implementation, in the case of a national project, results in funds being transferred in tranches to the Executing Entities (EEs) once the EE has satisfied the conditions that are defined under the legal instruments (Project Cooperation Agreement(s): PCAs) to be signed between UNEP and the EEs. The PCAs will prescribe each EE's financial obligations related to utilisation of funds, cost overruns, project management costs, unspent balances and audits.

The PCAs specifically require annual audits to be undertaken by a recognised firm of certified public accountants or, for governments, by a government auditor. This auditor should state whether the GCF proceeds were covered by the scope of the audit.

As all five EEs are national government authorities, they follow their government's financial and procurement rules and standards, and aid coordination agencies standards, as described in section B.4. High level national financial management processes in the five countries are sound and represent low risk. During the proposed Programme's inception phase, UNEP will conduct more detailed assessments of the EEs' capacity to undertake procurement in line with UN regulations, rules and processes. This assessment will guide the procurement monitoring plan which will be agreed between UNEP and the EEs. The same will be done for the Regional Technical Partners supporting execution in the countries (SPC, SPREP, BoM, NIWA, NOAA, UH, IFRC, APCC), who are subject to financial and procurement guidelines acceptable to their members or their governments' financial and procurement policies and guidelines and are audited annually.

G.4. Disclosure of funding proposal

No confidential information: The accredited entity confirms that the funding proposal, including its annexes, may be disclosed in full by the GCF, as no information is being provided in confidence.

With confidential information: The accredited entity declares that the funding proposal, including its annexes, may not be disclosed in full by the GCF, as certain information is being provided in confidence. Accordingly, the accredited entity is providing to the Secretariat the following two copies of the funding proposal, including all annexes:

- Full copy for internal use of the GCF in which the confidential portions are marked accordingly, together with an explanatory note regarding the said portions and the corresponding reason for confidentiality under the accredited entity's disclosure policy; and
- Redacted copy for disclosure on the GCF website.

The funding proposal can only be processed upon receipt of the two copies above, if containing confidential information.

H. ANNEXES

H.1. Mandatory annexes

- Annex 1 NDA no-objection letter(s) [\(template provided\)](#)
- Annex 2 Feasibility study - and a market study, if applicable
- Annex 3 Economic and/or financial analyses in spreadsheet format
- Annex 4 Detailed budget plan [\(template provided\)](#)
- Annex 5 Implementation timetable including key project/programme milestones [\(template provided\)](#)
- Annex 6 E&S document corresponding to the E&S category (A, B or C; or I1, I2 or I3):
[\(ESS disclosure form provided\)](#)
 - Environmental and Social Impact Assessment (ESIA) or
 - Environmental and Social Management Plan (ESMP) or
 - Environmental and Social Management System (ESMS)
 - Others (please specify – e.g. Resettlement Action Plan, Resettlement Policy Framework, Indigenous People’s Plan, Land Acquisition Plan, etc.)
- Annex 7 Summary of consultations and stakeholder engagement plan
- Annex 8 Gender assessment and project/programme-level action plan [\(template provided\)](#)
- Annex 9 Legal due diligence (regulation, taxation and insurance)
- Annex 10 Procurement plan [\(template provided\)](#)
- Annex 11 Monitoring and evaluation plan [\(template provided\)](#)
- Annex 12 AE fee request [\(template provided\)](#)
- Annex 13 Co-financing commitment letter, if applicable [\(template provided\)](#)
- Annex 14 Term sheet including a detailed disbursement schedule and, if applicable, repayment schedule

H.2. Other annexes as applicable

- Annex 15 Evidence of internal approval [\(template provided\)](#)
- Annex 16 Map(s) indicating the location of proposed interventions
- Annex 17 Multi-country project/programme information [\(template provided\)](#)
- Annex 18 Appraisal, due diligence or evaluation report for proposals based on up-scaling or replicating a pilot project
- Annex 19 Procedures for controlling procurement by third parties or executing entities undertaking projects financed by the entity
- Annex 20 First level AML/CFT (KYC) assessment
- Annex 21 Operations manual (Operations and maintenance)
- Annex x Other references

** Please note that a funding proposal will be considered complete only upon receipt of all the applicable supporting documents.*



CLIMATE CHANGE COOK ISLANDS
OFFICE OF THE PRIME MINISTER
GOVERNMENT OF THE COOK ISLANDS

Private Bag, Avarua, Rarotonga, Cook Islands, Phone: (682) 25 494, Fax: 20 856.
Email: wayne.king@cookislands.gov.ck Website: www.pmooffice.gov.ck

Cook Islands, 6 September 2019

To: Executive Director
The Green Climate Fund (“GCF”)

Re: Funding proposal to the GCF by the United Nations Environment Programme (UNEP) regarding Enhancing Climate Information and Knowledge Services for Resilience in 5 island countries of the Pacific Ocean

Dear Sir,

I refer to the programme “Enhancing Climate Information and Knowledge Services for Resilience in 5 island countries of the Pacific Ocean”.

The Cook Islands is included in the funding proposal and has made significant contributions to the proposal now being submitted by the UNEP to the GCF.

The undersigned is the duly authorized representative of Climate Change Cook Islands, the National Designated Authority (GCF NDA) of The Cook Islands.

Pursuant to GCF decision B.08/10, the content of which we acknowledge to have reviewed, we hereby communicate our no-objection to the programme as included in the funding proposal.

By communicating our no-objection, it is implied that:

- (a) The Government of The Cook Islands has no-objection to the programme as included in the funding proposal;
- (b) The programme as included in the funding proposal is in conformity with the Cook Islands’ national priorities, strategies and plans;
- (c) In accordance with the GCF’s environmental and social safeguards, the programme as included in the funding proposal is in conformity with relevant national laws and regulations.

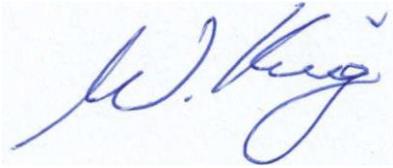


I also confirm that our national process for ascertaining no-objection to the programme as included in the funding proposal has been duly followed.

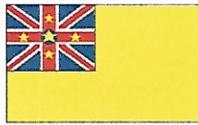
I also confirm that our no-objection applies to all Cook Islands projects or activities to be implemented within the scope of the programme.

Finally, I also acknowledge that this letter will be made publicly available on the GCF website.

Kind regards,

A handwritten signature in blue ink, appearing to read 'W. King', is centered on the page. The signature is fluid and cursive.

Wayne King
Director of Climate Change Cook Islands



GOVERNMENT OF NIUE
Office of the Premier

13th July 2020

The Secretariat
The Green Climate Fund (GCF)
Songdo Business District
175 Art Centre Daero
Yeonsu-gu Inchaero
REPUBLIC OF KOREA

Dear Madam, Sir,

Re: Funding proposal for the GCF by the United Nations Environment Programme regarding Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean

We refer to the programme "Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean" in Niue as included in the funding proposal submitted by the United Nations Environment Programme to us in 2020.

The undersigned is the duly authorized representative of the Project Management & Coordination Unit, the National Designated Authority of Niue.

Pursuant to GCF decision B.08/10, the content of which we acknowledge to have reviewed, we hereby communicate our no-objection to the programme as included in the funding proposal.

By communicating our no-objection, it is implied that:

- (a) The government of Niue has no-objection to the programme as included in the funding proposal;
- (b) The programme as included in the funding proposal is in conformity with Niue's national priorities, strategies and plans;
- (c) In accordance with the GCF's environmental and social safeguards, the programme as included in the funding proposal is in conformity with relevant national laws and regulations.

We also confirm that our national process for ascertaining no-objection to the programme as included in the funding proposal has been duly followed.

We also confirm that our no-objection applies to all projects or activities to be implemented within the scope of the programme.

We acknowledge that this letter will be made publicly available on the GCF website.

Kind regards,

Hon. Dalton Tagelagi

Premier of Niue
Green Climate Fund National Designated Authority



Republic of Palau
Office of the President

P.O. Box 6051, Palau, PW 96940
Tel. (680) 767-2403/2828
Fax. (680) 767-2424/1662
Email: rop.president@palaunet.com

File Ref. UNEP-NOL002

03 October 2019

To: The Green Climate Fund ("GCF")

Re: Funding proposal for the GCF by the United Nations Environment Program regarding Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean

Dear Madam, Sir,

We refer to the program "Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean" in Palau as included in the funding proposal submitted by the United Nations Environment Program to us in 2020.

The undersigned is the duly authorized representative of the Office of the President, the National Designated Authority of Palau.

Pursuant to GCF decision B.08/10, the content of which we acknowledge to have reviewed, we hereby communicate our no-objection to the program as included in the funding proposal.

By communicating our no-objection, it is implied that:

- (a) The government of Palau has no-objection to the program as included in the funding proposal;
- (b) The program as included in the funding proposal is in conformity with Palau's national priorities, strategies and plans;
- (c) In accordance with the GCF's environmental and social safeguards, the program as included in the funding proposal is in conformity with relevant national laws and regulations.

We also confirm that our national process for ascertaining no-objection to the program as included in the funding proposal has been duly followed.

We also confirm that our no-objection applies to all projects or activities to be implemented within the scope of the programme.

We acknowledge that this letter will be made publicly available on the GCF website.

Kind regards,

Ngirataoch 'Nick' Ngwal
Palau NDA – Green Climate Fund
Office of the President



REPUBLIC OF THE MARSHALL ISLANDS
Office of Environmental Planning & Policy Coordination

P.O. Box 975

Majuro, Marshall Islands 96960

Phone No: (692) 625-7944/7945

Skype: [clarence.samuel](https://www.skype.com/people/clarence.samuel) E-mail: clarencesam@gmail.com

October 4, 2019

Ref. MI20-004

To: The Green Climate Fund ("GCF")

Dear Sir/Madam,

**Funding proposal for the GCF by the United Nations Environment Programme
Regarding Enhancing Climate Information and Knowledge Services for
Resilience in the 5 Island Countries of the Pacific Ocean**

We refer to the programme "Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean" in Republic of Marshall Islands as included in the funding proposal submitted by the United Nations Environment Programme to us in 2020.

The undersigned is the duly authorized representative of the Office of Environmental Planning and Policy Coordination, the National Designated Authority of Republic of Marshall Islands. Pursuant to GCF decision B.08/10, the content of which we acknowledge to have reviewed, we hereby communicate our no-objection to the programme as included in the funding proposal.

By communicating our no-objection, it is implied that:

- a. The government of Republic of Marshall Islands has no-objection to the programme as included in the funding proposal;
- b. The programme as included in the funding proposal is in conformity with The Republic of Marshall Islands' national priorities, strategies and plans;
- c. In accordance with the GCF's environmental and social safeguards, the programme as included in the funding proposal is in conformity with relevant national laws and regulations.

We also confirm that our national process for ascertaining no-objection to the programme as included in the funding proposal has been duly followed.

We also confirm that our no-objection applies to all projects or activities to be implemented within the scope of the programme.

We acknowledge that this letter will be made publicly available on the GCF website.

Sincerely,

Clarence Samuel

RM, NDA/Director, OEPPC

Office of the Environmental Planning & Policy Coordination

P 1/1 of



GOVERNMENT OF TUVALU
MINISTRY OF FINANCE
NDA Secretariat

P.O.Box82,, Vaiaku, Funafuti, Tuvalu. Ph: +688 20517 E: PLatasi@gov.tv

Ref: CCD/GCF-NDA/Project/Jul2020

Date: 7th July 2020

To: Mr. Yannick Glemarec
Executive Director
The Green Climate Fund (GCF) Secretariat

Re: Tuvalu's No-Objection Letter for the funding proposal to the GCF by the UN Environment Programme on Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean.

Dear Mr. Glemarec,

I refer to the programme "Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean" in Tuvalu as included in the funding proposal submitted by the United Nations Environment Programme in 2020.

Pursuant to GCF decision B.08/10, the content of which we acknowledge to have reviewed, we hereby communicate our no-objection to the programme as included in the funding proposal. By communicating our no-objection, it is implied that:

- a) The government of Tuvalu has no objection to the programme as included in the funding proposal;
- b) The programme as included in the funding proposal is in conformity with Tuvalu's national priorities, strategies and plans;
- c) In accordance with the GCF's environmental and social safeguards, the programme as included in the funding proposal is in conformity with relevant national laws and regulations.

I confirm that our national process for ascertaining no-objection to the programme as included in the funding proposal has been duly followed. I also confirm that our no-objection applied to all projects or activities to be implemented within the scope of the programme.

I acknowledge that this letter will be made publicly available on the GCF website.

Sincerely yours,

Hon. Seve Paeniu
Minister for Finance and Tuvalu NDA to the GCF



Secretariat's assessment of FP147

Proposal name:	Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean
Accredited entity:	United Nations Environment Programme (UNEP)
Country/(ies):	Cook Islands, Niue, Palau, Republic of the Marshall Islands and Tuvalu
Project/programme size:	Small

I. Overall assessment of the Secretariat

1. The funding proposal is presented to the Board for consideration with the following remarks:

Strengths	Points of caution
Capability upgrade from category 1 (basic) to category 2 (essential) enables the participating countries to better understand, manage and adapt to their increasing climate vulnerabilities.	Under-maintenance of existing climate observation infrastructure is an issue. Adequate post-project maintenance and provision of related funding is critical.
Innovative: Compliance with emerging Global Basic Observing Network (GBON) standards a first in the Pacific.	Staffing approach depends on the countries converting some key consultant positions to permanent positions after the project lifespan. Whether or not these are converted may impact the post-project sustainability.

2. The Board may wish to consider approving this funding proposal with the terms and conditions listed in the term sheet and addendum XXIII, titled "List of proposed conditions and recommendations", respectively.

II. Summary of the Secretariat's assessment

2.1 Project background

3. As argued in the funding proposal, the livelihoods and economies of the Cook Islands, Niue, the Republic of Palau, the Republic of the Marshall Islands (RMI) and Tuvalu depend heavily on the ocean and climate-sensitive sectors such as fisheries, tourism and agriculture. Hazards worsened by climate change threaten lives, livelihoods, assets and infrastructure in these countries, and current forecasts are not sufficiently reliable and downscaled for use in disaster risk management. Weather, climate, water and ocean information services provided by the countries' respective National Meteorological and Hydrological Services (NMHS) are critical to the safety and livelihoods of Pacific island populations, but communication of the information is not reliably reaching the people who need it. These services are crucial to enhancing resilience and reducing the vulnerability of Pacific nations to climate-related hazards and the effects of climate change.

4. This project proposal aims to address several barriers across the project countries: the lack of climate and ocean observation data, the lack of clarity on roles and responsibilities among national agencies, and the lack of communication to people at “the last mile”. The project’s climate objective is therefore to improve the climate information capabilities and supporting frameworks of the five project countries, and to ensure that information can reach end beneficiaries through investments in last-mile early warning services.
5. The project would achieve its objective through investments primarily in observational hardware, supporting infrastructure and NMHS capacity investments under the second component, which accounts for a greater part (USD 34 million) of the USD 49.9 million overall project budget. Linkages to the “last mile” account for a relatively small but critical USD 6.4 million component of project budget, while components for institutional and policy framework investments (USD 4.7 million) and regional investments (USD 1.6 million) also play a role.
6. In terms of financing, a GCF grant is proposed and would account for the overwhelming majority of the project funding. Supplementary in-kind co-financing from the countries primarily takes the form of staff time contributions, and some of the countries are additionally committing to provide equipment and office space. UNEP has also committed to contribute to the project in the form of staff time for the Project Management Unit. The funding proposal points to budget and debt constraints in the countries, as well as other priorities from other donors, as primary reasons for the request for GCF grant funding.
7. The environmental and social safeguards (ESS) category has been assessed by the Secretariat team as category C.
8. Overall, the Secretariat assesses the proposed project to be potentially transformative in the regional and country context. Upgrading of the NMHS from category 1 to category 2 will enable them to provide more useful data and services to different end users, improving the countries’ ability to plan and prepare for climate change. The investments under this project would reduce vulnerability to climate change in Pacific communities. The Global Basic Observing Network (GBON), the emerging international standard, will enable the project to fill gaps in Pacific climate observation.
9. While GCF grant funding is justifiable given the public good nature of the services, the low level of co-financing and relatively high budgeting for travel and workshops negatively impact the proposal’s financial efficiency. The adaptation benefits for people at the “last mile” are clear and meaningful. However, the proposal is less clear about how different sectors such as agriculture and fisheries will access and utilize the new climate information produced and therefore how those sectors will concretely benefit from the project.
10. Long-term sustainability of the project after the implementation period poses a key concern. The AE has stated that the countries have committed to fully fund operations and maintenance (O&M) after the project implementation period, and countries have provided commitment letters stating the same. An O&M plan has also been submitted and will be updated during project implementation. However, it should be noted that under-maintenance of similar assets has previously been identified as an issue.

2.2 Component-by-component analysis

Component 1: Strengthened delivery model for climate information services and Multi-hazard Early Warning Services (MHEWS) covering oceans and islands (total cost: USD 4.7 million; GCF cost: USD 4.5 million)

11. Component 1 aims to assist each country to establish a National Framework for Climate Services to coordinate, facilitate and strengthen collaboration among national institutions for enhanced climate information services and products. From a budget perspective, this means a

series of workshops, consultants and travel within and across countries. Through these workshops, the respective NMHS will communicate with other government agencies about what information they can generate and how it can be applied to policy and practice. Sector representatives will present how they currently use climate information, what additional information would be useful to receive, and how they would like to work with that NMHS. Through this process, NMHS develop a suite of sector-specific climate information products that will be useful in the context of climate change.

12. In addition, the project will build on these frameworks each year during the National Climate Outlook Forums. The process will be repeated in the second, third and fourth years with the private sector, non-governmental organizations and community representatives. This National Climate Outlook Forum process appears valuable, but as an ongoing process, it is not clear how it would be funded after the project implementation period, or what this would mean in terms of post-project impact.

13. Private sector linkages will also be explored under this component: each country will conduct a climate services market assessment and develop a policy for sustainable financing and delivery of climate services. The usefulness of some of these activities will depend heavily on to what extent the representatives from related sectors and the private sector attend, engage and ultimately put the new data and services to productive use.

Component 2: Strengthened observations, monitoring, modelling and prediction of climate and its impacts on ocean areas and islands (total cost: USD 34 million; GCF cost: USD 32.1 million)

14. Currently, the five project countries' NMHS operate at the World Meteorological Organization's "Basic" or "Category 1" level, meaning that they can provide basic weather and climate services. An upgrade to "Essential" or "Category 2" means the NMHS possess the capability and capacity to provide comprehensive climate and ocean observations, impact-based forecasting, early warning systems (EWS), and inform climate-resilient preparedness and response actions. Component 2 makes this upgrade possible. Component 2 also represents the project's main set of investments by budget size, accounting for about 69 per cent of the total project budget.

15. In terms of budget, this component seeks funding for the hardware, infrastructure and installation costs of these capabilities. This means automatic weather stations, radar systems, wave buoys, data management systems, among others. It also proposes funding for the training workshops and capacity-building needed to operate these new systems effectively. The critical aspect of these investments is ultimately in whether the assets can be adequately maintained for ongoing operation; the AE has provided a draft O&M plan, which will be updated at inception and during implementation.

16. Within the country context, this component brings two relatively innovative or transformative aspects to the project. First, the project would be GBON compliant. GBON design specifications state in quantitative terms which parameters to measure, how often, at what horizontal and vertical resolution, and provide advice on which measurement techniques to use. GBON compliance will translate to better weather forecasts, early warnings and climate information products, which are essential for effective climate action.

17. The second relatively transformative project aspect is end-to-end ocean services. With these capabilities in place, the respective NMHS can engage with their marine sector and other relevant stakeholders to provide information on how to access and interpret ocean and climate data, which can then inform decision-making from other stakeholders.

Component 3: Improved community preparedness, response capabilities and resilience to climate risk (total cost: USD 6.4 million; GCF cost: USD 6.2 million)

18. Component 3 contains the "last mile" investments to make the upgraded climate data capabilities useful for people on the ground. Similar to component 1, this involves fairly

extensive workshops, travel and consultants. By improving the planning and policies around early warning communication, it is expected that severe weather impacts can be reduced or to some extent avoided.

19. This component has many activities including, for example, disaster preparedness plans, multi-hazard risk and vulnerability assessments, and public awareness on climate risks. The most innovative set of activities lays the groundwork for forecast-based financing in the countries. Forecast-based financing uses credible forecasts to pre-plan early actions, which are then funded and implemented before a climate-related shock to minimise losses and damages and reduce the need for humanitarian assistance in their aftermath.

Component 4: Enhanced regional knowledge management and cooperation for climate services and MHEWS (total cost: USD 1.6 million; GCF cost: USD 1.6 million)

20. Component 4 aims to enhance coordination and knowledge-sharing among the five countries to improve data and knowledge management. An interactive information and communication technology (ICT) platform will be developed and will enable exchange of climate data, information, experiences, case studies and other forms of knowledge from the five countries. The platform will include the establishment of a regional data centre fed by national data centres. The Secretariat of the Pacific Regional Environment Programme (SPREP) has committed to fund a key position of this component after implementation, as well as the associated fees including hosting of the data portal network. The component will also facilitate South-South exchanges and provide training for NMHS staff.

Project management (total cost: USD 2.4 million; GCF cost: USD 2.2 million); Monitoring and evaluation and contingency (total cost: USD 0.9 million; GCF cost: USD 0.9 million)

21. Project management costs, monitoring and evaluation costs and contingency are to be almost entirely GCF grant funded except for USD 150,000 of in-kind co-financing from UNEP in the form of Project Management Unit staff time.

III. Assessment of performance against investment criteria

3.1 Impact potential

Scale: High

22. The entire population of the programme countries (Cook Islands, Marshall Islands, Niue, Palau and Tuvalu) are at risk from climate-related hazards such as cyclones, storm surges, coastal inundation, floods and droughts. The programme claims it will reduce the expected loss of lives and economic assets due to the impact of climate hazards and extreme climate-related disasters; further, adaptive capacity at national, subnational and community level will be enhanced by establishing an integrated climate and ocean information service and impact-based multi-hazard early warning services (MHEWS) building resilience of the five countries to climate risks. In addition, it will make widely available robust, timely and actionable climate information and early warning systems (CIEWS) aiming at 100,038 people (51 per cent male and 49 per cent female) representing the total population. This constitutes women, children, elderly people and people with disabilities who are particularly at risk from the devastating impacts of climate variability and change.

23. The impact of this intervention is significant since this is the first time such innovative interventions are being deployed at this scale.

24. Since disaster management is not well-developed in some of the islands compared to other regions of the world, the proposal will benefit from a detailed analysis of beneficiaries based on demographics and disaggregated at the community level to enable a full understanding of how the most vulnerable groups are disproportionately impacted by climate variability and change. This will be important for focusing early warning/action interventions at

groups and communities that need the most support. This could be done in conjunction with an impact evaluation study to help quantify the true benefits of the interventions and could be undertaken during the full duration of the project.

3.2 Paradigm shift potential

Scale: Medium-High

25. The Pacific region lacks adequate meteorological and disaster management capacity to manage the scale of disasters presented by the increasing and intensifying climate extremes. Most of the programme countries provide basic climate services (category 1). They have weak early warning/early action systems to drive uptake and investment in CIEWS.

26. The proposal seeks to upgrade the level of the NMHS to category 2 by using innovative technologies to expand (in quantity and quality) observational networks to GBON-compliant standards, establish sub-seasonal and seasonal climate outlooks, climate monitoring, ocean services capabilities as well as provision of some specialized priority sector services. It also seeks to establish a business delivery model and quality management systems, improve early warning/early action through impact-based forecast and forecast-based actions to drive performance and uptake of CIEWS.

27. The innovative technologies that the programme proposes includes radar for nowcasting of severe weather systems for the aviation, marine, agriculture and other productive sectors of the economy as well as disaster management and safety. It also proposes to use cloud computing, the internet of things and data analytics technologies to improve the performance of forecasting and early warning/early action services at both the regional and national scale, pooling together the scarce national resources into a regional pool that will enable a critical mass of knowledge and infrastructure for effective production and delivery of climate information and early warning services to the “last mile” at-risk communities.

28. The programme also proposes to adopt impact-based forecasting and forecast-based actions which are some of the most innovative approaches to disaster management. The policy reforms that the proposal seeks to effect and its potential to drive uptake and investment in CIEWS through national policy organs are also significant.

29. Collectively, these interventions demonstrate the paradigm shift needed to ramp up climate action in the Pacific.

30. The proposal is fully aligned with the Paris Agreement, Sustainable Development Goal 13 and the four priorities of the Sendai Framework: (priority 1) understanding disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment; (priority 2) strengthening disaster risk governance to manage disaster risk; (priority 3) investing in disaster risk reduction for resilience through public and private investment to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment; and (priority 4) enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

31. This is an ambitious undertaking in a region with limited capacity, and by UNEP on its own, given that CIEWS is not its core mandate. The proposal will therefore benefit from a long-term strategic partnership with core players such as the World Meteorological Organization, UN Office for Disaster Risk Reduction (UNDRR), International Federation of Red Cross (IFRC) and other regional institutions already present in the region. It must detail how it will build local capacity, highlighting how it will partner with universities and other technical institutions in the Pacific to ensure a critical mass of human capacity to sustain the investments. This can be done during project implementation.

3.3 Sustainable development potential

Scale: Medium-High

32. Tropical cyclones are the major cause of deaths and financial losses in the Pacific. The 2015 UNDRR Global Assessment Report highlights the concentration of assets and essential infrastructure – airports, water storage, sanitation, hospitals and clinics, schools, cyclone shelters, fishing boats, inter-island ferries and often food gardens along the coasts of the Pacific island countries means that risk is heavily influenced by exposure. In relation to annual capital investment, small island developing States (SIDS) have very high concentrations of risk. All five programme countries have assets, infrastructure and crops at risk of being damaged from natural disasters with total replacement costs of over USD 7.6 billion, with buildings at risk contributing the majority of this total (86.5 per cent), infrastructure (13.2 per cent) and cash crops (0.4 per cent). The current average annual losses per capita in USD at 2019 equivalent rates are: 537 (Cook Islands); 119 (RMI); 2,122 (Niue); 208 (Palau); and 336 (Tuvalu).

33. The programme proposes to reduce the expected losses due to climate-related disasters with an overall reduction in damages and losses of 15–30 per cent by building resilience of communities and assets (such as fishing boats and equipment, agricultural land and properties) through robust and timely impact-based multi-hazard early warning services. A major economic benefit will be realized through increased productivity and avoided losses in priority sectors of agriculture, fisheries, shipping, inter-island boat operators, search and rescue services.

34. It further argues that deployment of a combined impact-based forecasting and forecast-based financing mechanism will yield significant benefits (including COVID-19 co-benefits) as demonstrated in similar regions of the globe. A World Meteorological Organization/World Bank global study on the utility of climate information and early warning systems shows that on average a USD 1 investment returns USD 2 to USD 36. A study in Nepal in 2018 indicated that the implementation of a forecast-based financing approach would save USD 22 million when responding to an emergency of average size (175,000 affected people). The study also revealed that up to USD 34 and 42 kg of CO₂ emissions could be saved per dollar invested within twenty years, after deducting the investment cost.¹

35. The proposal also seeks to demonstrate that investments in the interventions will make the global basic observing networks and forecasting system more robust to global pandemics like COVID-19 and related disasters since a fully automated infrastructure will reduce disruptions from unforeseen events.

36. The proposal will benefit from an extensive cost-benefit analysis for its infrastructure investments (radar, buoys, cloud, observation networks and related systems) within the context of the Pacific since this is the first time such a system will be widely deployed in the region. This should also be extended to assess the utility of the forecast-based actions as has been demonstrated in other countries. This should be done during the full period of project implementation.

3.4 Needs of the recipient

Scale: High

37. Pacific small island developing States (SIDS) are among the most vulnerable countries to climate change. The World Risk Index 2018 unequivocally states that disaster risk – the risk that an extreme natural event will lead to a disaster – is at its highest in Oceania.

38. The proposal comprehensively articulates these needs and provides interventions that will lay the foundation for addressing them in a way that reflects their expression in the national

¹ Forecast-based Financing in Nepal: A Return on Investment Study, World Food Programme, 2019.

and regional development plans, nationally determined contributions, national adaptation plans and related strategies and policies.

39. The proposal will benefit from a deliberate effort to support civil society organizations and the broader non-governmental stakeholders to energize government to ramp up climate action at the grass-roots level. This will ensure that the needs of the most vulnerable recipients are well articulated in the project implementation. This should be done during project implementation.

3.5 Country ownership

Scale: High

40. The proposal is assessed to have a relatively strong strategic alignment with national and regional climate change and sustainable development policy objectives and disaster management.

41. The proposal is fully aligned with Sustainable Development Goal (SDG) target 13 on climate action by seeking to: (13.1) strengthen resilience and adaptive capacity to climate-related hazards and natural disasters; (13.2) integrate climate change measures into national and subnational policies, strategies and planning (including a national adaptation plan, nationally determined contribution, national communication, national development plan and disaster management plans); (13.A) mobilize resources through both internal and external partnerships towards implementation of the Paris Agreement as evidenced through the co-financing and other means for the successful implementation of the project; and (13.B) promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities.

42. Currently most of the core expertise will be internationally sourced due to the acute capacity gap in the countries. The participation of research and academic institutions should be further strengthened during project implementation.

3.6 Efficiency and effectiveness

Scale: Medium

43. The Pacific Ocean provides some of the global weather phenomena that impact the day-to-day functioning of our socioeconomic systems. Despite this, the oceans of the Pacific are the least observed of our earth climate systems. The GBON system to be established will contribute to improving the global forecasting systems in much the same way as the national forecasting systems of the programme countries.

44. The proposal, citing a comparison of Switzerland to any of the five Pacific island countries, argues for a fundamental change in the funding model for developing country observations and particularly for SIDS with vast ocean territories. Switzerland (area: 41,000 km², GDP: USD 700 billion) spends roughly USD 20 million, representing less than 0.003 per cent of its GDP, on its observing network. A similar share of GDP spending for observations for Cook Islands (area: 1,830,000 km², GDP: USD 524.2 million) would amount to ~USD 15,700; for Niue (area: 450,000 km², GDP: USD 43 million) would amount to ~USD 1,290; for Palau (area: 603,978 km², GDP: USD 284 million) would amount to ~USD 8,520; for RMI (area: 1,990,530 km², GDP: USD 221.3 million) would amount to ~USD 6,640; and for Tuvalu (area: 749,790 km², GDP: USD 42.59 million) would amount to ~USD 1,280. Therefore, even for the Cook Islands with the highest GDP of the five programme countries, a similar share of GDP spending for observations would cover less than half the cost of sensors for a single Automatic Weather Station. It is not reasonable or equitable to expect the Pacific island countries to cover the full costs of observations. It is also unrealistic to expect that the countries will be able to sustain the

provision of observations over their territories or territorial waters on national and aid resources alone.

45. Given the public goods nature of the interventions (both national and global), the financial structure of the proposal is justified for highly vulnerable SIDS (climate risks, financial and economic situation) and for a GCF priority adaptation intervention area.

46. The proposal also provides a cost-benefit analysis, assuming a 10-year useful life of proposed interventions at a 9 per cent discount rate, showing all the discounted net present value to be positive. Similarly, the economic internal rate of return (EIRR) exceeds the discount rates in each instance making all proposed investments economically viable. This demonstrates significant improvements in efficiency and effectiveness with the use of impact-based forecasting and forecast-based actions and the other proposed interventions in mitigating against climate and related risks.

47. The proposal will, however, benefit from further exploration of potential sources of national funds (e.g. private sector investments) that could be mobilized to sustain and scale up the investments. This could be done during project implementation.

IV. Assessment of consistency with GCF safeguards and policies

4.1 Environmental and social safeguards

48. Based on the environmental, social and economic screening submitted by the AE, the project is assessed to be low risk, with no or minimal adverse environmental and/or social risks and/or impacts, including to indigenous peoples. The assessment is equivalent to GCF's risk category C. The Secretariat confirms the categorization which is within the entity's accreditation level.

49. Most of the programme activities are concerned with climate information, institutional capacity enhancement, monitoring and disaster risk preparedness measures and will therefore have no physical impact. However, some of the activities will include small infrastructure installations or rehabilitations (such as meteorological offices) on several islands in the target countries (i.e. the Marshall Islands and Tuvalu) as well as installation of various types of instruments and equipment across various locations in the five countries. The programme is not expected to cause physical and/or economic displacement of people in the communities (either authorised or unauthorised occupants) and installations will be on government-owned lands.

50. Land clearance and earthworks are expected to be minimal. Ecosystem disturbance from the installation of wave buoy anchor blocks can be minimized by appropriate site selection where least impacts will be observed. Some of the impacts relate to occupational and community health and safety hazards. Refurbishment of offices and installation of equipment (e.g. decommissioning of old air-con units, installation of 25kW solar photovoltaic (PV) panels and storage batteries) may result in the production of electronic hardware waste which will need to be segregated and disposed of in accordance with applicable good industry practices. Construction activities will also present construction-related hazards to workers and the executing entities (EEs) should ensure that contractors provide appropriate labour and working conditions.

51. The programme has conducted in-country consultations during which various stakeholders were provided with the opportunity to voice their concerns and issues which were then taken into consideration in development of the programme. The programme is expected to continue the effective engagement of stakeholders and has analysed the major stakeholders' roles in each of the countries. A stakeholder engagement plan with an engagement activity timetable is provided and will be further confirmed or modified during the programme's

inception phase to allow for a more detailed scheduling of engagements in each country. Within the programme, there will be a subactivity on traditional/indigenous knowledge that will increase local community engagement and uptake of forecasts.

52. The programme will set up a central Programme Management Unit (PMU) which will be hosted by the AE's Sub-regional Office in Apia, Samoa. The PMU is expected to provide, among other facilities, management and support to national implementation of the programme through coordination by the five national EEs and the regional technical partners involved in programme execution. The AE has an existing entity-level Stakeholder Response Mechanism (SRM) which is an avenue for lodging, reporting and resolving grievances. The programme will also establish project cooperation agreements with national EEs which will require them to put in place localized grievance redress mechanisms where concerns can be acted upon at the village level, at the national level (through the national coordination committee) and/or at the PMU level.

4.2 Gender policy

53. The AE has provided a gender assessment and gender action plan and therefore complies with the requirements of the GCF Gender Policy.

54. The gender assessment and analysis provide a description of the enabling environment for addressing gender equality within the five countries that are the focus of the proposal. The three countries of Cook Islands, the Marshall Islands and Tuvalu have ratified the Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW). Niue acceded to the convention (through New Zealand) but has not yet ratified CEDAW and lacks robust legal, policy or institutional structures supporting women's rights. Palau is one of only seven countries in the world that is not a signatory to CEDAW. In the case of Palau, the constitution guarantees women equality under the law and the country has a gender mainstreaming policy. In 2018 the Cook Islands developed The Cook Islands National Policy on Gender Equality and Women's Empowerment and Strategic Plan of Action. However, the plan is underfinanced and sufficient technical capacity to implement it is lacking. The Marshall Islands does have a national gender policy and a Gender and Development Office to provide technical capacity and move the policy forward. Tuvalu recently enacted a national gender policy to operationalize the Government's commitments to gender equality and women's empowerment. It also has a Gender Affairs Department to support the policy. This demonstrates the need to work towards strengthening the enabling environment for women's empowerment throughout the five islands.

55. The Gender Assessment, which was conducted based on a desk review, found little information regarding the challenges and barriers to women's engagement and empowerment throughout the five countries in relation to the proposed programme. Some studies referenced in the assessment indicate a range of issues. For example, a study undertaken in the Pacific region by Oxfam demonstrates that the bulk of post-disaster resource allocation decisions were made by men at the household and community levels; women were worried about receiving correct and timely information from men as forecast and disaster warnings were often not relayed from the public to the private sphere (reducing the critical time required for post-disaster/s preparation); and women generally could not participate in decision-making councils or at community meetings. A further look at the realities of women in the Pacific region indicates that women tend to be caregivers in the societies, and hence have different priorities and capacities in preparation for and response to disasters. It was observed that they prefer earlier evacuation, for example, when early warnings are given. Further, women seem to face additional difficulties in engaging and participating in decision-making processes. Regionally, women are primarily engaged in the bulk of domestic, care and reproductive work, in addition to productive work outside the home, both of which are further exacerbated by high levels of male out-migration for seasonal work. This leads to gendered time poverty in the Pacific

Islands. These challenges therefore emphasise the need for and the importance of gender-responsive adaptation approaches, which would include targeted consultations with women and purposive qualitative data collection.

56. The assessment also highlighted two areas where women face the greatest challenges: employment and the prevalence of gender-based violence (GBV). Gender inequality in employment distribution and labour markets persists throughout the region and women are more likely to take up vulnerable work and less likely to participate fully in employment opportunities in general. The prevalence of women in the informal economy may indicate the shortage of decent jobs and often leaves women with little in terms of social safety nets. Lifetime exposure to gender-based violence can be as high as between 40 per cent and even 70 per cent in certain areas, making GBV incidence rates the highest in the world. The Asian Pacific Institute of Gender-based Violence finds that cultural contexts of preserving family honour, shame stemming from experiencing violence, and lack of redress and grievance mechanisms as well as low support for survivors of GBV all contribute to elevated rates of GBV in the region. GBV statistics, sourced from either national bodies or UN Women, also show that, in the five Pacific countries selected for the project, an average of one in every four women experience intimate partner violence in their lifetimes.

57. The accredited entity (AE), as per the requirement of the GCF Gender Policy, has provided a gender action plan that includes activities, indicators, targets, timelines, budgets and gender experts to implement the gender action plan. The gender action plan indicates that at the start of programme implementation, an in-depth study on gender and community stakeholders will be conducted to ensure relevant information is gathered from stakeholders and communities (both women and men). This work will be undertaken in partnership with the Social Development Programme (Gender, Culture & Youth) of the Pacific Community and will examine: i) women's access to and control over resources (financial, natural, working capital, land support networks, etc.); ii) the roles of women in various sectors (including fishing, pearl farming, tourism, etc.); and iii) the opportunities, challenges and barriers for women-headed households, indigenous groups, youth, the elderly and other disadvantaged groups. The study will inform the gender-responsive design of EWS, and organizational and decision-making processes. This proposed in-country in-depth study with stakeholders will flesh out a range of indicative suggestions and will contextualize and propose concrete and relevant actions, targets and indicators. The monitoring and evaluation framework for the programme will be refined on the basis of the study and, as interventions progress, will include lessons learned in mainstreaming gender in the programme.

58. The current gender action plan mirrors the focal areas, results and activities of the overall programme and has included measures to strengthen gender responsiveness of institutional and policy frameworks and delivery models for climate services. Market assessments will focus on areas where women's role is important, including subsistence agriculture, and will also leverage women's group knowledge to ensure their priorities are integrated into market strategies. In addition, women will be trained as Trainers of Trainers in climate risk awareness and adaptation and resilience measures in various sectors. The programme also aims to achieve gender parity in hiring and staffing, development of gender-specific climate information products, and gender mainstreaming in data and information dissemination strategies, all designed to strengthen observations, monitoring, modelling and prediction of climate and its impacts on ocean areas and islands. Gender mainstreaming will be used as an approach, thereby improving early warning dissemination and communication; enhancing preparedness and response capabilities; establishing forecast-based financing; and enhancing regional data, knowledge management and cooperation. Having indicated and recognized the risk of gender-based violence in the countries, the programme will take measures to mitigate and respond to the risk while ensuring gender-sensitive design and responsiveness of the grievance mechanism that will be set up.

4.3 Risks

4.3.1. Overall programme assessment (medium risk)

59. GCF is requested to provide a grant of USD 47.4 million to develop integrated climate and ocean information services and multi-hazard early warning services (MHEWS) in the Cook Islands, Niue, Palau, RMI and Tuvalu. The Governments of participating countries and the AE will provide a total of USD 2.3 million and USD 150,000 in in-kind contributions, respectively.

60. The Governments of the five programme countries are seeking a full grant from GCF. As small island developing States, there is limited scope for the five countries to incur further public debt and the GCF investment does not generate direct revenue. While the amount of co-financing from the Governments is less than 5 per cent of the total financing, the Governments will provide O&M beyond the implementation period.

4.3.2. Accredited entity/executing entity capability to execute the current programme (medium risk)

61. The AE, UN Environment Programme, has a track record in climate change information management and early warning systems. It has a regional presence and operation in the Pacific region.

62. The AE will serve as an executing entity (EE) for certain subactivities under Component 1 and Component 4. In addition, a national EE is designated by the Government in each country, namely the Ministry of Finance and Economic Management in Cook Islands, the Premier's Officer in Niue, the Ministry of Finance in Palau and in Tuvalu, and the Ministry of Environment in RMI. The AE has reviewed the track record and procurement capacity of the national EEs and the risk mitigation measure will be built into the agreements. The full capacity assessments by the AE are pending.

4.3.3. Programme-specific execution risks (medium risk)

63. Implementation arrangements in remote coordination: the project activities will mostly be executed by the national EEs of the five countries. These EEs will execute 97 per cent of the project cost. Currently, the funding proposal package does not lay out clear responsibilities for the respective EEs. The responsibility of each EE needs to be clearly defined for specific subactivities in the funded activity agreement. While the AE will be executing project components accounting for three per cent of the project cost and provide overall oversight, the AE will act remotely. In addition, around 15 per cent of the project cost is for training activities. The programme countries are on different sides of international date line/time zones with unstable internet connectivity, therefore, virtual meetings and trainings are not always considered the most effective modality. On the other hand, the high cost of travel, logistics and transactions in the Pacific region and the pandemic situation also make any on-site meetings and trainings costly. Effectiveness of the training is critical for steady implementation and operation of the projects.

64. O&M risk: the funding proposal identified O&M related constraints as risks with high probabilities. The countries may face difficulties in maintaining the new and upgraded equipment due to the limited financing and local expertise. Although direct revenue will not be generated from the programme, it is expected to develop information products with potential commercial value that may enable partial cost-recovery options. However, this potential value is not included in the economic analysis. The costs for O&M and necessary training have been integrated into the programme budget, and relevant partners are committed to maintain the items over the programme lifetime until national capacity is built. The countries have committed to ensuring O&M for up to 20 years and a partner agency (SPREP) has also

committed to financing a position for a data manager and associated fees for a data portal network beyond the project implementation.

65. Economic and financial viability: the AE provided a cost-benefit analysis over a 10-year horizon, considering avoided economic damages and losses as benefits. The analysis resulted in the EIRR ranging between 11 per cent and 15 per cent in each country. All five countries show positive net present values even if benefits fall by 10 per cent or costs increase by 10 per cent. Given the level of co-financing from the Governments, the project will benefit from efforts made by them to mobilize additional resources for post-project operation.

4.3.4. Compliance risk (medium risk)

66. The AE (UNEP) has informed that the project and its activities will not engage with any entity or individual who may be subject to, or listed on, any United Nations Security Council (UNSC) sanctions lists. There are no sanctions by the UNSC currently in force against beneficiary countries – namely Cook Islands, the Marshall Islands, Niue, Palau or Tuvalu.

67. UNEP has advised that there are no intentions to disburse or distribute cash, vouchers, commodities, or other items of value among beneficiaries, either directly or indirectly. They have advised that GCF grant funds will be utilized towards strengthening the climate monitoring and observation infrastructure/equipment (over 50 per cent of the budget), capacity-building, technical assistance and training. Financial management of the programme will be in line with UN rules and regulations.

68. UNEP has informed that project cooperation agreements with national executing entities (EEs) will require the EEs to put in place localized grievance redress mechanisms, including stakeholder consultations and national procedures related to grievance redress. The programme website will also allow for reporting allegations of complaints of wrongdoing in programme activities, and such allegations shall be addressed in line with national requirements and/or the UNEP Environmental and Social Sustainability Framework.

69. UNEP has advised that a risk assessment has been conducted to identify potential risks for money laundering, terrorist financing, UNSC sanctions' violations or prohibited practices among counterparties and beneficiaries of activities within the project. UNEP has estimated a low level of risk.

70. UNEP has confirmed that the five programme countries – Cook Islands, the Marshall Islands, Niue, Palau and Tuvalu – have all acceded to and/or ratified the United Nations Convention Against Corruption. Furthermore, the Project Cooperation Agreement between UNEP and the EEs will include warranties and caveats by the EEs to, inter alia, ensure compliance with the Anti-Fraud and Anti-Corruption Framework of the United Nations Secretariat, as well as the GCF Policy on Prohibited Practices.

71. UNEP has advised that capacity assessments are being undertaken for each of the EEs prior to Board consideration. The assessments will identify legal and fiduciary risks including risks related to prohibited practices, money laundering and misuse of funds. Appropriate risk mitigation strategies, including low cash advances, frequent monitoring missions, and/or increased reporting requirements, will be incorporated in the Project Cooperation Agreements to be signed with EEs.

4.3.5. Recommended condition

72. Considering that UNEP has yet to advise the results of their capacity assessments for each of the EEs on the risk of money laundering, terrorist financing, or prohibited practices, the Office of Risk Management and Compliance (ORMC) team recommends that payments are not disbursed until such assessments and any appropriate risk mitigation strategies are reviewed by ORMC/Compliance and determined as acceptable.

4.3.6. Recommended risk rating (medium risk)

73. The ORMC/Compliance Team has conducted a review of the project in accordance with relevant GCF Board approved policies and does not find any material issue or deviation with respect to Compliance issues. Based on available information for this funding proposal, the ORMC/Compliance team have determined a risk rating of "medium" and have no objection to this request proceeding to the next steps for processing.

74. ORMC/Compliance would like to remind UNEP, as the AE, of its continuing obligations and responsibilities with regard to monitoring and reporting any risks for money laundering, terrorist financing, or prohibited practices among the intended counterparties, executing entities, beneficiaries, persons involved, or any of the proposed activities.

4.3.7. GCF portfolio concentration risk (low risk)

75. In the case of approval, the impact of this proposal on the GCF portfolio concentration in terms of result area and single proposal is not material.

4.3.8. Recommendation

76. It is recommended that the Board consider the above factors in its decision.

Summary risk assessment		Rationale
Overall programme	Medium	Due to the remoteness of each programme country and implementation arrangements, the role of the EE in each country is critical. The capacity assessment of the EE is not yet available. Sustainability of the project depends on the country's capacity and willingness to support and maintain the investment.
Accredited entity (AE)/executing entity (EE) capability	Medium	
Project-specific execution	Medium	
GCF portfolio concentration	Low	
Compliance	Medium	

4.4 Fiduciary

77. There are six Executing Entities (EE) in this project. They are: the Ministry of Finance and Economic Management (MFEM), Development Coordination Division of the Cook Islands; Project Management Coordinating Unit (PMCU) in the Central Agency for Finance and Planning within the Premier's Office of Niue; Ministry of Finance, Bureau of Budget and Planning of Palau; the Ministry of Finance of the Republic of the Marshall Islands; the Ministry of Finance of Tuvalu; and the United Nations Environment Programme (UNEP).

78. UNEP will undertake the dual role of Accredited Entity (AE) and EE in the project. As AE, UNEP will be responsible for overseeing the implementation, financial management, evaluation, reporting and closure of the activities under the project. UNEP will monitor and supervise the execution of the project and ensure the proper management and application of GCF grant proceeds by the EEs. UNEP will also ensure that the grant proceeds are utilised in accordance with the terms of the Funded Activity Agreement and the Accreditation Master Agreement.

79. The national EE designated by the Government in each country will be respectively accountable to UNEP for project execution at the national level and for the effective and efficient use of resources. Each EE is an existing established national agency and shall enter into a Project Cooperation Agreement (PCA) with UNEP for the execution of the Programme. The PCAs will

establish clear roles and responsibilities of the respective parties for the delivery of the proposed activities, and the schedule and conditions for instalments, the determination of the prevailing fiduciary standards and the terms and conditions for arbitrations and termination of contract. The PCAs will include specific obligations for the national EEs on project execution, financial management, personnel administration and reporting, as well as on arbitration and liability terms. The EEs will be required to comply with UNEP rules, policies and procedures on procurement.

80. Each national EE will provide technical and implementation guidance and will facilitate cooperation among the implementing organisations. The EEs will be accountable to the central PMU and the National Coordination Committee on Programme progress and will submit regular progress reports to the PMU. As an EE, UNEP will also undertake limited EE functions through its Sub-regional Office for the Pacific, in the context of project Result 4 focusing on regional knowledge management and cooperation. UNEP will execute the project in line with its programme manual and standard business procedures and will contract international consultants and Technical Partners to undertake relevant activities as appropriate.

81. A Programme Steering Committee (PSC) will be established to provide high-level oversight and guidance towards achieving Programme objectives. Among other functions, the PSC will review and approve the annual workplan and budget and approve the Programme's annual report as prepared by the PMU and national EEs. A National Coordination Committee will be established in each of the five countries whose role will be to review and approve the national annual workplan and budget and approve the project's annual report for submission to the PMU and PSC. The project will also receive technical expertise and support from Regional Technical Partners and National Service Providers.

82. UNEP will provide to the GCF the following reports: Annual Performance Reports (APR), Semi-annual Financial Information, a Mid-Term Evaluation Report, a Final APR at project completion and a Terminal Evaluation Report. The financial management and procurement within the Programme will be guided by UN financial regulations, rules and practices, as well as UNEP's programme manual.

83. The capacity assessment for each of the EE's have not been provided and it is recommended that this is placed as a condition in the project.

4.5 Results monitoring and reporting

84. The theory of change (TOC) clearly defines the ultimate project goal and explicitly states the causal logic that informs the project's design. The TOC's stated outcomes are defined in a manner that is clearly supportive of meeting the ultimate project goal. The "if, then, because" logic is clearly shown in the diagram as provided in the funding proposal.

4.5.1. Logical framework

85. At the core indicator level, the logical framework has been designed with relevant details, including reporting on the appropriate core indicators for adaptation, as well as on the respective impact, outcome and output indicators for the targeted results areas as per the GCF results management framework and performance measurement frameworks.

86. The appropriate indicators have been selected for outcomes at GCF level. However, we note that indicator A5.1 is a qualitative indicator and suggest that the AE must determine the baseline following careful analysis of the country-specific circumstances. It is good practice for formulation of the target to correspond to the major requirements for this indicator, such as defining the type of incentives and mechanisms, integration of the mechanisms in the planning process and measurement of effectiveness.

87. Indicator A5.2 refers to both the number and the level of effective coordination mechanisms, and as such it is both a quantitative and qualitative indicator. We suggest that, when formulating targets, the AE should examine both the number and type of mechanisms and their level of effectiveness. Regarding the level of effective coordination mechanisms, a scorecard approach is recommended, where the AE may define the different levels of effectiveness. The main assumptions made as part of the scorecard development should be reported in the assumptions section. Good practice for this indicator includes:

- (a) The targets specify the actual mechanisms to which they are related;
- (b) The targets examine the level of effective coordination by applying a scorecard approach; and
- (c) It is clearly specified how the targets are related to the planning process.

88. For indicator A7.2, the assumptions section should describe the approach for measuring the number of males and females or geographic coverage reached by the different elements of the early warning system.

89. The “last mile” issue has been thought through appropriately and a monitoring approach has been noted in a specific project performance result, namely improved community preparedness, response capabilities and resilience to climate risks. Specifically, the use of enhanced climate information has been enshrined in last-mile EWS protocols and the monitoring and evaluation budget increased to explicitly include monitoring the uptake of information from EWS and changes that occur in the communities.

4.5.2. Implementation timetable

90. The implementation timetable for the funding proposal has been completed appropriately. It shows all activities and key milestones associated with each phase of the project and these are consistent with the logical framework.

4.5.3. Monitoring, reporting and evaluation arrangements

91. The arrangements for monitoring, evaluation, and reporting (section E.7 of the funding proposal) are adequate.

4.6 Legal assessment

92. The Accreditation Master Agreement was signed with the Accredited Entity on 15 December 2016, and it became effective on 20 February 2017.

93. The Accredited Entity has provided a legal opinion/certificate confirming that it has obtained all internal approvals and it has the capacity and authority to implement the project.

94. The proposed project will be implemented in the Cook Islands, Niue, the Republic of the Marshall Islands, the Republic of Palau and Tuvalu. GCF has signed a bilateral agreement on privileges and immunities with the Cook Islands. With respect to Niue, the Republic of the Marshall Islands, the Republic of Palau and Tuvalu, GCF is not provided with privileges and immunities. This means that, amongst other things, GCF is not protected against litigation or expropriation in these countries, which risks need to be further assessed. The Secretariat has engaged with these countries as follows:

- (a) With respect to Niue, the Secretariat submitted a draft privileges and immunities agreement to the Government of Niue on 7 April 2016. Negotiations of the agreement have not advanced since June 2018.

- (b) With respect to the Republic of Palau, the Secretariat submitted a draft privileges and immunities agreement to the Government of the Republic of Palau on 7 April 2016. The agreement is currently under the Government's review.
 - (c) With respect to the Republic of the Marshall Islands, the Secretariat submitted a draft privileges and immunities agreement to the Government of the Republic of the Marshall Islands on 7 April 2016. So far, no response has been received from the Government.
 - (d) With respect to Tuvalu, the Secretariat submitted a draft privileges and immunities agreement to the Government of Tuvalu on 26 January 2016. Negotiations of the agreement have not advanced since June 2019.
95. The Heads of the Independent Redress Mechanism (IRM) and Independent Integrity Unit (IIU) have both expressed that it would not be legally feasible to undertake their redress activities and/or investigations, as appropriate, in countries where GCF is not provided with relevant privileges and immunities. Therefore, it is recommended that disbursements by GCF are made only after GCF has obtained satisfactory protection against litigation and expropriation in such countries, or has been provided with appropriate privileges and immunities.
96. In order to mitigate risk, it is recommended that any approval by the Board is made subject to the following conditions:
- (a) Signature of the funded activity agreement in a form and substance satisfactory to the Secretariat within 180 days from the date of Board approval; and
 - (b) Completion of legal due diligence to the satisfaction of the Secretariat.

Independent Technical Advisory Panel's assessment of FP147

Proposal name:	Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean
Accredited entity:	United Nations Environment Programme (UNEP)
Country/(ies):	Cook Islands, Niue, Palau, Republic of the Marshall Islands, Tuvalu
Project/programme size:	Small

I. Assessment of the independent Technical Advisory Panel¹

1.1 Impact potential *Scale: N/A*

1.1.1. Adaptation impact

1. The proposed programme is designed to reduce loss of life and economic assets due to the impact of extreme weather events and other effects of climate change through the development of integrated climate and ocean information services and multi-hazard early warning services (MHEWS) in five small island developing States (SIDS) in the Pacific: Cook Islands, Marshall Islands, Niue, Palau and Tuvalu. Climate resilience would be enhanced through the implementation of four main components: (1) support for the development of institutional frameworks and policies, including the assessment and development of the climate services market; (2) enhancement of the climate and ocean observation networks and of the capacity for modelling, forecasting and managing climate data and information; (3) improvement of community preparedness and response capabilities, including last-mile delivery of early warnings; and (4) enhancement of regional knowledge management and cooperation for climate services and MHEWS.

2. Program activities are expected to directly benefit the entire population of the participating countries, estimated at approximately 110,000 people, who are highly vulnerable to climate-related hazards such as cyclones, droughts, extreme rainfall events and consequent floods. The combination of an improved climate and ocean information system with sufficient capabilities to forecast climatic conditions and weather events and deliver early warnings, better response capabilities and strengthened institutions would help to reduce the population's exposure to climate-related risks.

3. Component 1 aims at strengthening institutional capacities and national policies related to climate services. This would be achieved through the establishment of national platforms to facilitate coordination and collaboration amongst climate sector agencies, a market assessment of climate information services for the sector, the creation of an annual National Climate Outlook Forum to mainstream climate risk knowledge into the government, private and community sectors, and the development of national policies to promote the sustainable financial management of climate services.

4. Increasing the generation and use of climate information is the core objective of the programme. Component 2 is specifically focused on strengthening and extending the coverage

¹ This assessment is based on the funding proposal submitted to independent TAP on 2020/08/14, version V10, and the responses to independent TAP questions provided by the accredited entity.

of climate and ocean observation networks in compliance with the World Meteorological Organization Global Basic Observing Network (GBON) standards. This would be achieved through a mix of surface-based automatic weather stations, automated weather observing systems, dual-polarization X-band Doppler radar systems, marine observations, and selected upper air observations. It would also involve training and support to improve capabilities for observations, modelling, impact-based forecasting, generation of early warnings, maintenance and the establishment of quality management systems (ISO9001:2015). Marine observations would include (a) surface wave and environmental buoys for in-situ measurements of a wide range of physical and environmental oceanic variables, (b) multi-parameter water quality and pressure sensors for systematic ocean monitoring, (c) installation of a high frequency radar to provide real-time 2D current and wave data, (d) precision sensor water temperature loggers, (e) deployment of a near-breaking-zone current profiler and wave directional system, (f) an unmanned deep ocean observing vehicle, (g) installation of automatic weather stations on six inter-island shipping vessels, and (h) routine deployment of an unmanned aerial vehicle to quantify 3D shoreline change and erosion. The programme would also provide capacity-building for remote sensing-derived coastal observations such as water quality mapping, marine habitat mapping and shoreline change analysis. The expected costs and technical aspects of the proposed interventions are described with sufficient detail in the feasibility study and the operations and maintenance (O&M) plan.

5. Component 3 involves the improvement of early warning dissemination and communication systems, the enhancement of preparedness and response capabilities, and the establishment of forecast-based financing (FbF). FbF consists in a scheme where pre-agreed funds are available to implement pre-designed early action protocols before the occurrence of a climate event, based on climate forecasts.

6. In response to the request from the independent Technical Advisory Panel (TAP), the accredited entity (AE) submitted a description of the pre-identified potential sources of funding for FbF:

- (a) The forecast-based action by the Disaster Relief Emergency Fund of the International Federation of Red Cross and Red Crescent Societies is fully operational and can currently disburse 350,000 Swiss Francs (CHF) (approx. USD 384,000) per country to national Red Cross societies based on a forecasted disaster.
- (b) The United Nations Central Emergency Response Fund has set aside USD 140 million to support anticipatory early action interventions over the course of 18 months in 2020–2021, with the expectation that this would assist in the design of a sustainable FbF mechanism in the future for the Central Emergency Response Fund. This funding is available to United Nations agencies, which can create partnerships with local governments and civil society for delivery of funding.
- (c) The Start Fund Crisis Anticipation Window is a funding mechanism for non-governmental organizations to prepare for forecasted crises and respond early to mitigate the predicted impacts.

7. Component 4 is focused on establishing an interactive information and communication technology platform and a regional data centre for the management and organization of climate data, information, experiences, case studies and other forms of knowledge from the five participating countries in standardized formats aimed at end users.

8. In order to mainstream the consideration of climate-related hazards and climate change knowledge in decision-making, planning and development strategies, the programme includes the development of a National Data and Information Strategic Action Plan for each country to improve climate-related data management, governance and inter-sectoral communication (activity 2.3), the establishment of an annual National Climate Outlook Forum to provide a platform for dialogue between climate service providers, disaster risk management actors and

all relevant stakeholders (sub-activity 1.1.4), and the design and implementation of FbF (activity 3.3).

9. Sub-activity 3.2.3 involves conducting public awareness and education campaigns to enhance community knowledge and understanding of climate hazards and the potential impacts on lives and livelihoods of local populations. The interventions would be tailored to the specific needs of vulnerable groups and would include the delivery of school and community-based activities for climate change awareness, training and capacity-building workshops on climate hazards, disaster risk reduction and the use of technology to access early warning information, community-based and youth climate initiatives, climate and health wellness programmes, and the establishment of two climate information centres.

10. One of the fundamental objectives of the project is to help communities adopt new climate-resilient livelihood practices by using improved climate information and risk knowledge.² The mechanism through which climate information, including forecasts and early warnings, would reach the benefited population is adequately described in the funding proposal. However, the original funding proposal reviewed by independent TAP does not clearly indicate which concrete activities would support the conversion of current livelihoods into climate-resilient ones. Questioned about this issue, the AE explained that the Climate Information Services Sector Action and Communication Plans for key climate-sensitive sectors, such as water, agriculture, health, fisheries and tourism, which would be developed under sub-activity 1.1.3, would "...outline sector-specific actions for disaster risk reduction, management and climate change adaptation, which are essential for ensuring the long-term resilience of sectors and the livelihoods of those that work within them. For example, if a wetter-than-usual summer is forecast, communities may be advised by agriculture extension officers that particular high value crops are likely to flourish, or that cleared land should not be left uncovered due to the risk of soil loss; health authorities could be advised to work with communities to remove vector hatching sites in advance and issue warnings about ciguatera; conservation departments might take advantage of a quiet cyclone season to support communities to undertake mangrove restoration planting." The programme would ensure that information from National Meteorological and Hydrological Services (NMHSs) is translated into concrete advice for communities to protect their lives, livelihoods and assets from weather and climate extremes. The AE also clarified that under activity 3.2, the programme would deliver concrete activities focused on knowledge and capacity-building to support the adoption of climate-resilient livelihood practices and described the case for each country. In addition, the AE would monitor and evaluate the extent to which the programme facilitates communities' adoption of new climate-resilient livelihood practices through several means of verification, including surveys on target beneficiaries in the five countries, community consultation reports and national programme implementation progress reports.

1.2 Paradigm shift potential

Scale: N/A

1.2.1. Innovation

11. The combination of impact-based forecasting and FbF would represent an innovative mechanism that would improve disaster preparedness and response, and enable more efficient management of government budgets.

12. A technical aspect of the project that could be considered innovative for these Pacific islands is the installation of the dual-polarization X-band Doppler radar systems in the five countries, which would increase weather forecasting capacity and real-time monitoring of weather event intensity.

² Funding proposal, page 5.

13. However, most of the project focuses on expanding and renewing the existing observation networks and improving existing systems.

1.2.2. Potential for knowledge and learning

14. The platform and the regional data centre to be developed would serve as fundamental tools for knowledge sharing across the participating countries. This would involve the addition of a new category for climate data and information to each national climate portal, training and engagement of national climate data consultants, support to prepare national reporting for climate-related agreements, the participation of data consultants in regional forums to enhance the use of data in national planning, the establishment of electronic links with existing data sources and data backup in the regional portal, and support for all information and communication technology interventions across the five countries.³

15. The programme would also include training, mentoring and advisory services for staff in NMHSs on topics related to climate information services, observations, monitoring, modelling and prediction, marine weather and ocean services, MHEWS at national and community levels, building of community resilience against climate risks, and national stakeholder workshops and a regional workshop to facilitate knowledge transfer on improved coral bleaching model forecasting and outlooks.⁴

16. Provisions for monitoring, reporting and evaluation are adequately described in section E.7 of the funding proposal.

1.2.3. Contribution to the creation of an enabling environment

17. Each NMHS has committed to conduct sound O&M of the equipment procured under the project as well as sustain the functions of the local consultancies as they relate to positions established under the project in the areas of climatology, oceanography and climate knowledge services for up to 20 years after the end of the programme. However, the commitment letters do not mention the amount of these O&M costs.

18. Governments would seek financing aid from the Systematic Observations Financing Facility (SOFF), which is being developed by the World Meteorological Organization as a new financial mechanism to address the fundamental mismatch between the current country-based financing of basic observations and the value of these observations as a global public good. It would provide long-term finance and technical assistance to developing countries, prioritizing Africa, SIDS and least developed countries, to achieve and maintain GBON compliance and data-sharing at the global level.⁵

19. The independent TAP found that post-project O&M costs could be unaffordable for the participating countries. For example, the total annual budget allocation for "meteorological services" in the Cook Islands was USD 338,000 for the fiscal year 2018/2019, reduced to USD 70,000 for 2019/2020, and is planned to be USD 110,000 for 2020/2021, USD 116,000 for 2021/2022 and USD 116,000 for 2022/2023⁶, while the O&M of the equipment procured by the programme would cost an additional USD 317,000 annually. Approximately two thirds of this cost are consumables for upper air observations. The O&M plan states that upper air observations are no longer functioning in the Cook Islands due to, among other things, the ongoing need to fund the supply of consumables. Another example is the case of Niue, which, with a population of only 1,600, would have an additional annual O&M cost of USD 68,000. All five countries would install an X-band Doppler radar, which would each cost USD 45,000 per

³ Funding proposal, page 88.

⁴ Funding proposal, page 75.

⁵ Funding proposal, page 70.

⁶ Cook Islands Government, Budget Estimates 2019/2020, Appropriation Bill. Hon. Mark Brown, Minister of Finance. June 2019.

year for O&M. Questioned by independent TAP on the reliability of post-project financing for O&M, the AE responded that “...the SOFF will be launched in 2021 and will cover foundational surface and upper-air observations, which would include upper air land-based consumables...” and that “The five Programme countries have been confirmed as pilots for the GBON initiative through this GCF Programme. Therefore, they are in a leading position to demonstrate the value of investing in GBON both to protect local communities and benefit local populations, but also as a critical element of regional and global forecasting and climate analyses. After the Programme implementation period, they will therefore be well positioned to access the SOFF. Support from the SOFF is expected to be available to the countries to continue maintaining GBON standards including for upper air observations in Cook Islands. At the same time, CIMS is committed to maintaining, refurbishing, upgrading and operating the existing infrastructure as per their formal commitment letter dated 12 August 2020, which was issued despite the severe economic impact of COVID-19 across the Pacific island region, particularly for tourism-reliant countries such as Cook Islands.”

20. Outputs that contribute to post-project sustainability include the assessment of the climate information market to be used as a basis to promote its expansion, the development of value-added climate products and services, the engagement of the private sector, the development of national policies for financing climate services, institutional strengthening in general, and most importantly, the inclusion of training and capacity-building as cross-cutting activities in all programme components.

1.2.4. Contribution to the regulatory framework and policies

21. Through sub-activity 1.1.4, the programme would support the development of national policies aimed at enabling the sustainable financial management of climate services, thus helping ensure that each NMHS has the means to cover O&M costs after programme lifespan.

22. The market assessment under sub-activity 1.1.2 would include the identification of policy incentives to foster private sector investment in climate information and early warning services.

1.2.5. Scalability and replicability

23. Scalability is limited given that the project would already cover the entire territory of the participating countries. On the other hand, there is a high potential for replicability in other SIDS, backed by a robust knowledge management component.

1.3 Sustainable development potential

Scale: N/A

1.3.1. Environmental co-benefits

24. Programme activities do not involve significant environmental co-benefits. Some co-benefits include improved management of natural resources through the use of climate information, reduced pressure on forests due to more efficient agricultural production, and reduced use of fossil fuels through the installation of a renewable energy system for the Meteorological Office in the Cook Islands.

1.3.2. Social co-benefits

25. Social co-benefits are central to the proposed programme. Activities in Component 3 are designed to transform climate data into social benefits through the enhancement of last-mile communication systems to guarantee that communities in remote locations receive early

warnings. Improved MHEWS and adaptation planning would help reduce loss of life and damage to assets.

26. The improvement in weather forecasting and in the prediction of severe weather events would allow farmers to conduct more informed agricultural planning, potentially resulting in bigger yields, which in subsistence agriculture translates to increased food security and, consequently, improved health conditions of the population.

1.3.3. Economic co-benefits

27. The programme has the potential to reduce economic losses from climate hazards, increase the productivity of climate-vulnerable sectors – particularly fisheries and agriculture – and increase the climate resilience of livelihoods in general.

28. The introduction of FbF would serve as a tool to support funding readiness for the implementation of pre-planned disaster response actions, helping to minimize damages and reduce the need for post-disaster humanitarian assistance.

1.3.4. Gender-sensitive development impact

29. At the start, the programme would conduct a study on gender and community stakeholders to be used as a basis for the design of MHEWS to ensure that organizational and decision-making processes are gender-responsive and consider different gender groups.⁷

30. The gender action plan adequately describes the gender considerations for each programme activity.

1.4 Needs of the recipient

Scale: N/A

1.4.1. Vulnerability of the country, vulnerable groups and gender aspects

31. Due to their geographical context and the dependence of their economies and livelihoods on climate-sensitive sectors such as subsistence farming, fisheries and tourism, these SIDS are highly vulnerable to climate-related hazards such as cyclones, flooding and drought.

32. Climate data presented in the feasibility study shows that temperatures have risen over the last 65 years, with a significant increase in the number of hot days (>30 °C) and hot nights (>26 °C). All trends in annual extreme temperature indices indicate a warming climate. Ocean temperatures have also risen: the West Pacific Warm Pool has expanded over recent decades, with the area of water with temperatures exceeding 29.5 °C having increased by 400–600 per cent.⁸

33. Regarding precipitation, the proposal states that the only statistically significant trends were observed at Majuro, Marshall Islands, and involve a decrease in the number of consecutive dry days, a decrease in the total rainfall derived from very wet days (very wet days are when daily rainfall > 95th percentile), and a decrease in total wet day rainfall.⁹ However, in the north Inter-Tropical Convergence Zone subregion, where Marshall Islands and Palau are located, a seasonal negative trend in September–November total precipitation was associated with increases in drought. The feasibility study also states that “...no significant trends in drought-specific indices were reported for the regions covering Cook Islands, Niue and Tuvalu.”¹⁰

⁷ Funding proposal, page 79.

⁸ Funding proposal, page 16.

⁹ Feasibility study, page 40.

¹⁰ Feasibility study, page 67.

34. Questioned by independent TAP about drought predictions, the AE responded that seasonal variations were also found in the Southern Cook Islands and Tuvalu, and that more intense droughts “...have implications for sectors such as agriculture and water, even if annual rainfall remains similar. In addition, previous studies have found a strong relationship between ENSO¹¹ and total precipitation and between ENSO and the threshold ETCCDI¹² indices (Griffiths et al. 2003. DOI: 10.1002/joc923; McGree et al. 2014. DOI:10.1002/joc.3874). As such we infer that the increase in frequency of extreme El Niño events (Cai et al. 2014. DOI: 10.1038/nclimate2100) has downstream impacts on precipitation patterns and extreme rainfall. This is corroborated by a recent journal paper by Dr Savin Chand (Federation University Australia) (currently under review), which reports that tropical cyclone contributions to extreme rainfall in the Pacific are substantially enhanced by El Niño conditions and that there are indications of increasing intensities of tropical cyclone-induced extreme rainfall events over the past few decades.”

35. A study cited by the funding proposal found that the average rate of relative sea-level rise in the region was 2.0 millimetres (mm)/year between 1950 and 2001. As per the Intergovernmental Panel on Climate Change Fifth Assessment Report, global mean sea level will continue to rise in the 21st century and will likely be in the range of 0.26–0.82 metres by 2100, depending on different emissions scenarios.

36. The proposal states that climate studies show that predicted higher ocean temperatures would lead to more intense tropical cyclones, with increased wind speed and rainfall, as a result of climate change. However, the proposal shows that ocean temperatures have already risen, and at the same time recognizes that there are no significant trends in the overall number of tropical cyclones, or in the intensity of tropical cyclones.¹³ Questioned by independent TAP about this inconsistency, the AE responded that “...a shift in tropical cyclone intensity with increased frequency of very intense cyclones is projected for countries across the Pacific (CSIRO, Australian BoM and SPREP, 2015). At the regional level, the PACCSAP findings on climate extremes highlights that ‘scientists are confident that over the course of the 21st century tropical cyclones will become less frequent in the Pacific region, but more intense’. The IPCC AR5 report also projects that the Pacific Islands will experience ‘more extreme precipitation associated with tropical cyclones’. An increase in tropical cyclone rainfall rate of ~5 – 20% is projected by the late 21st century (Chand et al. 2020. A Review of South Pacific Tropical Cyclones: Impacts of Natural Climate Variability and Climate Change)”.

1.4.2. Economic and social development

37. The economic development of the programme countries is described in each country profile in the feasibility study and summarized in Table 1.

¹¹ El Niño-Southern Oscillation

¹² Expert Team on Climate Change Detection and Indices

¹³ Funding proposal, page 18.

Table 1
Economic development of the programme countries

Indicator	Cook Islands	Niue	Palau	RMI	Tuvalu
Population	17,459	1,618	21,729	53,127	11,000
Rural population	24.9%	56%	11.9%	26%	38%
Number of islands¹	15 islands (12 populated)	1 island	340 islands (10 populated)	29 atolls (20 populated) 5 islands (4 populated)	6 atolls and 3 islar
Surface area (km²)	237	261	466	181	26
GDP total (US\$m)	302	20.4	310	220 (2019)	49
GDP per capita (US\$)	16,698	12,945	16,632	3,866	4,421
GDP growth (2018)	7%	N.D.	0.5%	2.5%	4.3%
Secondary schooling²	87%	109%	97%	47%	66%
Life expectancy at birth³	76.4	76.3	77.8	72.5	66.5

38. The social development of the programme countries is described in the Gender Assessment and Action Plan, with gender disaggregation when available. Poverty levels range from 14 per cent in Niue to 30 per cent in the Marshall Islands.

1.4.3. Absence of alternative sources of financing

39. As explained in the proposal, financing for specific climate change-related actions is highly constrained by budget limitations. Niue and Palau have no national budget allocation for climate change programming. Cook Islands allocated 16 per cent of the total national budget for the financial period 2016/2017–2019/2020 for climate change-related actions, of which less than half was provided by the Government of the Marshall Islands and the rest came from development partners and loans. The Marshall Islands and Tuvalu are developing contingency funds, but remain dependent on foreign aid.

1.4.4. Need for strengthening institutions and implementation capacity

40. The need for institutional strengthening is recognized and addressed throughout the programme via support for the revision and development of policies related to the climate services market and financing mechanisms, fostering of coordination and collaboration between agencies, and capacity-building at all levels.

41. The NMHSs are currently able to provide basic weather and climate services to their countries, but they lack capacity for comprehensive climate and oceans observations, impact-based forecasting, early warning systems, and informed preparedness and response actions. The feasibility study includes a comprehensive description of the status and needs of the existing climate information services and early warning systems.

1.5 Country ownership

Scale: N/A

1.5.1. Alignment with national climate strategy and policies

42. The programme is aligned with the Sustainable Development Goals (SDGs), the Paris Agreement, the Sendai Framework for Disaster Risk Reduction, the Small Island Developing States Accelerated Modalities of Action (SAMOA Pathway) and the 2019 United Nations Climate

Action Summit. Its contribution to SDGs includes the areas of disaster risk reduction, ecosystem protection, climate change adaptation, health and sustainable economic development.

43. The funding proposal provides a table that demonstrates how all programme activities are aligned with the Pacific Islands Meteorology Strategy 2017–2026. All five countries have identified climate information, early warning and disaster risk reduction as priority areas in their national strategies and plans.

1.5.2. Capacity of accredited entities or executing entities to deliver

44. The AE would be the United Nations Environment Programme, whose experience and capacity is demonstrated in the proposal.

45. The executing entities would be the Central Agency for Finance and Planning of Niue, the Ministry of Environment of the Marshall Islands, the Ministry of Finance and Economic Management of Cook Islands, the Ministry of Finance of Palau and the Ministry of Finance of Tuvalu. The proposal includes, for each of the five executing entities, a brief description of their respective functions, track record and role in each sub-activity.

1.5.3. Engagement with civil society organizations and other relevant stakeholders

46. The design of the programme is the result of a two-year staged consultation process with the five self-selected partner countries and is based on the Pacific Roadmap for Strengthened Climate Services 2017–2026, to which the five NMHSs contributed.

47. Details of the engagement with NMHSs, disaster management agencies, government agencies responsible for climate-sensitive sectors, media organizations, civil society organizations, women’s community organizations, United Nations agencies and regional technical organisations are provided in the Summary of Consultations and Stakeholder Engagement Plan (Annex 7). The engagement with women’s community groups was limited to the three *Au Vaine Kumiti*¹⁴ members in Cook Islands.¹⁵

48. The design phase ended with a validation workshop with the participation of the five NMHS directors, the Cook Islands national designated authority and the United Nations Environment Programme together, during which the budget for programme activities was defined.

1.6 Efficiency and effectiveness

Scale: N/A

1.6.1. Cost-effectiveness and efficiency

49. Being of a public service nature and with a still underdeveloped market, there is no reason to think programme activities would crowd out private investment. On the contrary, the programme includes provisions to identify policy incentives that would help to unlock barriers to private sector investment in the climate services sector.

1.6.2. Amount of co-financing

50. The programme has a fairly low co-financing ratio. GCF would be providing 95 per cent of total project costs. The remaining 5 per cent would be provided by the governments of the participating countries.

¹⁴ Grassroots women’s group in Cook Islands.

¹⁵ Please note that the programme would conduct a study on gender and community stakeholders to be used as a basis for the design of MHEWS to ensure that organizational and decision-making processes are gender-responsive and consider different gender groups (point 29 of this assessment).

1.6.3. Financial viability

51. The cost-benefit analysis was conducted separately for each country. Component 4 costs and project management costs, being common to the five countries, were divided into equal parts for each country. The analysis shows that, assuming a 10-year useful life of proposed interventions and a 9 per cent discount rate, all discounted net present values are positive and the economic internal rates of return exceed the discount rates (see Table 2).

Table 2
Economic indicators

Economic Indicators	Cook Islands	Niue	Palau	RMI	Tuvalu	Total Scenarios
	(\$m)	(\$m)	(\$m)	(\$m)	(\$m)	(\$m)
NPV @ 9% d.r.	\$6.40	\$3.49	\$5.65	\$4.85	\$3.60	\$23.99
EIRR	29%	27%	31%	27%	25%	-
<i>Total costs results 1-3</i>	<i>11.09</i>	<i>7.17</i>	<i>9.60</i>	<i>8.82</i>	<i>8.46</i>	<i>45.14</i>
<i>Total regional costs result 4</i>	<i>0.31</i>	<i>0.31</i>	<i>0.31</i>	<i>0.31</i>	<i>0.31</i>	<i>1.56</i>
<i>PMC costs</i>	<i>0.48</i>	<i>0.48</i>	<i>0.48</i>	<i>0.48</i>	<i>0.48</i>	<i>2.38</i>
<i>M&E</i>	<i>0.07</i>	<i>0.07</i>	<i>0.07</i>	<i>0.07</i>	<i>0.07</i>	<i>0.35</i>
TOTAL COSTS year 1-5	11.95	8.03	10.45	9.68	9.32	49.43
TOTAL COSTS year 1-10	13.53	8.37	10.89	10.29	10.37	53.45

52. Questioned by independent TAP, the AE confirmed that the assumed avoided losses used for benefit estimation are based on the damage reduction potential for households, livestock and agriculture, each country's asset replacement costs and average annual damage figures.

53. Economic damages and losses were estimated to be reduced by 36 per cent for Niue, Palau and Tuvalu, as few investments in climate information and early warning services have taken place in these countries and therefore the full savings are anticipated. For Cook Islands and the Marshall Islands, which have already invested in climate resiliency in the past, savings of 20 per cent were assumed.

54. The sensitivity analysis considered a case with a decrease in benefits of 10 per cent, another with an increase in costs of 10 per cent, and another with both a 10 per cent decrease in benefits and a 10 per cent increase in costs, resulting in all three cases in a decrease of economic internal rates of return, but still remaining above the 9 per cent threshold in all cases.

55. The cost-benefit analysis submitted failed to include O&M costs of equipment procured by the programme for years 6 to 10, assuming zero O&M costs for this period. Questioned by independent TAP about this matter, the AE submitted a revised version of the cost-benefit analysis including O&M for 10 years. The results from this revised version are satisfactory.

1.6.4. Best practices

56. In order to promote local acceptance and trust in NMHS forecasts, activity 3.2.3 would involve engagement with community elders to discuss their traditional methods of forecasting and how traditional knowledge can be applied to complement scientific forecasts.

II. Overall remarks from the independent Technical Advisory Panel

57. The independent TAP recommends this funding proposal for approval.

Response from the accredited entity to the independent Technical Advisory Panel's assessment (FP147)

Proposal name:	Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean
Accredited entity:	United Nations Environment Programme (UNEP)
Country/(ies):	Cook Islands, Niue, Palau, Republic of the Marshall Islands, Tuvalu
Project/programme size:	Small

Impact potential

UNEP welcomes the iTAP's positive assessment of the impact potential of the Programme, which accurately reflects how its implementation will achieve the core objective of increasing the generation and use of timely, accurate and actionable climate and ocean information for enhanced resilience of the five Pacific SIDS to climate change and climate-related hazards.

Paradigm shift potential

UNEP would like to highlight that the Programme will not only strengthen the existing observation networks but will also significantly expand them to new locations to ensure that every inhabited island has an observation point – thereby significantly improving the spatial resolution of data – and will provide essential data in compliance with the Global Basic Observing Network (GBON) to feed into Numerical Weather Prediction (NWP) as a global public good.

Furthermore, UNEP agrees that the Programme has a high replication potential in other SIDS, but also highlights the potential for in-country scalability of community-based activities.

Sustainable development potential

UNEP considers the long-term environmental co-benefits of the Programme to be substantial. Actionable climate information can significantly improve natural resources management – from climate risk-informed policymaking to conservation and arresting biodiversity loss. Ocean information services support the responsible management of marine ecosystems and inform sustainable fisheries and tourism practices that minimise environmental impacts. Impact-based forecasting and decision-support tools contribute to the rapid identification of environmental risks for safeguarding of nature and biodiversity. Furthermore, detailed climate information is necessary for comprehensive environmental impact assessments and can inform energy management decisions to improve efficiency and reduce GHG emissions.

Needs of the recipient

UNEP notes the iTAP's assessment of this criterion and affirms the high vulnerability of the five Pacific SIDS to climate extremes and related hazards. UNEP further notes and agrees that the Programme addresses the urgent need for institutional strengthening and capacity building at all levels for climate and ocean observations, impact-based forecasting, early warning systems and evidence-based preparedness and response actions.

Country ownership

UNEP agrees that the Programme is well aligned with international, regional and national priorities related to climate information, early warning and DRR (e.g. priorities identified in the region's first Framework for Resilient Development in the Pacific (2017-2030)) and appreciates iTAP's recognition of its expertise and capacity to deliver as AE.

Extensive consultations were undertaken with stakeholders at different levels. National counterparts engaged additional stakeholders such as women's organisations – e.g. People's Empowerment Project (Palau) and Women United Together (RMI). Furthermore, an in-depth gender study will be conducted in partnership with SPC to further facilitate engagement of women's groups and communities.

Efficiency and effectiveness

UNEP appreciates and agrees with iTAP's recognition that the Programme will support the unlocking of barriers to private sector investment in climate services. Employing a value chain approach, UNEP anticipates the Programme to encourage private sector engagement and catalyse innovation in climate information technologies and services.

At the local level, UNEP agrees that engagement with traditional knowledge (TK) holders is highly effective in promoting acceptance and trust of scientific forecasts. Accordingly, UNEP also emphasises the value of integrating TK into climate-related decision-making to strengthen institutional response capacity, as highlighted in the IPCC Global Warming of 1.5°C report.

Overall remarks from the independent Technical Advisory Panel:

UNEP appreciates the iTAP's overall positive review of the proposal and notes with thanks the recommendation that the Board approves the Programme.

Further to the responses above, UNEP reiterates the critical value of increasing the generation and use of climate information to support climate resilience and sustainable development in five highly vulnerable Pacific SIDS. We would like to specifically highlight the considerable environmental co-benefits of the Programme, which facilitate that resilience building extends to the natural environments on which populations reciprocally depend. The strong emphasis on integrating ocean and climate information and enhancing related national capacity acknowledges the importance of strengthening marine health and the need for sustainable development of oceans, seas and coasts – as recognised by the UN Decade of Ocean Science for Sustainable Development.



Annex 8

Gender Assessment and Action Plan

Annex 8 – Gender Assessment and Action Plan

1. INTRODUCTION: Gender mainstreaming for the GCF Pacific UNEP Programme

This Gender Assessment is a formative research input for a Green Climate Fund (GCF) funding proposal being developed by UN Environment Programme (UNEP), titled: *Enhancing Climate Information and Knowledge Services for Resilience in Five Island Countries of the Pacific Ocean*.

This Programme aims to bolster climate resilience and adaptive capacities among communities, stakeholders and governments by providing climate information services in five vulnerable Pacific Island countries (Cook Islands, Niue, Palau, Republic of Marshall Islands – RMI, and Tuvalu). Classified as Small Island Developing States (SIDS), these countries have been identified as ‘climate hotspots’ (or vulnerable to climate risks and impacts due to greater exposure to coastal erosion, natural hazards, sea-level rise and saline intrusion, temperature variability, among others) compounded by the following factors:¹ remoteness and deprivation from the benefits of scale, small domestic markets and heavy dependence on a few and external markets, high volatility of economic growth, fragile natural environments, and socioeconomic as well as gendered vulnerabilities.

With four Results focused on strengthened climate information, climate modelling and predictions, and improved response capability and community resilience, the proposed Programme can strategically contribute towards greater gender equality in the five countries by:

- Adopting gender-responsive approaches for the design of climate information services;
- Promoting gender-balance, where possible, through technical and maintenance capacity-building activities of hydro-meteorological networks, equipment and systems;
- Establishing gender-aware policy frameworks to inform collaboration between climate service and national/regional hydro-meteorological stakeholders; and
- Pioneering gender mainstreaming analyses and praxis with regard to, climate information, geospatial, hydro-meteorological and early warning services in the Pacific Ocean region.

A kaleidoscope of overlapping cultural, economic, social and political roles form gender relations in the Pacific SIDS beneficiaries of this project. Given the expanse of the region and the unique markers of the different island societies, these roles have multiple facets, broadly reflecting the:

- Geographical and geopolitical specificities of the region;
- Traditional norms within intraregional societies of the five countries; and
- Gender gaps in economic roles and political representation, which also show variation between the countries.

The Programme recognises that the lack of a gender-responsive approach to address the above baseline (see Section 3 for details), particularly stemming from:

- Stereotypical views of climate services being gender-neutral;²
- Lack of incorporation of gender needs or ethnic vulnerabilities in adaptation opportunities, resilience capacities and mitigation services;³ and

¹ UN-OHRLLS – Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries, and Small Island Developing States (2015). *Small Island Developing States: Climate Change*. Report. Accessed 16 July 2019. Available at: https://sustainabledevelopment.un.org/content/documents/2189SIDS-IN-NUMBERS-CLIMATE-CHANGE-EDITION_2015.pdf

² Current literature on climate change, and its effects and emergent risks, are predominantly produced in scientific circles. Yet, there is increasing evidence that adopting social science methods, and situating resilience and adaptation practice within a broader science-policy interface and right-based perspectives, can gear projects towards environmental and socioeconomic co-benefits. Particularly, this could better prepare communities to avoid resource strife and respond to the complexity of social arrangements, reducing far-reaching impacts of climate risks. See Butterfield, R. (2018) ‘Bringing rights into resilience: revealing complexities of climate risks and social conflict’ in *Disasters*. Journal Article.

³ Poor or missing gender analysis, or the lack of gender-responsive action, may lead to planners or personnel depending on women to assume a central role in their coping strategies, which may not be the practical reality for many vulnerable communities. Further, this also glosses over the

- Paucity of financial means, gender budgeting and dedicated resources towards mainstreaming gender action.

These factors can limit the potential, inclusiveness and success of adaptive actions in the Pacific countries. Benefits of increased support and access to climate services, as well as awareness raising and capacity building, may accrue to better-off households or more mainstream groups, that are able to capitalise on new opportunities and respond better to changes ushered in by the Programme.

A 'gender lens', thus, is both necessary and relevant for the project to maximise its outcomes. This is particularly for the creation and strengthening of climate information service capacities for predicting and tackling climate change impacts, natural hazards and weather variation that cannot be avoided. An exercise of establishing institutional structures and broad-based political and socioeconomic frameworks to mobilise medium- and long-term climate change adaptation action as well as cooperation is also necessary.

To elucidate, employing a gender mainstreaming perspective will highlight and amend persistent inequalities and unequal access, which often result in specific and entrenched vulnerabilities in the region. Vulnerabilities can be defined as a set of general characteristics that impair the ability of a social group to cope with external shocks, to respond effectively to them, and to adapt to a situation of climate change.⁴ These vulnerabilities (such as economic status and political access; performance on health, education and livelihood indicators; access to productive assets, information networks, skills, among others) need addressing through climate services, as they act as impediments towards adaptive capacities against climate risks and impacts. Further, these vulnerabilities, when compounded or individually, can reverse the progress achieved in securing household economic stability (with spill-over effects on food, energy and water security) and managing community, resource and social strife, as well as reverse advances made on developmental goals and social change.

On the other hand, gender mainstreaming through the Gender and Development (GAD) approach⁵ (as adopted by the Programme) will also recognize the role marginalised and vulnerable groups can play, and not simply stylise them *a priori* as 'victims'. With an inclusive project design, they are often able to contribute traditional and artisanal knowledge of coping and improvising strategies, which can either be strengthened and mainstreamed as well as used as a basis for further capacity development.

existing burdens on women among such groups. See Nelson, V., Meadows, K., Cannon, T., Morton, J., & Martin, A. (2002) 'Uncertain predictions, invisible impacts and the need to mainstream gender in climate change adaptations' in *Gender and Development*. Journal Article.

⁴ DIE – Deutsches Institute für Entwicklungspolitik (2009). "Climate Change Adaptation from a Gender Perspective". Discussion Paper.

⁵ The GAD approach seeks to correct systems and mechanisms that produce gender inequality by focusing not only on women, but also by assessing the social status of both women and men. Moreover, it emphasizes the role of men in resolving gender inequality, and places importance on the empowerment of women, who are placed in a socially and economically weaker position than men.

2. Methodology: Identification of Gender Priorities for GCF Pacific

2.1 Appraisal of Gender Mainstreaming Priorities of GCF and UN Environment

The analytical prerogatives of this Gender Assessment and Action Plan are informed by both GCF's and UNEP's respective gender policies.

The GCF adopted a revised version of its 2014 Gender Policy and Action Plan on June 2018 in Korea.⁶ The revised Policy addresses pertinent issues on gender and climate change: the expansion of gender mainstreaming beyond the preserve of 'women's issues'; and, the identification of synergies with the in-house Indigenous People (IP) Policy as well as the United Nations Framework Convention on Climate Change (UNFCCC)'s Gender Action Plan (GAP), Sustainable Development Goals (SDGs) and Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW). Overall, the Policy and Action Plan reinforce the responsiveness of GCF to the multiple, heterogeneous, culturally diverse context of gender equality to better address and account for the links between gender equality and climate change – a perspective that this five-country Programme mainstreamed in the development of the funding proposal.

UNEP recognises the role of gender equality as a 'driver of sustainable environmental development'⁷, to not only assuage the stresses on natural resources, impending climate risks and adopting adaptive and mitigating actions, but as well to increase the visibility and capacity of vulnerable and social groups in sustainable development and climate resilient policy- and decision-making. To that end, the organisation has sought to formalise and bolster agency-wide gender mainstreaming efforts through its *Gender Equality and the Environment*⁸ policy, *Global Gender and Environment Outlook*⁹ research study, and inclusion of gender-responsive elements in previous and upcoming projects, as an accredited entity (AE) of the GCF.

2.2 Literature Review, Secondary Data and Gender Baseline

The Gender Assessment and Action Plan is informed by the following methodological steps:

- The content of this annex draws from a comprehensive desk-review and *ex-post* gender analysis of Feasibility Studies conducted for each country. Actions suggested through the action plan, and beneficiary identification (and enumeration), therefore are indicative only. At the start of Programme implementation, a more in-depth study of gender stakeholders will be conducted.
- The desk-review of existing literature was conducted on climate change adaptation (CCA), climate information systems (CIS), early warning systems (EWS), disaster risk reduction and management (DRR/M), and hydro-meteorological systems in relation to gender and the context of the Pacific SIDS. Literature was drawn from: research reports from international organisations or platforms (Secretariat of the Pacific Community – SPC, United Nations Development Programme – UNDP South Pacific, United Nations Economic and Social Commission for Asia and the Pacific – UNESCAP, etc.); multilateral development banks (the World Bank and the Asian Development Bank – ADB); journals (*Gender and Development*, *Journal of Coastal Research*, etc.); and grey literature (government reports and policies).

⁶ GCF – Green Climate Fund (2018). "Updated Gender Policy and Action Plan". Policy Document. Accessed 22 April 2019. Available at: https://www.greenclimate.fund/documents/20182/1087995/GCF_B.20_07_-_Updated_Gender_Policy_and_Action_Plan_2018_2020.pdf/9bd48527-6e35-a72a-2f52-fd401d16d358

⁷ UN Environment (2015). "Gender Equality and the Environment: Policy and Strategy". Policy Document. Accessed 19 April 2019. Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/7655/Gender_equality_and_the_environment_Policy_and_strategy-2015Gender_equality_and_the_environment_policy_and_strategy.pdf.pdf?sequence=3&isAllowed=y

⁸ UN Environment (2015). *Ibid.*

⁹ UN Environment (2016). *Global Gender and Environment Outlook*. Research Report. Accessed: 28 June 2019. Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/14764/Gender_and_environment_outlook_HIGH_res.pdf?sequence=1&isAllowed=y

- The literature review revealed useful data and research, which were informed by varied methodologies and perspectives. Thus, a derivative baseline (Section 3) from these readings was inferred to identify the gender barriers and dynamics in the five nations, and the potential entry points for this Programme.
- The next section (Section 4) presents gender-responsive elements to be incorporated within Programme outcomes to reduce climate vulnerability, particularly of at-risk households and ethnic minority groups; gender considerations and actions for stakeholders; and presents normative information to gear the overall proposal towards better socioeconomic, gender and environmental co-benefits.
- Subsequent to the above, Section 5 explores the policy environment in the Programme countries, and presents a potential list of gender collaborators, relevant for activities and stakeholder consultations during Programme implementation.

3. Socioeconomic and Gender Baseline in the Pacific Countries

3.1 Composite Indices

Implementing gender-responsive adaptation action requires situating the project’s results framework on a thorough and context-driven baseline. A primary step in understanding the baseline is collation of scores and rankings from composite indices. These indices have differing methodologies, and are being employed, as indicative (and *not* conclusive) measures of current levels of development, gender equality, and poverty and labour force participation.

As Booyesen’s research¹⁰ shows, composite indices present both challenges and advantages. For example, numerous fallacies have been identified in the methodologies employed in composite indexing. These indices are mainly quantitative, and present empirical and aggregate measures of complex development phenomena, making values apparently objective, at the cost of subjective nuances. Yet, these also remain invaluable as useful supplements to income-based development indicators, understanding relative degrees of development, simplifying complex measurement constructs as well as providing access to non-technical audiences.

This baseline, firstly, has compiled scores of three different UNDP composite indices: Human Development Index (HDI), Gender Inequality Index (GII) and Gender Development Index (GDI).

At the outset, this revealed a data gap, as figures for Cook Islands, Niue and Tuvalu are unavailable for the HDI. Further, there are no figures for the GDI and GII, as the tables below reveal. Secondly, the extent of the data gap became clearer when the baseline attempted to make references to the World Economic Forum (WEF)’s Global Gender Gap Index (GGGI) and Oxford Poverty and Human Development Initiative (OPHI)’s Multidimensional Poverty Index (MPI), where data for the project countries remain unavailable as well.

I. HDI	COOK I.	NIUE	PALAU	RMI	TUVALU
<p>HUMAN DEVELOPMENT INDEX UNDP (2018) – out of 189 countries¹¹</p> <p>This index measures and combines three basic dimensions of human development (long and healthy life, knowledge and decent standard of living) and provides an overall socioeconomic landscape of a country.</p> <p>In line with Booyesen’s argument, however, the HDI should be treated as indicative, not conclusive. It provides an overview of relative degree of development in a particular country but remains a ‘synthetic indicator’. Recent research has shown the need to supplement the HDI with other indicators associated with economic and social cohesion, sound development strategies, and sustainability in growth models.¹²</p>	-	-	60	106	-
<p>NOTE: HDI rankings for the Cook Islands, Niue and Tuvalu are not available in the latest edition, revealing the existing data gap for the region. Although HDI values are available for regional clusters such as East Asia and Pacific (0.7333 – high development) and SIDS (0.722 – high development), it is difficult to percolate these values at the national level of the project countries.</p>					

¹⁰ Booyesen, F. (2002). “An Overview and Evaluation of Composite Indices of Development” in *Social Indicators Research*, (Vol. 59 No. 2). Journal Article.

¹¹ UNDP – United Nations Development Programme (2018). *Human Development Reports*, ‘Table I: HDI and its Components’. Website. Accessed 18 June 2019. Available at: <http://hdr.undp.org/en/composite/HDI>

¹² Bilbao-Ubillos, J (2011). “The Limits of HDI” in *Sustainable Development*, (Vol. 21 No. 6). Journal Article.

<h2>II. GII</h2> <p>GENDER INEQUALITY INDEX UNDP (2018) – out of 189 countries¹³</p> <p>This index, showing inequality in achievement between men and women in three aspects (reproductive health, empowerment and labour market), provides a useful gender baseline in terms of health equity, economic capital and financial access, speaking to the gender opportunities of men and women in the countries. It provides a primary understanding of the different levels of achievements on basic development indicators between men and women. This displays useful features towards the gender status quo hypotheses, which could then be derived in the context of this project. GII should be treated as indicative, not Permmayer finds that the functional form of the index could be unclear, particularly the inclusion of indicators of relative performance of women vis-à-vis men, along with absolute women-specific indicators.¹⁴</p>	COOK I.	NIUE	PALAU	RMI	TUVALU
		—	—	—	—
<p>NOTE: GII rankings for all the project countries are not available in the latest edition, revealing the existing data gap for the region. GII values for the relevant regional clusters such as East Asia and Pacific (0.312 – high development) and SIDS (0.447 – medium development) are available; although it is difficult to percolate these values at the national level of the project countries.</p>					

<h2>III. GDI</h2> <p>GENDER DEVELOPMENT INDEX UNDP (2018) – grouped in 5 for absolute deviation¹⁵</p> <p>The GDI (UNDP) index shows the ratio of female to male HDI values. GDI expresses values in deviation, hence, in order to facilitate understanding GDI grouped categories have been used (as grouped by UNDP) to show the absolute deviation from gender parity in HDI values. This further reiterates the results of the HDI and GII (also by UNDP), and shows the real gender gap in human development achievements.</p> <p>Geske Dijkstra and Hanmer find that although gender-related development indices have increased attention towards ‘feminization of poverty and underdevelopment’, more robust data needs and indicators are required to create aggregate indices that are sensitive to contemporary trends in gendered privation, particularly with the categorization of ‘women’.¹⁶</p>	COOK I.	NIUE	PALAU	RMI	TUVALU
		—	—	—	—
<p>NOTE: GDI rankings for all the project countries are not available in the latest edition, revealing the existing data gap for the region.</p>					

¹³ UNDP – United Nations Development Programme (2018). *Human Development Reports*, ‘Table V: Gender Inequality Index’. Website. Accessed 18 June 2019. Available at: <http://hdr.undp.org/en/composite/GII>

¹⁴ Permmayer, I (2013). “A Critical Assessment of UNDP’s Gender Inequality Index” in *Feminist Economics*, (Vol. 19 No. 2). Journal Article.

¹⁵ UNDP – United Nations Development Programme (2018). *Human Development Reports*, ‘Table IV: Gender Development Index’. Website. Accessed 18 June 2019. Available at: <http://hdr.undp.org/en/composite/GDI>

¹⁶ Geske Dijkstra, A. & Hanmer, L. C (2002). “Measuring Socio-Economic Gender Inequality: Towards an Alternative to the UNDP Gender Index” in *Feminist Economics*, (Vol. 6, No. 2). Journal Article.

<h2>IV. GGGI</h2> <p>GENDER GENDER GAP INDEX WEF (2018) – out of 144 countries¹⁷</p> <p>The GGGI (WEF) benchmarks 144 countries on their progress towards gender parity on four thematic dimensions – economic participation and opportunity, educational attainment, health and survival, and political empowerment. The Index benchmarks national gender gaps on economic, political, education- and health-based criteria, and provides country rankings that allow for effective comparisons across regions and income groups.</p>	COOK I.	NIUE	PALAU	RMI	TUVALU
		–	–	–	–
<p>NOTE: GGGI rankings for all the project countries are not available in the latest edition, revealing the existing data gap for the region.</p>					

<h2>V. MPI</h2> <p>MULTIDIMENSIONAL POVERTY INDEX (2019) – out of 101 countries¹⁸</p> <p>Calculated by the Oxford Poverty and Human Development Institute (OPHI), and UNDP, the global Multidimensional Poverty Index (MPI), measures acute poverty in developing countries (covering 76% of the population). It complements traditional income-based poverty measures by capturing the severe deprivations with regard to different indicators: education, health, and living standards. The index not only identifies those living in multidimensional poverty, but the extent (or intensity) of their poverty. The MPI can help the effective allocation of resources by making possible the targeting of those with the greatest intensity of poverty; it can help address some SDGs strategically and monitor impacts of policy intervention.¹⁹</p>	COOK I.	NIUE	PALAU	RMI	TUVALU
		–	–	–	–
<p>NOTE: MPI rankings for all the project countries are not available in the latest edition, revealing the existing data gap for the region.</p>					

3.2 National Aggregate Statistics and Data

Adding nuance to the baseline established by the composite indices is the next step of understanding the gender inequality context in which the project is expected to function. The national-level data points (divided into three categories – poverty and hardship, labour and education, and, health and social indicators) presented below are *not* comparable across countries, given the different methodologies of each statistical bureau or office. These broadly speak to issues²⁰ identified by the GCF as crucial in the project design stage (such as: poverty levels, participation of men/women in formal/informal labour markets; gender-disaggregated education and literacy indicators; gender-disaggregated health, morbidity and mortality statistics, etc.) to map and mainstream existing vulnerabilities.

¹⁷ WEF – World Economic Forum (2018). *The Global Gender Gap Report*. Report. Accessed 7 July 2019. Available at: http://www3.weforum.org/docs/WEF_GGGR_2018.pdf

¹⁸ UNDP – United Nations Development Programme & University of Oxford (2019). *Human Development Reports*, 'Multidimensional Poverty Index: Developing Countries'. Website. Accessed 31 July 2019. Available at: http://hdr.undp.org/sites/default/files/mpi_2019_table_1.pdf

¹⁹ UNDP & University of Oxford (2019). *Human Development Reports*, 'MPI Technical Note'. Technical Note. Accessed 31 July 2019. Available at: http://hdr.undp.org/sites/default/files/hdr2019_technical_notes.pdf

²⁰ GCF and UN Women (2017). "Mainstreaming Gender in Green Climate Fund Projects". Policy Document. Accessed 7 June 2019. Available at: https://www.greenclimate.fund/documents/20182/194568/Guidelines__GCF_Toolkit_Mainstreaming_Gender.pdf/860d1d03-877d-4c64-9a49-c0160c794ca7

I. POVERTY & HARDSHIP	COOK I.	NIUE	PALAU	RMI	TUVALU
<ul style="list-style-type: none"> ● % OF POPULATION BELOW INTERNATIONAL POVERTY LINE 	-	-	-	-	3.3 ²¹
<ul style="list-style-type: none"> ● % OF POPULATION BELOW NATIONAL POVERTY LINE 	28.4 ²²	14 ²³	24.9 ²⁴	~30 ²⁵	26.3 ²⁶
<ul style="list-style-type: none"> ● % OF FEMALE-HEADED HOUSEHOLDS LIVING BELOW POVERTY LINE 	27 ²⁷	37.5 ²⁸	35.5 ²⁹	-	-
<ul style="list-style-type: none"> ● % OF MALE-HEADED HOUSEHOLDS LIVING BELOW POVERTY LINE 	32 ³⁰	14 ³¹	18.4 ³²	-	-
<p>NOTE:</p> <p>NATIONAL / INTERNATIONAL POVERTY LINES / HARDSHIP / VULNERABILITY: It is important to differentiate these three concepts in the context of the five Pacific project countries. National poverty lines are defined according to each country's specific economic and social circumstances. The national poverty lines are typical lower in poorer countries and higher in richer countries. International poverty lines attempt to hold the real value of the poverty lines consistent across countries by accounting for differences in purchasing power across countries.³³ According to a World Bank report³⁴, hardship and vulnerability are related, but distinct, concepts: hardship is about having low current well-being, and vulnerability is about expectations of reductions in future well-being. People can be said to experience hardship based on many different measures, such as lacking access to services or living in low-quality housing. A common measure of hardship around the world, which this report applies to the Pacific, is the inability to meet the basic needs of life as measured by consumption. On the other hand, vulnerability is based on expectations about the future. Specifically, vulnerable people face high risk, or a high probability, of a reduction in their well-being in the future, possibly to the point of experiencing hardship or deepening existing hardship.</p> <p>COOK ISLAND: In 2006, 24% of female-headed households (FHH) had just one person, which increased to 28% in 2011, as evidenced from trends in Rarotonga. This is important to note because one-person households are considered vulnerable or at a social disadvantage associated with age. Further, in 2005-2006 FHHs lived very close to the poverty line. In Rarotonga, women headed 27% of households, but such households accounted for 32% of households in the lowest 20% of household expenditures. Thus, a woman headed about 3 out of every 10 of the lowest-spending households in Rarotonga, and 1 out of 4 were headed by a woman in the Southern Group. A similar analysis based on household income estimates and sex of the household head from the 2011 Census shows that 28% of FHHs had</p>					

²¹ The World Bank (2018). *Poverty & Equity Brief: Tuvalu*. Brief Report. Accessed 3 August 2019.

Available at: <http://documents.worldbank.org/curated/en/938421528201838621/pdf/Tuvalu-PEB-Spring-2018.pdf>

²² ADB – Asian Development Bank (2016). 'Cook Islands'. Data Portal. Accessed 3 August 2019. Available at: <https://www.adb.org/countries/cook-islands/poverty>

²³ Niue Stats, part of PRISM – Pacific Regional Information System (2012). 'Poverty Indicators'. Data Portal. Accessed 3 August 2019. Available at: https://niue.prism.spc.int/index.php?option=com_content&view=article&id=38&Itemid=290

²⁴ The World Bank, Global Poverty Working Group (2006). 'Poverty headcount ratio at national poverty lines (% of population)'. Data Portal. Accessed 3 August 2019. Available at: <https://data.worldbank.org/indicator/SI.POV.NAHC>

²⁵ The Borgen Project (2017). 'Poverty Rate in the Marshall Islands'. Website. Accessed 3 August 2019. Available at: <https://borgenproject.org/poverty-rate-in-the-marshall-islands/>

²⁶ The World Bank, Global Poverty Working Group (2010). 'Poverty headcount ratio at national poverty lines (% of population)'. Data Portal. Accessed 3 August 2019. Available at: <https://data.worldbank.org/indicator/SI.POV.NAHC>

²⁷ Government of Cook Islands & SPC – Secretariat of the Pacific Community (2012). *Gender Profile*. Report. Accessed 3 August 2019. Available at: http://www.mfem.gov.ck/images/documents/Statistics_Docs/10.Other-Information/Cook-Gender-Profile.pdf

²⁸ Niue Stats & PRISM (2012). *Ibid.*

²⁹ Palau Office of Planning and Statistics & UNDP Pacific Centre (2008). *Analysis of the 2006 Household Income Expenditure and Survey*. Report. Accessed 3 August 2019. Available at: <https://www.palau.gov.pw/wp-content/uploads/2015/01/Palau-Poverty-Analysis.pdf>

³⁰ ADB – Asian Development Bank (2016). 'Cook Islands'. Data Portal. Accessed 3 August 2019. Available at: <https://www.adb.org/countries/cook-islands/poverty>

³¹ Niue Stats & PRISM (2012). *Ibid.*

³² ADB – Asian Development Bank (2016). 'Palau'. Data Portal. Accessed 3 August 2019. Available at: <https://www.adb.org/countries/cook-islands/poverty>

³³ See The World Bank, Data Help Desk (2018). 'Poverty Data: National and International Poverty Lines'. Technical Note (online). Accessed 17 April 2019. Available at: <https://datahelpdesk.worldbank.org/knowledgebase/articles/193309-should-i-use-national-or-international-poverty-lin> for more.

³⁴ See The World Bank (2015). *Hardship and Vulnerability in the Pacific Island Countries (PICs)*. Accessed 23 June 2019. Available at: <http://documents.worldbank.org/curated/en/649891468098658407/Hardship-and-vulnerability-in-the-Pacific-island-countries>

household incomes in the lowest 20%, compared with 17% of male-headed households (MHHs). While there are more MHHs in the lowest income percentiles than FHHs, a higher proportion of FHHs are in this group.³⁵

NIUE: This is the figure for 'Basic Needs Poverty', which broadly attests to the definition of hardship, as provided above.

PALAU: FHHs, in Palau, are slightly disadvantaged overall. Nationally, 26.5% of all HHs were headed by females, and accounted for 27% of urban HHs and 25% of rural HHs. FHHs were under-represented in the lowest two urban deciles, accounting for only 15% of HHs, but were very much over-represented (28% of HH) in the lowest two deciles in the rural areas. The situation was even more marked in the lowest three rural deciles, where 40% of all HHs were headed by females. In the urban centre, 30% of HHs in the lowest three deciles were headed by females suggesting that there were a considerable number of FHHs in the third decile, and therefore amongst the most vulnerable in the present circumstances of rising prices.³⁶

RMI: About 1 out of 4 (26%) households are FHHs. In 2011, average annual income for FHHs was 41% lower than for MHHs.³⁷

TUVALU: As of 2012 (UNFPA website), gender disaggregation unavailable.

See Table II on the next page.

³⁵ SPC – Secretariat of the Pacific Community (2017). *Women's Economic Empowerment in the Pacific*. Report (Regional Overview). Accessed 6 August 2019. Available at: <https://www.spc.int/sites/default/files/wordpresscontent/wp-content/uploads/2017/09/Overview-Pacific-Womens-Economic-Empowerment-SPC2.pdf>

³⁶ Palau Office of Planning and Statistics & UNDP Pacific Centre (2008). *Ibid.*

³⁷ Government of the Republic of the Marshall Islands & SPC – Secretariat of the Pacific Community (2018). *Gender Equality: Where Do We Stand?*. Report. Accessed 4 August 2019. Available at:

https://spccfpstore1.blob.core.windows.net/digitallibrary-docs/files/90/900b490b23e303a65b354ff9a89fc29b.pdf?sv=2015-12-11&sr=b&sig=qL%2Fp3e1eSxNFAokGTPeYzwaalrZtens1M%2Fylu23m4mc%3D&se=2020-02-05T09%3A58%3A12Z&sp=r&rsc=public%2C%20max-age%3D864000%2C%20max-stale%3D86400&rsct=application%2Fpdf&rscd=inline%3B%20filename%3D%22RMI_2018_Gender_Equality_Booklet.pdf%22

II. LABOUR & EDUCATION	COOK I.	NIUE	PALAU	RMI	TUVALU
• % OF LABOUR FORCE – FEMALE	65 ³⁸	74.8 ³⁹	58.1 ⁴⁰	28 ⁴¹	51.1 ⁴²
• % OF LABOUR FORCE – MALE	77 ⁴³	76.7 ⁴⁴	78.4 ⁴⁵	51 ⁴⁶	67.6 ⁴⁷
• % FORMAL LABOUR – FEMALE	54.5 ⁴⁸	46 ⁴⁹	~40 ⁵⁰	36.7 ⁵¹	36 ⁵²
• % OF ADULT LITERACY – FEMALE	79 ⁵³	-	99.1 ⁵⁴	98.2 ⁵⁵	-
• % OF ADULT LITERACY – MALE	75 ⁵⁶	-	98.2 ⁵⁷	98.3 ⁵⁸	-
NOTE: LABOUR FORCE PARTICIPATION: The labour force participation rate is a measure of the proportion of a country's working-age population that engages actively in the labour market, either by working or looking for work; it provides an indication of the size of the supply of labour available to engage in the production of goods and services, relative to the population at working age. The breakdown of the labour force (formerly known as economically active population) by sex and age group gives a profile of employment distribution of the labour force within a country. ⁵⁹					

³⁸ Ministry of Finance and Economic Management, Government of Cook Islands (2011). 'Labour Market Indicators'. Census Data (online). Accessed 4 August 2019. Available at: <http://www.mfem.gov.ck/statistics/economic-statistics/labour-market-indicators>

³⁹ UNDESA – United Nations Department of Economic and Social Affairs (2001). *Country Profile: Niue*. Accessed 4 August 2019. Available at: http://data.un.org/CountryProfile.aspx/_Images/CountryProfile.aspx?crName=Niue

⁴⁰ UNDESA – United Nations Department of Economic and Social Affairs (2005). *Country Profile: Palau*. Accessed 4 August 2019. Available at: http://data.un.org/CountryProfile.aspx/_Images/CountryProfile.aspx?crName=Palau

⁴¹ Government of the Republic of the Marshall Islands & SPC – Secretariat of the Pacific Community (2018). *Gender Equality: Where Do We Stand?*. Report. Accessed 4 August 2019. Available at:

https://spccfpstore1.blob.core.windows.net/digitallibrary-docs/files/90/900b490b23e303a65b354ff9a89fc29b.pdf?sv=2015-12-11&sr=b&sig=qL%2Fp3e1eSxNFAokGTpEYzwaalrZtens1M%2Fylu23m4mc%3D&se=2020-02-05T09%3A58%3A12Z&sp=r&rscc=public%2C%20max-age%3D864000%2C%20max-stale%3D86400&rsct=application%2Fpdf&rscd=inline%3B%20filename%3D%22RMI_2018_Gender_Equality_Booklet.pdf%22

⁴² SPC – Secretariat of the Pacific Community (2017). *Ibid.*

⁴³ Ministry of Finance and Economic Management, Government of Cook Islands (2011). *Ibid.*

⁴⁴ UNDESA – United Nations Department of Economic and Social Affairs (2001). *Ibid.*

⁴⁵ UNDESA – United Nations Department of Economic and Social Affairs (2005). *Ibid.*

⁴⁶ Government of the Republic of the Marshall Islands & SPC – Secretariat of the Pacific Community (2018). *Ibid.*

⁴⁷ SPC – Secretariat of the Pacific Community (2017). *Ibid.*

⁴⁸ Government of Cook Islands & UNFPA – United Nations Population Fund (2015). *Economic Activity and Labour Force*. Data Analysis Report (Census Data). Accessed 6 August 2019. Available at:

http://www.mfem.gov.ck/images/New_Stats_Website/12.Other_Content/Labour/UNFPA-Economic-activity-and-labour-force-of-the-Cook-Islands_Reduced.pdf

⁴⁹ SPC – Secretariat of the Pacific Community (2017). *Ibid.*

⁵⁰ *Ibid.*

⁵¹ *Ibid.*

⁵² *Ibid.*

⁵³ Government of Cook Islands, Cook Islands Ministry of Education (2017). *Education Statistics Report*. Statistical Report. Accessed 6 August 2019. Available at: <http://www.education.gov.ck/wp-content/uploads/2017/10/2017-Education-Statistics-Report-1.pdf>

⁵⁴ UNESCO – United Nations Educational, Scientific and Cultural Organization (2015), Institute for Statistics (UIS) (2015). 'Country Profile: Palau'. Data Portal. Accessed 6 August 2019. Available at: <http://uis.unesco.org/country/PW>

⁵⁵ UNESCO – United Nations Educational, Scientific and Cultural Organization (2015), Institute for Statistics (UIS) (2011). 'Country Profile: Republic of Marshall Islands'. Data Portal. Accessed 6 August 2019. Available at: <http://uis.unesco.org/country/MH>

⁵⁶ Government of Cook Islands, Cook Islands Ministry of Education (2017). *Ibid.*

⁵⁷ UNESCO UIS (2015). *Ibid.*

⁵⁸ UNESCO UIS (2011). *Ibid.*

⁵⁹ ILO – International Labour Organization. 'ILOSTAT Technical Note'. Online. Accessed 6 August 2019. Available at: https://www.ilo.org/ilostat-files/Documents/description_LFPR_EN.pdf

Reliable data on labour force participation and unemployment in small PICs are scarce and often inconsistent, finds an ADB report on Pacific labour markets.⁶⁰

FORMAL LABOUR: These figures show the percentage of female labour force involved in formal sector labour. According to the ADB⁶¹, though countries in the Pacific stand to benefit from a demographic dividend of young population, but labour markets are simply not producing enough jobs to accommodate all the young people entering the workforce each year. This has pivotal repercussions for the future, as current trends already foreshadow a high degree of unemployment among disadvantaged demographics – particularly young women. Thus, gender inequality in employment distribution and labour markets persists throughout the region. This imbalance extends to, additionally, the labour market, where women are more likely to take up vulnerable work and less likely to participate fully in the first place. The prevalence of the informal economy is a particular worry, as it comes with a shortage of decent jobs and social safety nets.

LITERACY RATE: According to UNESCO UIS, literacy rate is the percentage of population aged 15 years and over who can read and write with understanding a short simple statement on his/her everyday life. Generally, 'literacy' also encompasses 'numeracy', the ability to make simple arithmetic calculations. The Cook Island figures are the average for English and Maori literacy for both men and women.

III. HEALTH & SOCIAL	COOK I.	NIUE	PALAU	RMI	TUVALU
<ul style="list-style-type: none"> ● % MATERNAL MORTALITY RATIO (MMR) 	-	-	-	-	-
<ul style="list-style-type: none"> ● # UNDER-FIVE MORTALITY RATE, PER 1000 LIVE BIRTHS 	8.1 ⁶²	22 ⁶³	15.3 ⁶⁴	35.4 ⁶⁵	33 ⁶⁶
<ul style="list-style-type: none"> ● % EXPOSURE TO GENDER-BASED VIOLENCE (GBV) 	33 ⁶⁷	- ⁶⁸	25 ⁶⁹	51 ⁷⁰	37 ⁷¹

⁶⁰ ADB – Asian Development Bank & ILO – International Labour Organization (2017). *Improving Labour Market Outcomes in the Pacific*. Accessed 6 August 2019. Available at: <https://www.adb.org/sites/default/files/publication/409216/improving-labour-market-outcomes-pacific.pdf>

⁶¹ ADB – Asian Development Bank & ILO – International Labour Organization (2017). *Ibid*.

⁶² WHO – World Health Organization & Government of Cook Islands (2018). 'Country Cooperation Strategy 2018 – 2022'. Policy Document. Accessed 6 August 2019. Available at:

<https://iris.wpro.who.int/bitstream/handle/10665.1/13941/WPRO-2017-DPM-007-cok-eng.pdf>

⁶³ UNICEF – United Nations Children's Fund (2012). *Country Profile: Niue*. Country Brief. Accessed 6 August 2019. Available at:

https://data.unicef.org/wp-content/uploads/country_profiles/Niue/Maternal_NIU.pdf

⁶⁴ UNICEF – United Nations Children's Fund (2012). *Country Profile: Palau*. Country Brief (online). Accessed 6 August 2019. Available at:

<https://data.unicef.org/country/plw/>

⁶⁵ WHO – World Health Organization & Government of the Republic of Marshall Islands (2018). 'Country Cooperation Strategy'. Policy Document. Accessed 6 August 2019. Available at:

https://apps.who.int/iris/bitstream/handle/10665/136940/ccsbrief_mhl_en.pdf;jsessionid=A87F2F4329F4E965427D2E98EB02B1DD?sequence=1

⁶⁶ UNICEF – United Nations Children's Fund (2012). *Country Profile: Tuvalu*. Country Brief. Accessed 6 August 2019. Available at:

https://data.unicef.org/wp-content/uploads/country_profiles/Tuvalu/Maternal_TUV.pdf

⁶⁷ Data from Cook Islands National Council of Women in Government of Cook Islands & SPC – Secretariat of the Pacific Community (2012). *Ibid*.

⁶⁸ UN Women estimates that 60 to 80% of women and girls in the Pacific Islands will experience physical or sexual violence in their lifetimes, given the prevalence in the region. With regard to GBV in Niue, interviews with government officials and the police department suggest that interpersonal violence (IPV) is more common than non-partner violence in Niue. As with other Pacific Island countries and territories, the data is sparse. Comprehensive surveys on VAWG have only been conducted in 12 other PICTs in the past 10 years, and as of November 2017, Niue has not been one of them. See ICAAD – International Centre of Advocates Against Discrimination (2017). *Assessing Gender-Based Violence in Niue*. Report. Accessed 12 August 2019. Available at:

<https://www.api-gbv.org/resources/assessing-gender-based-violence-niue-2017/>

⁶⁹ UN Women, Global Database on Violence Against Women. 'Palau'. Online Database. Accessed 12 August 2019. Available at: <http://evaw-global-database.unwomen.org/en/countries/oceania/palau>

⁷⁰ UN Women, Global Database on Violence Against Women. 'Marshall Islands'. Online Database. Accessed 12 August 2019. Available at: <http://evaw-global-database.unwomen.org/en/countries/oceania/marshall-islands>

⁷¹ UN Women, Global Database on Violence Against Women. 'Tuvalu'. Online Database. Accessed 12 August 2019. Available at: <http://evaw-global-database.unwomen.org/en/countries/oceania/tuvalu>

NOTE:

MATERNAL MORTALITY RATIO & UNDER-FIVE MORTALITY RATE: The World Health Organization (WHO) identifies MMR or complications during pregnancy and childbirth as a leading cause of death and disability among women of reproductive age in developing countries.⁷² The MMR represents the risk associated with each pregnancy, i.e. the obstetric risk. It was an MDG as well as is an SDG 3 indicator. Similarly, the under-five mortality rates take stock of child deaths below the age of 5 due to preventable reasons. Inequities in child mortality between high-income and low-income countries remain large, according to the WHO.⁷³ In 2017, the under-five mortality rate in low-income countries was 69 deaths per 1000 live births – around 14 times the average rate in high-income countries (5 deaths per 1000 live births). Reducing these inequities across countries and saving more children's lives by ending preventable child deaths are important priorities, particularly under the post-2015 SDG agenda.

LIFETIME EXPOSURE TO GBV: According to the World Bank, around 1 in every 3 women in the world face/will face physical and sexual abuse during their lifetime; and, 1 in 4 children bear witness to domestic or GBV. In some Pacific countries, the statistics are telling – lifetime exposure from 40 to 70% in certain areas, making GBV incidence rates the highest in the world. The Asian Pacific Institute of Gender-based Violence (APIGBV) finds that cultural contexts of preserving family honour, shame stemming from experiencing violence, and lack of redressal and grievance mechanisms as well as low support for GBV Pacific Islander survivors are crucial in continued and elevated rates of GBV in the region. GBV statistics, sourced from either national bodies or UN Women, show that an average of 1 out of 4 women experience intimate partner violence in their lifetimes in the selected Pacific countries for the project.

⁷² WHO – World Health Organization (2018). 'Maternal Mortality'. Online Factsheet. Accessed 12 August 2019. Available at: <https://www.who.int/news-room/fact-sheets/detail/maternal-mortality>

⁷³ WHO – World Health Organization (2018). 'Under-five Mortality'. Online Factsheet. Accessed 12 August 2019. Available at: https://www.who.int/gho/child_health/mortality/mortality-under-five

4. Gender Mainstreaming, Sectoral Issues & Climate Information Services

Using the above gender baseline as the point of departure, sectoral issues in relation to gender mainstreaming for climate information services have been identified for the Programme design and planning.

4.1 Mainstream Gender within Climate Information Services in Pacific Islands Countries

The Pacific Island countries identified by the Programme are uniquely vulnerable to aggregate shocks from both economic and environmental stressors due to their countries' predicament of small size, isolation, and other geographic, economic and socio-political features. Despite several Household Income and Expenditure Surveys (HIESs) having been conducted in the region and macroeconomic impacts of negative shocks having been well studied, the impacts on household well-being and effectiveness of prevailing risk management mechanisms are not well understood.⁷⁴

Given this lacuna in data and research, impacts of climate-related risks, hazards and natural disasters in the backdrop of limited climate information services, cannot be empirically quantified but can be postulated to not generate uniformly distributed impacts within a population. The impacts and exposure compound with current prevalence of hardship, gender inequality and lack of access to social safety networks to disproportionately affect the poorer and more vulnerable demographics – determined by the needs, opportunities and risks facing men and women.

A study conducted by Practical Action⁷⁵ in Nepal and Peru, for example, finds that gender inequality and social marginalization increases vulnerability to disasters. This is primarily because pre-determined social and economic roles disallow for women to participate meaningfully in DRR and DRM decision-making. Women also tend to care-givers, in the Pacific societies, and hence have different preferences and capacities to prepare and respond – it has been observed that they prefer earlier evacuation, for example, when disaster and early warnings are announced. At the start of Programme implementation, an in-depth engagement of these stakeholders will be conducted, which will include exercises to understand how youth and vulnerable groups are placed within the household, to deliver gender-responsive climate information products.

Gender-responsive climate information services will play a unique and positive role in increasing adaptability and resilience of communities towards climate-related risks and hazards; bolstering national meteorological and hydrological services (NMHS) and climate data collection, analysis and interpretation; and strengthening early-warning services.

At the outset, mainstreaming gender in climate information services through the Programme will involve the consideration of the following factors⁷⁶ in activity design: division of labour (activity/place); visibility of labour (formal/informal sector); poverty levels; human development factors including nutrition pattern, literacy levels, health, recourse to legal protection (inheritance/land rights); survival skills; access to information; supply of information; access to critical resources (emergency aid/loans/insurance); and influence over decision-making processes. The Programme will further analyse and address the impacts of gender inequalities in the implementation of relevant sub-activities. For example, the in-country deep dive study will inform the design of gender-responsive Early Warning Systems (EWS) organisational and decision-making processes (sub-activity 3.1.1); and differential access and control of resources will be assessed for the identification of appropriate communication channels for women, youth and the elderly in the development of localised communications systems (sub-activity 3.1.2).

A study by Oxfam⁷⁷ in the Pacific region demonstrates the importance of gender-responsive adaptation approaches: through women's focus group discussions and purposive qualitative data

⁷⁴ The World Bank (2015). *Ibid.*

⁷⁵ Brown, S., et al. (2019). *Gender Transformative EWS: Experiences from Nepal and Peru*. Report. Practical Action UK.

⁷⁶ The World Bank & GFDRR – Global Facility for Disaster Risk Reduction and Recovery (n.a.). 'Disaster Risk Management in East Asia and the Pacific'. Knowledge Note (Working Paper Series no. 24/63407).

⁷⁷ Lane, R. & McNaught, R (2009). 'Building gendered approaches to adaptation in the Pacific' in *Gender and Development*. (Vol. 17, No. 1). Oxfam GB.

collection, it was discovered that – bulk of post-disaster resource allocation decisions were made by men at the household and community level; women were concerned about receiving correct and timely information from men as forecast and disaster warnings were not often relayed from the public to the private sphere (reducing the critical time required for preparing in the wake of the disaster/s); and, women were generally segregated from decision-making councils, community meetings, etc.

The Programme will minimise the risk of increasing gender-based violence (GBV) through adopting a gender-sensitive and responsive approach to EWS. Based on awareness and understanding of the specific ways in which gender relates to EWS in the five Pacific SIDS and the differential impacts of the EWS on gender groups, the Programme will ensure that disaster preparedness, response and contingency planning proactively consider gender and respond to the specific needs, concerns and capabilities of different gender groups.⁷⁸ To this end, the Programme will follow Good Practices as defined by the EU-funded Global Crisis Response Support Programme.⁷⁹ For the four key elements of EWS this implies:

- **Risk Knowledge:** risk assessments will include core questions on what gender-related factors make specific groups of women, men, girls and boys at greater risk during different types of crises.
- **Monitoring and Warning Service:** the Programme will assess which specific groups of women/men/ boys/girls have access to which types of observational information and how each group can be leveraged for this information to help monitor for early warning signs of impending crises.
- **Dissemination and Communication:** the Programme will assess gender and age differences related to communication of warnings and develop a strategy that takes these into account.
- **Response Capability:** The Programme will consider women and children as potential change agents and not just as vulnerable groups. Planning will take this factor into account and also ask women at the community level what factors need to be addressed to ensure their priority needs are also taken care of during different types of crisis and in the post-crisis recovery period.

4.2 Gear Products towards End Users in Climate-Vulnerable Sectors

A World Bank report⁸⁰ finds that of the 20 countries with the highest average annual disaster losses scaled by Gross Domestic Product (GDP), eight are Pacific island countries: including Niue (ranked 4th), the Marshall Islands (ranked 14th), and the Cook Islands (ranked 16th). Palau, in this analysis, is ranked a close 22nd. The extent of exposure, another CGIAR report⁸¹ highlights, to these impacts and losses are determined mainly by two factors: *ex ante* and *ex post* coping mechanisms, resources and information available to a community, and frequency and intensity of shocks/impacts that determines income shortages, asset loss, and cause failures of local recovery techniques built up over time. The reports reiterate the importance of climate information services for the Pacific Island countries, and how these cannot simply be limited to technical capacities and tools, particularly because expected and unavoidable variations in climatic patterns, climate-induced disasters and hazards, and unpredicted climate change risks will create different exposure patterns among communities. The in-depth study on gender and community stakeholders will include analyses to disentangle the relations of power and patronage in the five Pacific SIDS. This will build on the stakeholder consultation and mapping exercises conducted in each island, which revealed that

⁷⁸ Brown *et al.* (2019). Gender Transformative Early Warning Systems: Experiences from Nepal and Peru, Rugby, UK: Practical Action

⁷⁹ Global Crisis Response Support Programme. (2017). Good Practices for Gender in Early Warning Systems

⁸⁰ The World Bank (2013). 'Acting on Climate Change and Disaster Risk for the Pacific'. Knowledge Note. Accessed 10 August 2019. Available at: <https://www.worldbank.org/content/dam/Worldbank/document/EAP/Pacific%20Islands/climate-change-pacific.pdf>

⁸¹ CGIAR CCAFS – Research Program on Climate Change, Agriculture and Food Security (2013). 'Investigating Climate Information Services through a Gendered Lens'. Working Paper no. 42.

communities are aware of, and have some auto-adaptation methods for coping, towards climate events.

In Cook Islands, outer island consultations highlighted the necessity to expand forecasting capabilities (Pa Enea), with cross-checking capacities from local observations. In this context, Au Vaine Kumiti (women's committee) has been identified as an organization with the capacity to raise funds and dispense tropical cyclone warnings to communities. With Programme support, Au Vaine can be expected to expand to Pa Enea, among other outer islands. In Niue, Boy's and Girl's scouts play a similar role in community engagement and will be supported to ensure community prerogatives are included in the National Framework for Climate Information Services. For Palau, island disaster preparation and recovery committees, the Palau Red Cross Society, and Center for Women's Empowerment Belau are key stakeholders to both identify deeper nuances of what community activities and how women navigate these spaces. The Australian Bureau of Meteorology (BOM) and SPREP will also coordinate and collaborate with the Palau Weather Service to include traditional climate knowledge and leverage available resources in these communities. In RMI, the Marshall Islands Red Cross Society and Women United Together Marshall Islands will perform similar roles as in Palau. BOM and SPREP are also expected to instigate work on collecting and capitalizing on traditional knowledge towards integration into climate and weather advice, in collaboration of the RMI Weather Service Office. In Tuvalu, the Red Cross has been identified (as in Palau and RMI) as a key collaborator to ensure the last-mile delivery of EWS and CIS.

In order to address differential exposure patterns, climate service products, such as impact-based forecasting (analysing and disseminating implications of the forecast and specific uses of the forecast information) and nowcasting (short range weather forecasting, particularly from ground-based remote sensing systems, radars, wind profilers) etc., have to be geared towards end users, particularly those with low access in vulnerable sectors such as agriculture, fishing, pearl farming.

In the Programme design phase, consultations held in each Programme country provided insight into end user-relevant climate information services. In Cook Islands (where the economy is driven by tourism, pearl farming, fishing and agriculture) key informants and stakeholders revealed the need for tailored forecasting and information (such as agro-climate bulletins) for end users in each sector. Similarly, in Niue, consultations focused on the requirement of demand-driven climate products, interpretational capacities and technical training (for manual hydro-meteorological tools). Further, in RMI, a consolidated adaptation portal with a user-friendly interface that collates relevant climate information, and adaptation and resilience strategies for sector-specific stakeholders were requested. Lastly, in Palau and Tuvalu, funding requests prioritised national dashboards to allow for downscaling forecast data and analysis in line with user requirements, and distributable oceanic climate information to sectoral users, respectively.

At the start of Programme implementation, a deep dive into these identified community contexts in collaboration with key stakeholders will be conducted, which will improve understanding of the current gender stakeholders and the roles that they perform. This study will help in designing gender-responsive climate information products and early warning services for greater end-to-end value and effectiveness functions, in tandem with gender-responsive mapping of users and stakeholders. These processes, in the context of the Pacific island countries, have to specifically target women because they are often excluded from decision-making spheres, and lack access to information and communication channels due to cultural traditions leading to lack of investment in gender-relevant climate content development at the local level.

The case of agriculture in the Pacific islands, for example, demonstrates how women play pivotal roles in climate-vulnerable sectors. Development of Sustainable Agriculture in the Pacific (DSAP), a EU-funded SPC project,⁸² highlights how using a gender-responsive participatory consultative approach for project design recognised women's participation in the agricultural sector in seventeen

⁸² USAID & APAN – Asia Pacific Adaptation Network (n.a.). 'Integrating Gender in Climate Change Adaptation Proposals'. Online Sourcebook. Accessed 9 August 2019. Available at: <http://asiapacificadapt.net/gender-sourcebook/>

Pacific islands. Further, the successes of gender engagement of the project reveal how women are able to adopt long-term adaptation strategies (through active participation and inclusion in priority-setting and decision-making) in the project's intervention sites through capacity building and strategic extension support.

DSAP's methodology recognized and capitalised on the fact that women are generally more active in subsistence agriculture in Pacific societies because:⁸³ their male counterparts often predominate cash crop production such as sugar, copra, coconut etc., as they have greater access to agricultural training or, migrate to urban/peri-urban areas of the islands/abroad as they are culturally to attain the bread-winning role in the household. Thus, women are specifically responsible for food security within the household and have to shoulder important farm management decisions and actual labour – making them key users of agro-climate information services, impact forecasting and hydro-meteorological content. The Programme will follow the best practices and lessons learnt from the DSAP project in recognition of the need to leverage the capacities of women as key actors in food security. Additional analysis, built on the formative research presented above, will be conducted in a dedicated Gender Session within the climate sector action and communication plan (CSACP) workshops.

4.3 Utilise Community Information Channels and Local Knowledge

A complementary approach to creating user-friendly and gender-responsive climate service products is sourcing local knowledge, artisanal practices and traditional know-how to inform these outputs. Despite the vulnerability of Pacific islands to disaster and climate change variability, research shows that men and women of Pacific island communities have been successfully using knowledge of their surrounding environments to mitigate impacts and risks for generations.⁸⁴ Through a variety of traditional practices and unique coping mechanisms maintained through informal education across generations, Pacific societies have managed climate and disaster loss burdens. These methods include both community-based practices: traditional systems of exchange/warning, management of natural resources, weather pattern interpretation and information dissemination, and intra-household practices: food preservation, housing construction, etc.⁸⁵

Conducting mapping exercises, informed by participant observation and consultative approach, will be key to: understanding how local information and warning systems work; identifying community engagement and decision-making groups; and, investing in gender-relevant or women's groups. These exercises will assist in empowering women in their roles as key actors in climate-vulnerable sectors; encourage active participation and involve them as information producers; and, draw out valuable inputs for the design of climate information products.

Youth and elderly groups are part of the household structure in the Pacific islands. Women are often the primary caregivers within this household structure; therefore, this assessment prioritises gender stakeholders. However, the Programme includes specific interventions targeted at youth and elderly peoples – for example, the Youth Climate Change Awareness Camp in Niue (sub-activity 3.2.2) and engagement with community elders to integrate traditional knowledge in EWS (sub-activity 3.1.3). These interventions will deliver on increasing awareness, increasing participation, and expanding the roles played by these specific vulnerable groups.

A CGIAR⁸⁶ report finds that inclusion of traditional methods and gender-responsive design in community engagement could substitute for where modern innovations are lacking in gender awareness or accessibility, as these utilize strong social networks that have a historical continuity within the community and provide a familiar means of communication. Adaptation to technological changes is not linear, hence, these traditional methods can be easily hybridized with modern

⁸³ UN Women (2012). *Rural Pacific Island Women and Agriculture*. Report. Accessed 9 August 2019. Available at: <https://www2.unwomen.org/-/media/field%20office%20eseasia/docs/publications/2012/rural%20pacific%20island%20womenand%20agriculture.pdf?la=en>

⁸⁴ Lane, R. & McNaught, R (2009). *Ibid.*

⁸⁵ *Ibid.*

⁸⁶ CGIAR CCAFS – Research Program on Climate Change, Agriculture and Food Security (2013). *Ibid.*

technology such as (where available) radio, television and short messaging service (SMS) through telecom networks to ensure impact forecasting products and other relevant climate content are disseminated effectively. Feedback loops, by which community members, specifically women in vulnerable groups such as subsistence-dependent, can reflect upon which methods work best for their particular context, are also necessary.⁸⁷ By introducing new technologies into traditional networks and means of communication, climate information providers such as field workers from met services, may be able to extend the reach of their climate information services and help more vulnerable communities to adapt to environmental changes.⁸⁸

4.4 Create Opportunities for Women to Overcome Gendered Barriers

Section 3.2 presents different statistics related to poverty and hardship, labour and education, and health and social indicators to demonstrate the gendered realities of the Pacific islands under the purview of this project. To further the analyses, it is important to consider the intra-household dynamics between men and women pertaining to culture- and faith-based socioeconomic practices. Regionally, it is commonplace for women to participate in the bulk of domestic, care and reproductive work – which is further exacerbated⁸⁹ with productive labour due to high levels of male out-migration for seasonal work. Thus, it can be surmised that gendered time poverty in the Pacific Islands is high.

Bardasi and Wodon define an individual as ‘time poor’ if he/she is working long hours, while being simultaneously monetary poor, or facing the risk monetary poverty if he/she were to reduce his/her working hours below a given time poverty line.⁹⁰ Thus, time poverty results from the combination of two conditions: firstly, the individual does not have enough time for rest and leisure once all working hours (whether spent in the labour market or doing household chores such as cooking, and fetching water and wood) are accounted for; and, secondly, the individual cannot reduce his/her working time without either increasing the level of poverty of his/her household (if the household is already poor) or leading his/her household to fall into monetary poverty due to the loss in income or consumption associated with the reduction in working time (if the household is not originally poor).⁹¹

An additional implication of time poverty is the lack of flexibility/opportunity to change the current time usage pattern within the household to explore other economic activities, or, as in the case of this project, for autonomous or technical adaptation options towards climate resilience. For the project, the incidence of time poverty, particularly among women in the chosen Pacific islands, is an important factor to be considered in designing pilot activities, technical or maintenance capacity building, and the potential time use alterations for communities.

In addition to facing the time poverty-related risks, GBV persists as a serious epidemic in the Pacific region. Available figures suggest that between 40 – 70% of women are subjected to violence from intimate partners and families across their lifetimes. Table III (Health and Social) indicators show that about 37% of the women in the five beneficiary countries face GBV during their lifetime. Despite long-standing aid programming to target and community policing to address GBV, rates remain high due to a variety of reasons: cultural underpinnings of masculinity, power, protection and patriarchy; high incidence of alcoholism among men in certain areas; and, lack of redressal and grievance mechanisms (or lack of expression due to traditional norms informing femininity, stigma and shame).

The International Federation of Red Cross and Red Crescent Societies (IFRC), upon conducting an in-depth research⁹² on its designated regional zones and national societies, found that GBV is a constant theme in post-disaster contexts. Given the negative shocks, loss of family members,

⁸⁷ *Ibid.*

⁸⁸ *Ibid.*

⁸⁹ Chatter, P (2019). ‘Beyond development impact: gender and care in the Pacific Seasonal Worker Programme’ in *Gender and Development*. (Vol. 27, Issue. 1)

⁹⁰ Chatter, P. (2019). ‘Beyond development impact: gender and care in the Pacific Seasonal Worker Programme’ in *Gender and Development*. (Vol. 27, Issue. 1)

⁹¹ The World Bank, Poverty Reduction and Economic Management Network – Gender Group & Human Development Network, Development Dialogue on Values and Ethics (2010). ‘Working long hours and having no choice: time poverty in Guinea’. Policy Research Working Paper (no. 4961).

⁹² IFRC – International Federation of Red Cross and Red Crescent Societies (2015). *Unseen, Unheard: GBV in Disasters*. Report.

livelihoods and homes, domestic conflict levels tend to rise leading to greater incidence of GBV, among other effects on gender relations. With the increasing frequency and intensity of climate-related hazards and risks, GBV can be expected to witness an upward trend, reiterating the importance of resilience mechanisms through climate information services. Further, recent research⁹³ undertaken by the International Union for the Conservation of Nature (IUCN) with USAID has revealed potential risks of and connections with environment- and climate-related stressors on increased GBV, which is both detrimental to the well-being of survivors as well as an impediment for climate change adaptation and resilience.

⁹³ Research connecting environmental and climate-related stressors to GBV is nascent. AGENT – Advancing Gender in the Environment (USAID-IUCN partnership) is the at the forefront of collating, analyzing and identifying these stressors in different contexts.

5. Policy Environment, Legal Framework, & Potential Stakeholders

This section takes stock of the policy environment and legal frameworks available for gender-responsive climate change in the project countries (international conventions such as the Convention on the Elimination of all Forms of Discrimination against Women or CEDAW, national laws and policies, strategy documents on gender and climate change). It identifies potential institutions for collaboration on gender mainstreaming, who were also included in the stakeholder consultations (see Annex 7) during the project cycle.

Legal tools and enabling policies are crucial in ensuring that gender inequality can be addressed through tangible and formal procedures. Additionally, the inclusion of local and national gender partners engenders capacity and technical knowledge towards future gender efforts while establishing ownership of the project and the change narrative being implemented.

The Social Institutions and Gender Index (SIGI)⁹⁴ scores, indicating the relative strength of legal and social institutions in the country, are not available as of August 2019 for the Pacific nations under the Programme's purview.

I. Cook Islands

CEDAW, United Nations General Assembly (UNGA)	<p>The Convention on the Elimination of All Forms of Discrimination Against Women is the most central and comprehensive international treaty working for the advancement of women. Since its adoption in 1979 by the United Nations General Assembly (UNGA), it has been ratified by 189 states.</p> <p>2006 – Cook Islands ratified CEDAW.</p> <p>In ratifying CEDAW, the Cook Islands committed to undertake all appropriate measures, including legislation, to ensure the full development and advancement of women, for the purpose of guaranteeing them the exercise and enjoyment of human rights and fundamental freedoms on a basis of equality with men.⁹⁵</p>
National Gender Policy	<p>2018 – The Cook Islands National Policy on Gender Equality and Women's Empowerment and Strategic Plan of Action (drafted by the Ministry of Finance and Economic Management), recognises that women and men are equal partners to the development of the Cook Islands, and places gender equality at the heart of economic and social progress, giving equal value to the roles and responsibilities of Cook Islands women and men.⁹⁶</p> <p>It also recognises that in order to redress gender it is necessary to create the conditions for women's empowerment while women and men work together to address attitudinal and institutional barriers to gender equality.⁹⁷</p>
Governmental Mechanisms	<p>1979 – the Government of Cook Islands established the Women's Desk (the Women in Development Division, since renamed GADD) within the Ministry of Internal Affairs but failed to provide adequate resources.⁹⁸</p> <p>2011 – 2016 The Cook Islands National Policy on Gender Equality and Women's Empowerment includes a strategic action plan with clear policy direction, prioritisation and commitment to allocate resources for gender equality, but with</p>

⁹⁴ Calculated by the Organization for Economic Cooperation and Development (OECD), the SIGI charts the health and strength of formal and informal laws, and access to rights, justice and empowerment opportunities for women and girls by combining qualitative and quantitative variables to understand how a woman's life could be determined by discriminatory social and legal institutions. See OECD's Technical Note here.

⁹⁵ Government of Cook Islands & SPC – Secretariat of the Pacific Community (2012). *Ibid.*

⁹⁶ Government of Cook Islands, Ministry of Finance and Economic Management (2018). *Gender Policy*. Policy Document.

⁹⁷ Government of Cook Islands, Ministry of Finance and Economic Management (2018). *Ibid.*

⁹⁸ Government of Cook Islands & SPC – Secretariat of the Pacific Community (2012). *Ibid.*

very limited financial resources and technical capacity.⁹⁹

A National Steering Committee, with representatives from all government ministries and some agencies including the national council of women, has been established to provide advice and monitor implementation progress.¹⁰⁰

II. Niue

CEDAW, UNGA	<p>New Zealand ratified CEDAW in 1985 and through this process Niue acceded to the convention; however, Niue has not yet ratified CEDAW in its own right.¹⁰¹ In 2001, it was recommended that Niue undergo a CEDAW compliance assessment to identify the extent to which Niue meets CEDAW indicators, with a focus on legislative compliance and non-discrimination.¹⁰² The report was not completed, but the draft highlighted significant shortcomings in existing legislation.¹⁰³</p> <p>However, the Government of New Zealand, in collaboration with Niue, has incrementally dropped the special reservations for the non-application of CEDAW protocols and articles, such as for the Armed Forces and law enforcement forces.¹⁰⁴</p>
Gender Policies	<p>One of the strategies under the implementation of the 2009-2013 plan is to encourage increased participation of women in the development of Niue.¹⁰⁵ The indicator for this was to develop and implement a national gender equality policy by 2013 to promote the increased participation of women and support Niue to meet its international commitments to gender equality.¹⁰⁶</p>
Governmental Mechanisms	<p>The Niue Council of Women (NCW) has historically been the civil society organization identified by government to address women's issues at a local level.¹⁰⁷ Until 2010, the NCW was the sole implementing agency for government grant funds for women. These grant funds are the only government mechanism targeted to support women's empowerment and gender equality.¹⁰⁸</p> <p>A stock take of the Government's gender mainstreaming capacity undertaken by the SPC (2015) found that while the government had a draft national policy on gender equality, there was a lack of awareness on the present challenges as well as limited resources and technical capacity to address the same.¹⁰⁹</p>

III. Palau

CEDAW, UNGA	<p>Palau is one of only seven countries in world that is not a signatory to CEDAW.</p>
National Policies	<p>The Palau Constitution and Title 1 of the Palau National Code (PNC) guarantee women equality under the law¹¹⁰:</p>

⁹⁹ *Ibid.*

¹⁰⁰ *Ibid.*

¹⁰¹ SPC – Secretariat of Pacific Community (2015). *Stocktake of the Gender Mainstreaming Capacity of Pacific Island Government: Niue*. Report.

¹⁰² *Ibid.*

¹⁰³ *Ibid.*

¹⁰⁴ Ministry of Justice, Government of New Zealand (2020). International Human Rights, CEDAW. Accessed 07 July 2020. Available at: <https://www.justice.govt.nz/justice-sector-policy/constitutional-issues-and-human-rights/human-rights/international-human-rights/cedaw/>

¹⁰⁵ *Ibid.*

¹⁰⁶ *Ibid.*

¹⁰⁷ *Ibid.*

¹⁰⁸ *Ibid.*

¹⁰⁹ Australian Aid – Pacific Women. *Country brief: Niue*. Accessed 07 July 2020. Available at: https://pacificwomen.org/wp-content/uploads/2017/07/Niue-Country-Page_15Oct17.pdf

¹¹⁰ Government of the Republic of Palau & SPC – Secretariat of the Pacific Community (2016). *Stocktake of the Gender Mainstreaming Capacity of Pacific Island Government: Palau*. Report.

/ Constitution	<p>Every person shall be equal under the law and shall be entitled to equal protection. The government shall take no action to discriminate against any person on the basis of sex, race, place of origin, language, religion or belief, social status or clan affiliation, except for the preferential treatment of citizens (Palau National Constitution, Section IV.5).</p> <p>No law shall be enacted...which discriminates against any person on account of race, sex, language, or religion, nor shall the equal protection of the laws be denied (1 PNC 407).</p> <p>2012 – the Palau Family Protection Act provides protection to families from all forms of abuse.¹¹¹</p> <p>2013 – consultations began on developing a gender policy for Palau. In this context, ‘gender’ was considered to mean both men and women in balanced roles in society.¹¹²</p> <p>2013 – compilation of the proceedings from 20 years of an annual women’s conference in Palau will be completed and will contribute towards developing the policy.¹¹³</p> <p>2018 – the Palau National Gender Mainstreaming Policy was endorsed in April and is under implementation. The Policy correlates with the Convention on Elimination of all Forms of Discrimination Against Women, focusing on gender sensitive policies applicable to Palau. The Bureau of Aging and Gender under the Ministry of Community and Cultural Affairs is actively engaged with traditional women groups in implementation of the Policy.¹¹⁴</p>
Governmental Mechanisms	<p>Under the constitution of Palau, according to UN Women analysis, women are afforded equality of opportunity with men; recommendations by the association of women’s chiefs (<i>Mechesil Belau</i>) are given high consideration in legislative matters.</p> <p>Further, the Ministry of Community and Cultural Affairs consists of three wings: the Bureau of Cultural and Historical Preservation; the Bureau of Aging, Gender and Disability (ADG); Bureau of Archives and Research; and the Bureau of Youth, Applied Arts and Career (YAC).¹¹⁵</p>

IV. Republic of Marshall Islands (RMI)

CEDAW United Nations General Assembly (UNGA)	<p>RMI ratified CEDAW in 2006 and has pledged to embed CEDAW articles into legislative and policy initiatives across the governmental framework. This relates to the first Priority Outcome identified by the National Gender Mainstreaming Policy towards strengthened capacity across government to deliver gender-responsive programs and services.¹¹⁶</p>
National Gender Mainstreaming Policy and Action Plan	<p>The purpose of the National Gender Mainstreaming Policy is to guide the process of developing laws, policies, procedures and practices that will address the needs, priorities and aspirations of all women and men, working towards effectively eliminating all forms of discrimination and inequality.¹¹⁷</p>

¹¹¹ Government of the Republic of Palau & SPC – Secretariat of the Pacific Community (2016). *Ibid.*

¹¹² *Ibid.*

¹¹³ *Ibid.*

¹¹⁴ Republic of Palau (2019). *2014 – 2019 Palau National Review of the Implementation of the Beijing Declaration*. Government Report. Accessed 07 July 2020. Available at: [https://asiapacificgender.org/sites/default/files/documents/Palau%20\(English\).pdf](https://asiapacificgender.org/sites/default/files/documents/Palau%20(English).pdf)

¹¹⁵ *Ibid.*

¹¹⁶ Government of the Republic of Marshall Islands (n.a.). *National Gender Mainstreaming Policy*. Policy Document.

¹¹⁷ Government of the Republic of Marshall Islands (n.a.). *Ibid.*

	It concerns private and public sectors, local governments, and communities. It requires the mainstreaming of a gender perspective across all government policies, strategies, programs and services. ¹¹⁸
Governmental Mechanisms	<p>The Gender and Development Office, under the Ministry of Internal Affairs, is the official gender focal point of the government.¹¹⁹ The Gender and Development Office acts in an advisory and coordinating capacity.¹²⁰ It informs, advises and provides technical assistance to the various levels of government to ensure that gender inequality and women’s human rights issues are properly addressed.¹²¹</p> <p>The Gender and Development Office also coordinates the government’s efforts in addressing those issues.¹²² The Office also supports the monitoring and reporting process under the National Gender Mainstreaming Policy and other regional and international commitments promoting gender equality, and identifies areas needing further action.¹²³</p>

V. Tuvalu

CEDAW United Nations General Assembly (UNGA)	1999 – Tuvalu ratified the CEDAW and is working towards embedding CEDAW articles into the constitution, legislative and statutory reforms, and policy initiatives across the government under the recent Gender Mainstreaming Policy. The CEDAW review report is also being prepared for presentation to the CEDAW committee.
National Gender Policy	<p>2014 – the Tuvalu National Gender Policy enacted this year aims to “achieve the recognition of women and girls in Tuvalu as partners and beneficiaries in all aspects of decision making and to ensure progressive realisation of women’s human rights.”¹²⁴</p> <p>The Strategic Plan of Action (2014 – 2016) outlined a series of outputs and key actions in order to achieve the key outcomes of the Policy.¹²⁵ The National Gender Policy aims to provide the guiding framework to operationalize Government’s commitments to gender equality and women’s empowerment in Tuvalu. The Policy outlines the specific areas that the Government will focus on within the next five years and provides the basis for multi-sectoral engagement and partnerships towards the overarching goal of gender equality and the empowerment of women.</p>
Governmental Mechanisms	Tuvalu’s main gender institution is the Department of Women Affairs, which has been renamed to the Gender Affairs Department, to reflect an inclusive approach and a broader focus on gender equality and women’s empowerment.

¹¹⁸ *Ibid.*

¹¹⁹ *Ibid.*

¹²⁰ *Ibid.*

¹²¹ *Ibid.*

¹²² *Ibid.*

¹²³ *Ibid.*

¹²⁴ Government of Tuvalu (2015). *3rd and 4th Periodic review for the CEDAW UN expert committee*. Government Report. Accessed 07 July 2020. Available at: https://tbinternet.ohchr.org/Treaties/CEDAW/Shared%20Documents/TUV/INT_CEDAW_STA_TUV_19642_E.pdf

¹²⁵ Government of Tuvalu (2015). *National Gender Policy: Tuvalu*. Government Report. Accessed 07 July 2020. Available at: https://www.pacificclimatechange.net/sites/default/files/documents/Tuvalu_National_Gender_Policy.pdf

6. Conclusion: Regional Potential & Way Forward

This Gender Assessment has identified and illustrated both explicit and implicit gender and socioeconomic issues that could be addressed through the Programme Results. The findings from the Assessment also form the basis for the Gender Action Plan (Section 7), which will specify this proposal's desired results, corresponding actions, indicators, timelines, responsible parties, and budget allocations, through the results framework.

This assessment is based on gender analysis of literature and data collected through a comprehensive desk-review. It is a formative research study as well as an inventory of sources, which will be the basis for a deep dive into gender aspects relevant for the Programme at the start of the implementation period. The proposed in-country deep dive study on gender and community stakeholders will flesh out the indicative suggestions made by this Annex and will contextualise the Results areas for greater gender impact and results. The Monitoring and Evaluation (M&E) framework for the Programme will be refined on the basis of the study, paying specific attention to gender differences and gaps in coping mechanisms, resources and information availability to design appropriate indicators that will monitor the gender-responsiveness of Programme implementation.

As gender equality gains priority in the GCF's, SPC's, UNEP's and other agencies' portfolios, this Programme partakes in the international conversation on gender mainstreaming and gender-responsive planning in climate change adaptation efforts, particularly through strengthened climate information services. If implemented effectively, this Programme has the potential to become a good practice gender-mainstreaming guide for future interventions in the Cook Islands, Niue, Palau, Republic of Marshall Islands, and Tuvalu (nationally), other Pacific Ocean island nations (regionally), as well as amongst other SIDS.

7. Gender Action Plan

The Gender Action Plan (GAP) forms the basis for operationalising the results and recommendations of the Gender Assessment presented in the above sections. It contains specific gender-responsive elements to be considered in the Programme design and during the implementation of Programme activities, in order to maximise the development impact and co-benefits of the GCF investment.

The GAP is closely aligned to the outputs of the Programme logical framework and proposed activities. The GAP complements the Environment and Social Safeguards Report (Annex 6b), which identifies the Programme to be categorised as Risk Category C. This does present certain gender-related risks and the Programme has initiated mitigation of these by conducting the Gender Assessment and developing the Action Plan.

In-country deep dive study

At the start of Programme implementation, an in-depth study on gender and community stakeholders will be conducted in partnership with the Social Development Programme (Gender, Culture & Youth) of the Pacific Community (SPC). This will include: i) an assessment / analysis of women's access and control over resources (i.e. financial, natural, working capital, land support networks, etc.); ii) examination of the roles of women in various sectors (including fishing, pearl farming, tourism, etc.); and iii) analysis of the opportunities, challenges and barriers for women-headed households, indigenous groups, youth, the elderly and other disadvantaged groups. The objectives of the study are outlined below:

- Identify opportunities to strengthen the enabling environment for gender mainstreaming in government implementing partner agencies (institutions);
- Explore the gendered roles of men and women in a community site in each of the five Pacific countries, their access to and control over resources, including gendered opportunities, barriers and challenges;
- Identify existing women's groups and community networks that could support the active engagement of women and other vulnerable groups in community-based interventions;
- Recommend concrete actions to support meaningful participation of women in Programme activities;
- Study and document traditional knowledge of early warning systems and climate adaption;
- Using a gender analysis framework, explore how the overall Programme can contribute to the poverty reduction in the community, empowerment, increased awareness of rights and social justice, meaningful participation in governance mechanisms and education;
- Through establishment of a baseline, if relevant, make recommendations to ensure gender responsive measures are incorporated throughout the Programme, including within the Monitoring and Evaluation (M&E) framework.

The study will inform the gender-responsive design of Early Warning Systems (EWS) organisational and decision-making processes – to be delivered under sub-activity 3.1.1.

Provision of gender expertise across the Programme

Throughout the Programme, gender expertise will be provided in cooperation with UNEP's Gender Unit and relevant Regional Technical Partners. In particular, the Programme will partner with the Pacific Community (SPC) and its Social Development Programme, which has a strong track record in the region on Gender Equality and Social Inclusion. The central Programme Management Unit (PMU) will be responsible for ensuring this engagement and provision. The Programme Steering Committee will engage gender expertise and include specific discussions on the gender dimension of different activities of the Programme. The National Coordination Committees in the five countries will also source and engage local gender expertise, in collaboration with SPC and others.

Monitoring, evaluation and reporting

The Monitoring and Evaluation (M&E) Plan (Annex 11) will be refined on the basis of the inception phase study to design gender-specific indicators and collect associated sex-disaggregated data that will monitor the gender-responsiveness of Programme implementation – including in achieving the GAP and Environment and Social Action Plan (ESAP) targets, and facilitating adaptive management as required. Monitoring will include the collection of lessons learned from gender mainstreaming activities undertaken by the Programme. The Programme Steering Committee (PSC) will include representatives from women's organisations to facilitate that gender needs are reflected in Programme decision-making.

Grievance Redress Mechanism

The Programme will set up a grievance redress mechanism (GRM), as outlined in Annex 6b. The GRM has been designed to be able to:

- i) Record, categorise, and prioritise grievances;
- ii) Resolve grievances in consultation with the complainant and other stakeholders;
- iii) Inform the aggrieved parties about the solutions; and
- iv) Forward any unresolved cases to higher authorities for resolution.

The GRM will address any concerns and complaints from affected parties promptly and transparently through the process, with responsibilities and required activities outlined above. The GRM will be gender-responsive and readily accessible to all affected parties at no cost.

Furthermore, the Project Cooperation Agreements (PCAs) with national Executing Entities (EEs) will require that EEs put in place localised GRMs, including stakeholder consultations and national procedures relating to grievance redress. GRMs should be gender and age-inclusive and responsive, and address potential access barriers to women, the elderly, people with a disability, youth and other potentially marginalised groups. Localised GRMs shall also maintain a flexible approach with respect to receiving grievances in light of identified local constraints to communications and access to resources for some stakeholders. To facilitate communications with and between the GRM and potential claimants, the GRM will seek support from local government, civil

society organisations and women’s groups. All individuals and communities participating in the Programme activities will be made aware of the GRM and the means to access it.

RESULT 1: STRENGTHENED DELIVERY MODEL FOR CLIMATE INFORMATION SERVICES AND MHEWS COVERING OCEANS AND ISLANDS

Programme Result 1 will assist each country to establish a coherent National Framework for Climate Services (NFCS) to coordinate, facilitate and strengthen collaboration among national institutions for enhanced climate information services and products, supported by effective coordination mechanisms to integrate climate information and disaster risk knowledge into the decision-making of climate-sensitive sectors. Continuing, regular stakeholder engagement will inform the development of tailored, accessible products and services that serve the practical needs of end users. This will lead to increased understanding of and use of NMHSs’ information and advice, and reduced losses from climate variability and extreme events. Moreover, NMHS staff will gain cumulative experience in communicating with non-scientists to achieve practical outcomes and ensure that essential climate information reaches “the last mile”.

Long-term sustainability of climate services and disaster risk management will be achieved through strengthened institutional and stakeholder partnerships as a result of the NFCSs, identification of opportunities for private sector engagement and investment based on detailed market assessments, and the development of financial policies to ensure that the five NMHSs have the means to sustain and ensure the ongoing operation of their mandated services in order to mitigate weather-, climate-, and water-related risks. This will facilitate national climate funding, including through cost-recovery mechanisms from sectors, where feasible, beyond the Programme’s lifespan, based on the value chain approach.

ACTIVITY:

1.1: Strengthen institutional and policy frameworks and delivery models for climate services

SUB-ACTIVITIES	GENDER-RESPONSIVE ENTRY POINT FOR THE PROGRAMME	TIMELINE	AE / EE	ESTIMATED BUDGET
1.1.1. Develop National Frameworks for Climate Services (NFCSs)	<p>The Programme will include gender-relevant inputs from Consultation Workshops for the NFCSs through the analysis of cross-cutting gender impacts from key sectors in a dedicated Gender Session.</p> <p>The Programme will provision for gender-responsive policy elements and legislative frameworks, in alignment with WMO guidelines. The NFCSs will also include gender-sensitive performance standards (e.g. for employment of women,</p>	Year 1	AE	USD 181,600

	gender-responsive protocols and service delivery practices, and human resource management practices).			
1.1.2. Conduct market assessment to explore viable opportunities for climate information services in sectors and business segments	Market assessments will be used by the Programme to understand the sectoral needs of different climate-vulnerable segments. Particularly, focus will be given to subsistence agriculture and other sectors where women are key players, and where women's actions have impact on household food, nutritional and water security. Women's organisations will be leveraged in this context to ensure that marginalised voices are heard and provisioned for.	Year 1 – Year 5	AE + EEs	No additional cost implications
1.1.3. Mainstream climate risk knowledge into sectors	The Programme will analyse cross-cutting gender impacts in key sectors in a dedicated Gender Session within the climate sector action and communication plan (CSACP) consultation workshops. CSACPs will be drafted with gender-responsive language and actions; and include sector-specific sex-disaggregated indicators and gender indicators for monitoring and evaluation. The sector-specific climate training programme and Train the Trainers for Sectors workshop should include dedicated gender awareness, gender-specific needs and gender-responsive actions training.	Year 1 – Year 5	AE + EEs	USD 273,200
1.1.4. Develop national policies for financing climate services	The Programme will provision for gender-responsive policy elements, aligned with WMO guidelines, to incorporate gender considerations into the financial policies for climate services. The financial policies should stipulate allocation of funding for gender mainstreaming into climate services.	Year 1 – Year 5	AE	No additional cost implications

RESULT 2: STRENGTHENED OBSERVATIONS, MONITORING, MODELLING AND PREDICTION OF CLIMATE AND ITS IMPACTS ON OCEAN AREAS AND ISLANDS

Programme Result 2 will enable the five countries to expand their observation networks with robust and well-supported equipment, collecting data from critical sites such as distant inhabited outer islands and from ocean areas. Enhancing observation and monitoring network will build the foundation for

full compliance of the five countries with the requirements of the WMO Global Basic Observing Network (GBON), which “represents a new approach in which basic surface-based observations are designed, defined and monitored at the global level” and emphasises the need for access to 24/7 global observations as a global public good. Installation and capacity building for weather radar observations will further enhance extreme weather monitoring and early warning systems, and support validation of Numerical Weather Prediction (NWP) forecasts. An improved observation system in the tropical Pacific will not only benefit the host countries but also the entire global forecasting capability. One of the most significant activities in this Programme will be to establish end-to-end ocean services. This is a major priority for Pacific NMHSs, in response to user demand for ocean climate information, particularly relating to fishing conditions and safety. The ocean is a fundamental climate regulator and is the major influence on the climate of small, isolated islands, but the small economies of the Programme countries render most modern equipment and consumables infeasible to obtain.

This Result will support the implementation of the Global Framework for Climate Services (GFCS) helping to address deficiencies in the Observation and Monitoring Pillar of the GFCS in Cook Islands, Niue, Palau, RMI and Tuvalu. This is fully in line with the Pacific Roadmap for Strengthened Climate Services 2017–2026, which proposes several regional and national actions within the GFCS pillars.

ACTIVITIES:

2.1: Enhance infrastructure and technical support for observations and monitoring

2.2: Strengthen ocean and climate modelling and impact-based forecasting

2.3: Harmonise climate data and information management

SUB-ACTIVITIES	GENDER-RESPONSIVE ENTRY POINT FOR THE PROGRAMME	TIMELINE	AE / EE	ESTIMATED BUDGET
2.1.1. Enhance national observations and monitoring networks to GBON standards and establish Quality Management Systems (QMSs)	The Programme will encourage, where possible, 50-50 gender disaggregation in technical personnel hired towards enhancing national observation and monitoring networks.	TBD	AE + EEs	No additional cost implications
2.2.1 Establish ocean information services	The Programme will encourage, where possible, 50-50 gender disaggregation in technical personnel hired for ocean information services.	TBD	AE + EEs	No additional cost implications

2.2.2 Enhance climate information and impact-based forecasting	The Programme will promote a gender-responsive approach to delivering impact-based forecasts and climate information products. A range of stakeholders for community and gender resilience have been identified in each of the five SIDS (including women's groups, Scouts, church groups, Red Cross societies, etc.). The early warning communication strategies and community feedback mechanisms (established under sub-activity 3.1.1) will facilitate that climate information and impact-based forecasts are understandable for local usage in climate-vulnerable contexts, and that these climate products reach the last mile.	Year 1 – Year 5	AE + EEs	USD 337,900
2.3.1 Establish and implement national climate data and information strategies	The Programme will include standards for gender mainstreaming in these data and information strategies. This will include the requirement for collection of sex- and age-disaggregated data and information, where relevant.	Year 1- Year 5	AE + EEs	USD 164,100

RESULT 3: IMPROVED COMMUNITY PREPAREDNESS, RESPONSE CAPABILITIES AND RESILIENCE TO CLIMATE RISKS

Programme Result 3 contributes to the attainment of the overall Goal of the Sendai Framework for Disaster Risk Reduction: “The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries”. In particular, the Programme will contribute to the Framework’s Global Target (g) “Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030”.

The Programme will also contribute to the outcomes of the 2019 UN Climate Action Summit, in particular targets 3 and 4 of the Risk-informed Early Action Partnership (REAP) on investment in “early warning system infrastructure and institutions to target early action in ‘last/first mile’ communities” and “more people are covered by new or improved early warning systems...”.

Furthermore, this Result will introduce Forecast-based Financing (FbF) in the five countries as an innovative mechanism whereby early actions at community and government level are pre-planned based on credible forecasts, and are funded and implemented before a climate shock to minimise losses and damages caused by climate-related hazards and reduce the need for humanitarian assistance in their aftermath.

ACTIVITIES:**3.1:** Improve warning dissemination and communication**3.2:** Enhance preparedness and response capabilities**3.3:** Establish Forecast-based Financing (FbF)

SUB-ACTIVITIES	GENDER-RESPONSIVE ENTRY POINT FOR THE PROGRAMME	TIMELINE	AE / EE	ESTIMATED BUDGET
3.1.1. Strengthen EWS organisational and decision-making processes	<p>The Programme will conduct an in-depth study on gender and community stakeholders in partnership with the Social Development Programme (Gender, Culture & Youth) of the Pacific Community (SPC) at the start of the implementation period. This will include assessment of access to and control over resources; women's roles in various sectors; and opportunities, challenges and barriers for women-headed households and other vulnerable groups.</p> <p>Furthermore, the Programme will encourage 50-50 disaggregation of men and women participating in EWS workshops. Active participation of women will be encouraged through flexible timing, provision of women-only sessions/focus groups and female trainers, where required, to respect cultural boundaries. Early warning communications strategies and SOPs will include responsive actions to address the specific needs of women, youth, elderly people and other vulnerable groups. The SOPs should facilitate that common standards for gender mainstreaming in information collection, communication, and community feedback mechanisms, etc. are applied across the five countries.</p>	Year 1 – Year 5	AE + EEs	USD 100,000
3.1.2. Strengthen communication systems to reach the last-mile	The Programme will analyse the capacities of “high risk” groups – including women, youth and elderly people – to access and understand early warning information and identify appropriate communication channels to disseminate information to vulnerable groups. This will inform the development and/or installation of localised communication systems, infrastructure and information products that utilise a multi-channel communications and gender-responsive approach.	Year 1 – Year 5	AE + EEs	USD 240,000

3.1.3. Communicate early warnings to island communities	The Programme will encourage 50-50 disaggregation of men and women participating in the co-design of early warning information products. Active participation of women will be encouraged through flexible timing, provision of women-only sessions/focus groups and female trainers, where required, to respect cultural boundaries. Early warning information products will be tailored to the needs and capacities of different end-users (e.g. language requirements, literacy levels, etc.).	Year 1 – Year 5	AE + EEs	USD 56,000
3.2.1. Enhance disaster preparedness and response measures	The Programme will adopt a gender-responsive approach to the development and delivery of community-based disaster preparedness and response interventions, plans and training; and will stipulate that disaster risk management approaches also address the specific needs of youth and elderly people. The Programme will partner with local women’s organisations (e.g. the Palau Centre for Women’s Empowerment) to deliver targeted, gender-responsive activities based on local and traditional knowledge.	Year 1 – Year 5	AE + EEs	USD 972,200
3.2.2. Conduct public awareness and education campaigns on climate hazards and risks	The Programme will adopt a gender-responsive approach in enhancing public awareness and education on climate risks and hazards to ensure that information is tailored to the varying needs and capacities of different end-users (e.g. language requirements, literacy levels, different levels of access to communications assets). The Programme will partner with local women’s organisations and youth groups (e.g. Au Vaine Kumiti in Cook Islands and the Girls and Boys Brigades in Niue) to deliver tailored information based on local and traditional knowledge.	Year 1 – Year 5	AE + EEs	USD 554,600
3.2.3. Integrate traditional knowledge into early warning services	The Programme will encourage 50-50 disaggregation of men and women participating in traditional knowledge training and workshops. Active participation of women will be encouraged through flexible timing, provision of women-only sessions/focus groups and female trainers, where required, to respect cultural boundaries. Active inclusion of elderly groups will play a key role in this sub-activity.	Year 1 – Year 5	AE + EEs	USD 862,400
3.3.1. Develop FbF Roadmaps defining thresholds and triggers	The Programme will ensure that the FbF Roadmaps are drafted in gender-neutral language and include specific gender-responsive actions within the Roadmap ‘next steps’.	Year 1 – Year 5	AE + EEs	No additional cost implications

3.3.2. Build capacity for FbF	The Programme will operationalise gender-responsive actions recommended in the Roadmaps to ensure that capacity to implement FbF mechanisms is built in a gender equitable manner.	Year 1 – Year 5	AE + EEs	USD 100,000
3.3.3. Support development of Early Action Protocols (EAPs)	The Programme will encourage active participation of multiple stakeholders in FbF technical working groups and EAP development to ensure that various sectors are represented: women, men, youth and elderly people, etc. The EAPs should be gender-responsive and tailored to the specific needs of vulnerable groups.	Year 1 – Year 5	AE + EEs	USD 187,500

RESULT 4: ENHANCED REGIONAL KNOWLEDGE MANAGEMENT AND COOPERATION FOR CLIMATE SERVICES AND MHEWS

Programme Result 4 will optimise synergies among the Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu. Benefits of the multi-country approach include: i) facilitation of strategic partnerships, stronger relationships and collaboration; ii) cost efficiency, ease of planning and coordination; iii) knowledge sharing; iv) increased awareness of the Programme, leading to increased likelihood of replication of community interventions across the region; v) South-South cooperation modalities enhancing the multiplier effects of the Programme. To this end, the Programme will organise joint learning events and training; promote equipment, software and tools common to all five countries; and foster networking and mentoring among the five NMHSs. The Result will directly address the key education and training needs – such as Forecasting and Numerical Weather Prediction (NWP), Instrumentation and Observation and Climate Services – reported by Pacific NMHSs to WMO and in a study conducted by the Disaster Resilience for Pacific SIDS (RESPAC) project.

This regional approach will ensure optimal knowledge management by sharing lessons learned and information on best practices. Programme Result 4 will complement and build on existing mechanisms for the entire Pacific region such as the newly established Pacific Climate Change Centre (PCCC), the Pacific Meteorological Council (PMC), the Regional Climate Outlook Forum, WMO regional meteorological centres and training and regional learning institutions such as the University of the South Pacific (USP) and its Pacific Centre for Environment and Sustainable Development (PaCE-SD).

ACTIVITY:

4.1: Enhance regional data, knowledge management and cooperation

SUB-ACTIVITIES	GENDER-RESPONSIVE ENTRY POINT FOR THE PROGRAMME	TIMELINE	AE / EE	ESTIMATED BUDGET
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4.1.1. Establish interactive ICT platform	Technical personnel hired and/or trained for ICT platform, through the Programme, will have 50-50 disaggregation where possible. New hiring will be done through a progressive policy of equal opportunity recruitment.	TBD	AE + EEs	No additional cost implications
4.1.2 Organise learning, mentoring and training	The Programme will encourage 50-50 disaggregation of men and women participating in learning, mentoring and training activities. Expert technical advisory will be provided on best practice climate information services, including gender-responsive implementation.	Year 1 – Year 5	AE + EEs	USD 638,100
