Concept Note

Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean

Cook Islands; Niue; Palau; Republic of the Marshall Islands; Tuvalu | United Nations Environment Programme (UNEP)

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GREEN CLIMATE FUND

Concept Note

Project/Programme Title:	**Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean**
Country(ies):	Cook Islands; Niue; Palau; Republic of the Marshall Islands; Tuvalu
National Designated Authority(ies) (NDA):	Office of the Prime Minister (Cook Islands), Project Management and Coordination Unit (Niue), Office of the President (Palau), Office of Environmental Planning and Policy Coordination (Republic of the Marshall Islands), Government of Tuvalu (Tuvalu)
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A. Project/Programme Summary (max. 1 page)			
A.1. Project or programme	☐ Project ☒ Programme	**A.2. Public or private sector**	☒ Public sector ☐ Private sector
A.3. Is the CN submitted in response to an RFP?	Yes ☐ No ☒ If yes, specify the RFP:_____	**A.4. Confidentiality**	☐ Confidential ☒ Not confidential
A.5. Indicate the result areas for the project/programme	Mitigation: Reduced emissions from: ☐ Energy access and power generation ☐ Low emission transport ☐ Buildings, cities and industries and appliances ☐ Forestry and land use Adaptation: Increased resilience of: ☒ Most vulnerable people and communities ☒ Health and well-being, and food and water security ☐ Infrastructure and built environment ☐ Ecosystem and ecosystem services		
A.6. Estimated mitigation impact (tCO2eq over lifespan)		**A.7. Estimated adaptation impact (number of direct beneficiaries and % of population)**	Beneficiaries: up to 100,000 people at risk of climate-induced extreme events and hazards (entire population of Cook Islands; Niue; Palau; Republic of the Marshall Islands and Tuvalu). Most vulnerable are the populations living in coastal zones (90-100%).
A.8. Indicative total project cost (GCF + co-finance)	Amount: USD 50 million	**A.9. Indicative GCF funding requested**	Amount: USD 47 million
A.10. Mark the type of financial instrument requested for GCF funding	☒ Grant ☐ Reimbursable grant ☐ Guarantees ☐ Equity ☐ Subordinated loan ☐ Senior Loan ☐ Other: specify_____		
A.11. Estimated duration of project/ programme:	5 Years	**A.12. Estimated project lifespan**	10 Years
A.13. Is funding from the Project Preparation Facility requested?	Yes ☐ No ☒ Other support received ☐ If so, by who:	**A.14. ESS category**	☐ A or I-1 ☐ B or I-2 ☒ C or I-3
A.15. Is the CN aligned with your accreditation standard?	Yes ☒ No ☐	**A.16. Has the CN been shared with the NDA?**	Yes ☒ No ☐
A.17. AMA signed (if submitted by AE)	Yes ☒ No ☐	**A.18. Is the CN included in the Entity Work Programme?**	Yes ☒ No ☐
A.19. Project/Programme rationale, objectives and approach of programme/project (max 100 words)	Small Island Developing States across the Pacific Ocean are increasingly threatened by similar climate-related impacts and hazards such as cyclones, coastal storm surges, droughts and sea level rise, which result in considerable damages to livelihoods, assets and ecosystems. Appropriate adaptation interventions to address climate change threats, require tailored climate information and people-centred multi-hazard early warning services covering oceans and islands for all sectors. This programme will build capacity to provide such services for 5 vulnerable Pacific Island Countries by using a multi-country approach. The AE will convene a range of partners, including the Secretariat of the Pacific Regional Environment Programme and the World Meteorological Organization.[1]		

[1]Potential partners: Pacific Regional Environment Programme (SPREP); Secretariat of the Pacific Community (SPC), Pacific Islands Forum Secretariat (PIFS), University of the South Pacific (USP); World Meteorological Organization (WMO); National Oceanic and Atmospheric Administration (NOAA), Global Ocean Observing System (GOOS); Pacific Islands Global Ocean Observing System (PI-GOOS), Pacific Meteorological Council (PMC), National Meteorological Services, National Ministries of Environment, Pacific Climate Change Centre (PCCC), World Adaptation Science Programme (former PROVIA); Global Centre of Excellence on Climate Adaptation; UNESCO/Abdus Salam International Centre for Theoretical Physics ; AP Climate Center (APCC); GRID Centers; International Federation

B. Project/Programme Information (max. 8 pages)

B.1. Context and baseline (max. 2 pages)

Current and future climate vulnerabilities and impacts

Pacific Small Island Developing States (SIDS) are among the countries most vulnerable to climate change.[2] As their land mass accounts for only around 2% of the entire Pacific region,[3] the state of ocean ecosystems is especially critical to the wellbeing of island populations. They are already experiencing the impacts of rising sea levels, rising sea surface temperatures and ocean acidification.

Climate variability in the Pacific region is driven by three major extensive bands of large-scale convergence zones (**Figure 1**). The Inter Tropical Convergence Zone (ITCZ); the South Pacific Convergence Zone (SPCZ); and the Western Pacific Monsoon (WPM).[4] The interplay between these climate drivers causes dramatic changes in weather in South Pacific islands, most obviously during El Niño and La Niña events. Rainfall decreases south west of the SPCZ and increases to the north east and many South Pacific island nations therefore have drastic changes in weather, dependent on the position of the SPCZ.

As Pacific SIDS, the 5 programme countries (Cook Islands, Niue, Palau, Republic of the Marshall Islands and Tuvalu) are increasingly under threat from common challenges related to climate change and climate variability. Current climate change impacts 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.[5] 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 intensity[6] and most climate change projection models indicate an increase in the proportion of more intense storms by the late 21st century.[7]

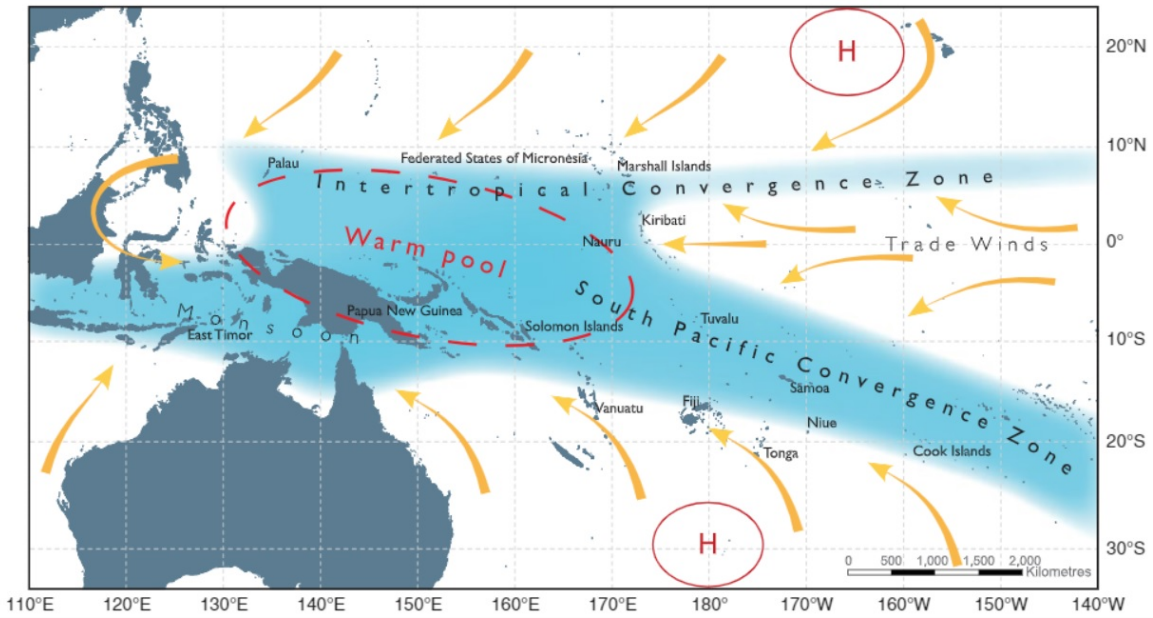

Figure 1: Map showing the average positions of the major climate features of the western tropical Pacific region in November to April. The yellow arrows show near surface winds, the blue shading represents the bands of rainfall (convergence zones with relatively low pressure), and the red dashed oval indicates the West Pacific Warm Pool. H represents the typical positions of moving high pressure systems.

of Red Cross (IFRC) societies in the Pacific; International Ecosystems Management Partnership (IEMP); National Meteorological services of Australia, New Zealand.

[2] UNEP, 2014. GEO Small Island Developing States Outlook

[3] http://www.sprep.org/attachments/Publications/PECCO_lr.pdf Page 26

[4] Pacific Community, Vulnerability of Pacific Island agriculture and forestry to climate change, 2016.

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

[6] The Economics of Climate Change in the Pacific, Asian Development Bank 2013

[7] Government of Australia, PACCSAP Volume 1: Regional, 2011.

A summary of key climate variables for each of the 5 programme countries is presented in an annex.

The Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu are all situated in the area of the South Pacific regularly subject to tropical storms.[8] Between 1820 and 2006 the Cook Islands witnessed 143 tropical cyclones.[9] Palau has seen 68 typhoons between 1945 and 2013[10] and between 1969 and 2010, 63 tropical cyclones passed within 400 km of Niue.[11] The Marshall Islands are affected less by tropical cyclones and are subject to major storms once every 4-7 years with the northern islands being hit more frequently than the southern islands.[12] Tuvalu has been hit by 13 major typhoons since 1972: one of the most recent was tropical cyclone Pam which in 2015 reached category 5. 45% of Tuvalu's population was displaced and $92 million of damage was caused.[13]

Damage costs of climate change are significant for SIDS in general and the programme countries in particular: Cook Islands, Niue, Palau and the Marshall Islands**)** are in the top 20 countries when measuring average annual losses from natural disasters as a percentage of GDP according to World Bank statistics (**Figure 2**). Most of these losses are caused by tropical cyclones.[14]. Modelling shows future tropical storms are likely to see windspeed increases if global temperatures continue to increase, which will result in more destructive tropical storms.[15]

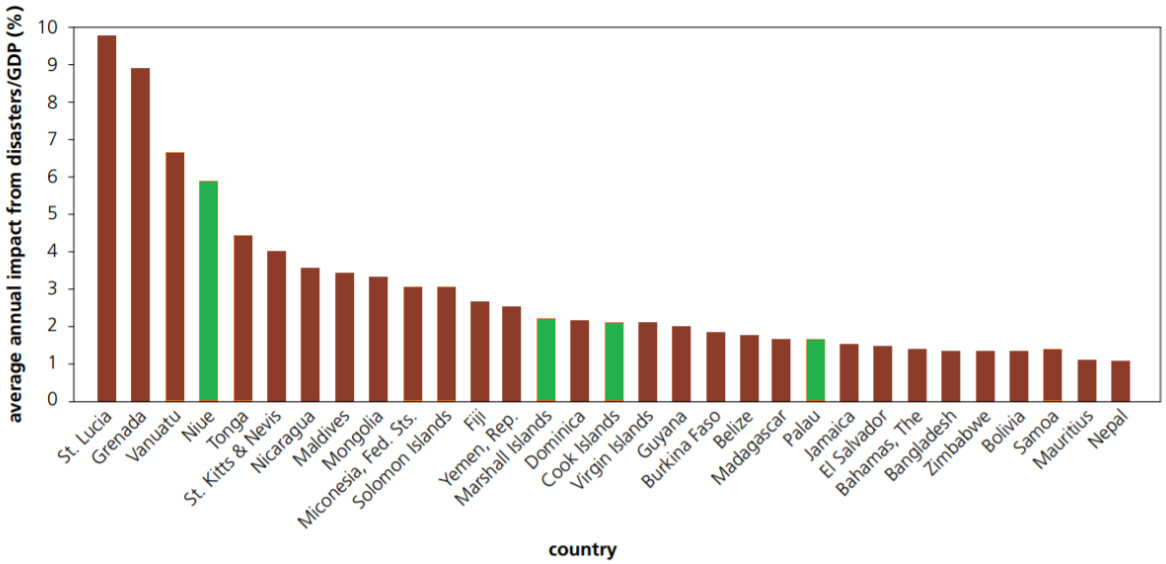

Figure 2: Countries with highest average annual losses as a percentage of GDP[16]. Programme countries are highlighted in green.

Historical data is available on the deaths and financial damage caused by climate-related disasters in the Pacific region starting from 1831[17] although it most likely underestimates deaths and financial losses, especially in earlier years. The main contributors to deaths and financial losses in the Cook Islands, Niue, Palau, the Marshall Islands and Tuvalu are tropical cyclones. Estimated deaths and losses caused by climate related hazards provided on the UNISDR DesInventar platform are summarized in the table below, with the caveat that the data has significant gaps.

Country	Deaths Caused by Tropical Cyclones	Losses caused by Tropical Cyclones (US$)	Losses caused by Floods (US$)	Losses caused by Drought (US$)	Losses caused by Storm Surges (US$)
Cook Islands	79	174,828,456	50,000	0	0

[8] Historical Tropical Cyclones (Earth Observatory)
[9] Tropical Storm frequency in Cook Islands
[10] Tropical Storm frequency in Palau
[11] Tropical Storm frequency in Niue
[12] Tropical Storm frequency in Marshall Islands
[13] Cyclone Pam
[14] Acting on Climate Change & Disaster Risk for the Pacific (World Bank)
[15] C. M Patricola, M. F. Wehner, Nature, 2018, **563**, 339-346
[16] Acting on Climate Change & Disaster Risk for the Pacific (World Bank)
[17] DesInventar Data

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

Baseline climate information services

Due to the vast ocean areas, the large number of dispersed islands, changing climatic conditions, capacity constraints and other root causes and barriers, it has been difficult for Pacific SIDS to put in place comprehensive and sustained climate information and multi-hazard early warning services through National Hydrometeorological Services (NMHSs). Amongst others, this is due to a lack of capacity for comprehensive climate observation, impact-based forecasting, early warning systems and response actions. While efforts have been made to improve the quality of climate data collected through the current climate observations networks there are still many gaps especially related to ocean areas and outer islands. The *Pacific Island Meteorological Strategy 2017-2026*[18] summarized the situation as follows:

- **Weather Services:** Many NMHSs[19] 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.
- **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 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.
- **Ocean Services:** In many Pacific island countries, there is no official purveyor of ocean information, and enquiries are directed to the NMHS. The Strategy has identified ocean services as a long-term goal. Technical skills for ocean services are a priority.
- **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.

More specifically, the baseline for climate information services in the 5 programme countries and gaps that will be addressed on this programme can be summarized as follows:

The ***Cook Islands*** Meteorological Service (CIMS) is a division of the Ministry of Transport. It provides weather updates, forecasts and warnings. The Second Joint National Action Plan for Climate Change and Disaster Risk Management 2016-2020 (JNAP II) and country consultations[20] highlights the following gaps and priorities:

- Need to strengthen the capacity of CIMS to collect and manage data and information on weather and climate variability – especially severe weather and natural hazard events and impacts;
- Capacity building and training;
- Developing GIS capabilities;
- Collecting information, data and traditional knowledge relevant to adaptive fishing and farming.[21]
- Enhancing/Extending the current observational network
- Enhanced dissemination of products (local language, graphical products, newsletters, reports)
- Development of sector-specific products

In ***Niue***, the Meteorological Service aims to deliver credible and efficient weather and climate information. In its reporting to the Pacific Meteorological Council (PMC), the following gaps and priorities were identified:

- Increasing capacity of human resource development through capacity building and training to enhance and strengthen weather and climate services;
- Providing sector-specific climate information for fisheries, agriculture, health and tourism;
- Outreach on weather, climate and hazards for village communities;

[18] https://www.pacificclimatechange.net/sites/default/files/documents/PIMS_2017-2026_FINAL-.pdf
[19] This particularly applies to very small Pacific countries, including the five partners to this proposed project.
[20] Pacific Science Solutions, Cook Islands Benchmarking exercise for PIMS, 2017
[21] JNAP II: https://www.pacificclimatechange.net/sites/default/files/documents/cok170758.pdf

- Implementation of Climate Early Warning Systems (CLEWS);
- Providing actionable climate information in local language for communities and schools.[22]

In ***Palau***, the National Weather Service (NWS) provides weather, hydrologic, and climate forecasts and warnings. NWS data and products form a national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the community. The national Climate Change Policy (2015) highlights disaster risk management as a strategic priority and recognizes the role of the Palau National Weather Service and its tracking systems. It furthermore identifies gaps and priority actions to be addressed related to:

- The assessment of climate change and disaster vulnerability/risk at multiple levels;
- Emergency communication;
- Integration of climate change and disaster risk reduction education into school curricula;
- Other disaster preparedness and risk reduction measures.[23]

In the ***Republic of the Marshall Islands***, the Weather Service Majuro comprises of 3 main programmes: Supervisory; Operation; Forecast and Warnings. The following gaps and priority areas to be addressed have been identified including:

- The enactment of laws to govern weather services;
- Staff capacity building;
- Better observational coverage;
- The establishment of more additional observing sites in the cooperative climate network.[24]
- The second National Communication to the UNFCCC highlighted that "Data management also remains a key gap to be addressed in RMI's response to climate change. Topographic data and GIS layers relevant to climate change management in the Marshall Islands remain to be digitized from old maps, created from fieldwork, and/or consolidated. These data are the building blocks needed to develop models to simulate weather events and impacts"[25].
- The Joint National Action Plan (JNAP) for climate change adaptation and disaster risk management stresses the need for effective dissemination of early warning products from the Weather Service to government agencies, NGOs and communities, along with suitable action / response plans[26].

In ***Tuvalu***, the climate change policy emphasizes the need to understand and communicate climate change and its impacts. Regarding the Tuvalu Meteorological Services, it identifies gaps and priority areas to be addressed including:

- Capacity building for climate services;
- Enabling policy and legislation within the Tuvalu NMS;
- Replacement and maintenance of old equipment;
- Translating weather and climate information for end users;
- Enhancing public and school awareness of weather and climate information;
- Improving inter-island communication.[27]

There is a multitude of projects addressing aspects of climate information management in Pacific Countries. For example, the Pacific Climate Change Science Programme (PCCSP)[28] and 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.[29] However, significant data gaps continue to exist in priority areas such as oceans, fisheries, air pollution, health, agriculture and energy. The lack of harmonization in data collection and management with regard to i) transparency, ii) verification, iii) frequency of updates, iv) security and v) spatial coverage due to the project-based nature of climate information efforts hampers effective responses to climate change. Data, information and research are often not accessible to potential users due to a lack of sustained institutional and technical capacity at national levels, which is in turn due to the small size of the countries, insufficient data sharing among institutions and the low priority frequently given to outreach activities.

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, RMI, Tuvalu and Palau, are particularly vulnerable due to a lack of awareness of existing climate data and information caused by difficult

[22] Reporting on National Priority Actions of the Pacific Islands Meteorological Strategy (PIMS) 2012-2021 https://www.pacificmet.net/sites/default/files/inline-files/documents/Niue%20PMC-4%20Country%20Report%20Final_0.pdf
[23] https://www.pacificclimatechange.net/sites/default/files/documents/PalauCCPolicy_WebVersion-FinanceCorrections_HighQualityUPDATED%2011182015Compressed.pdf
[24] Reporting on National Priority Actions of the Pacific Islands Meteorological Strategy (PIMS) 2012-2021 https://www.pacificmet.net/sites/default/files/inline-files/documents/11.7%20Marshal%20Islands%20Country%20Report%20-%20PMC-4%20FINAL.pdf
[25] https://unfccc.int/sites/default/files/resource/mhlnc2.pdf
[26] https://pafpnet.spc.int/attachments/article/782/RMI-JNAP-CCA-DRM-2014-18.pdf
[27] Tuvalu climate change policy, 2012 https://reliefweb.int/sites/reliefweb.int/files/resources/TUV_2012_Te_Kaniva_CCpolicy.pdf
[28] Pacific Climate Change Science Programme (https://www.pacificclimatechangescience.org/)
[29] http://www.sprep.org/inform/home

communication systems with remote outer islands. These countries have a number of outlying islands with weak communication and transport networks. As a result, these communities often do not have the actionable climate information needed for initiating timely responses or enhancing their resilience.

Problem statement

The livelihoods and economies of Cook Islands, Niue, Palau, Republic of the Marshall Islands and Tuvalu depend heavily on the ocean and sectors such as fisheries, tourism and agricultural production. Changes in precipitation and cyclone patterns are already having devastating effects on the availability of fresh water, agricultural yields and loss 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. Lives, livelihoods, assets and infrastructure are threatened by several climate-related hazards as summarized above. As recognized 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 to and reducing vulnerability of Pacific people to climate-related hazards and the effects of climate variability and climate change[30] but governments in these small countries need support in integrating climate information from their NMHSs into their planning and management processes.

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 too often constrained by a lack of human, financial and technical resources to develop and deliver those services.[31] These constraints include gaps in geographical coverage (e.g. of ocean areas and outer islands), the lack of capacity to deal with multiple aspects of climate-related risks and hazards, incomplete coverage of the entire climate information landscape from data collection to delivery and response of users, constrained communication and outreach systems especially to communities on remote outer islands, and a lack of comprehensive end-to-end Early Warning Systems.

The common vulnerabilities, climate change impacts and capacity challenges outlined above limit the ability of the 5 countries to provide appropriate climate information services for planning and implementing adaptation interventions across all economic sectors and all governance levels. Moreover, they restricts their capability to safeguard island populations and assets against multiple similar climate-related hazards through effective early warning.

Root causes and barriers

The lack of capacity of the Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu to sustainably provide essential climate information services to decision-makers results from numerous factors, including similar constraints relating to:

- legislation establishing the role and responsibilities of the weather service and ensuring its funding—this particularly applies to RMI and Tuvalu, but all five countries would make efficiency gains from clarification of their NMHSs' mandate and the relationship with national disaster management organisations and other national partners;
- sustainable financing of institutions and technologies ensured through legislation and where possible through fee for service agreements (most feasible for aviation services);
- policy frameworks that structure the science-policy interface;
- formal structures for delivering early warning systems and tailored hydro-meteorological information to end users;
- access to expertise for analysis of climate risks and hazards, climate modelling and hydro-meteorological data;
- access to more geographical data, especially for ocean areas;
- knowledge management, communication and outreach systems especially for widely dispersed island communities (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[32]);
- capacity of vulnerable communities and sectors to interpret and use climate information services;
- weak coordination of projects and programmes focussing on climate information services;
- inadequate resources for delivery of tailored, appropriately-packaged climate information to end-users; and
- use of outdated technologies.

The effect of these constraints is that decision-makers, the public and private sectors are not being provided with the appropriate climate information for addressing climate change risks and hazards facing their countries and the region at large.

[30] https://www.pacificclimatechange.net/sites/default/files/documents/PIMS_2017-2026_FINAL-.pdf
[31] Pacific Roadmap for Strengthened Climate Services 2017 – 2026
[32] https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap29_FINAL.pdf

Proposed solutions

This GCF programme will address the common vulnerability of the island populations, their livelihoods and assets to climate change impacts and multiple climate-related hazards in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu. Besides facing common challenges and vulnerabilities, these 5 countries have indicated interest in adopting demand-driven solutions that establish sustainable climate information and multi-hazard early warning systems in the same timeframe as follows:

- Addressing gaps in national institutional settings, policies and coordination mechanisms for effective climate information services and multi-hazard early warning in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu. It will enhance the collection, analysis and use of climate data and information in these countries and build the capacity of decision-makers and national institutions to use climate information. Moreover, this programme will put in place the national capacities for end-to-end, multi-hazard people-centred early warning systems and ensure that each country has legislation that clearly and accurately states the role of its NMHS and provides for ongoing national funding for its functioning.
- Strengthening and modernizing the National Meteorological and Hydrological Services (NMHSs) in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu. This will significantly strengthen the ability of the 5 countries to base climate adaptation planning and decision-making on the best possible climate data and information. The strengthened observations, monitoring, modelling and impact-based forecasting of NMHSs will underpin the national multi-hazard early warning services by providing timely and reliable data and information on climate-related hazards and their expected impact on people, livelihoods and assets. The programme will also include outputs and activities that strengthen and institutionalize the linkages between NMHSs and other key actors and end-users to ensure uptake, analysis and use of climate information and support each NMHS in discussions with national partners to confirm and formalise, or establish, its role in
    - Climate change awareness and education
    - Informing climate change planning for adaptation
    - Climate advocacy in international forums
    - Provision of local climate and weather information services
    - Provision of or contribution to multi-hazard early warning systems
    - Ocean services/management and hydrology
- Enhancing social resilience to climate change and building national response capability to multiple climate-related hazards. The programme will not only secure the delivery of climate information and early warnings to end-users but work with them to co-design and co-produce information products and warnings that are actionable and effective. Furthermore, the programme will support community-based early warning schemes, e.g. on remote outer islands.
- Establishing a regional multi-country hub with related ICT infrastructure and the organization of learning events to ensure optimal knowledge management including best practices and lessons learned. In view of the importance of ocean data for the 5 countries, there will be targeted activities to strengthen marine weather and ocean services.

Through these activities, the programme will support the five NMHSs to generate and disseminate critical climate risk information enabling the Governments of Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu to design and implement transformative policies and plans, reducing the exposure and vulnerability of their populations, economic sectors (e.g. agriculture, fisheries, tourism, health) and critical infrastructure (ports, roads, bridges, electricity transmission lines, water and sanitation facilities) to climate-related hazards and the impacts of climate change. The programme will thus effect a paradigm shift to evidence-informed climate adaptation, risk reduction and multi-hazard early warning by integrating the use of climate information across all government entities and stakeholders. The programme has been designed to facilitate sustainability of climate information services for the long term. Through the integration of climate services in key policies, strategies, plans and budgets, this programme will provide a foundation for the uptake of climate information in decision-making and facilitate sustainable service provision beyond the programme duration. The identification of funding modalities for climate information products and a multi-stakeholder and multi-sector programme approach will contribute to this sustainable modus operandi. Furthermore, the programme will facilitate the integration of Multi-Hazard Early Warning Systems (MHEWSs) into government policies, decision-making processes and emergency management systems at national and community levels.

Contribution to regional and national adaptation needs and priorities

The SAMOA pathway adopted by the Third International Conference on Small Island Developing States in 2014 contains a comprehensive set of priorities for addressing the unique vulnerabilities of SIDS.[33] This programme will address the needs highlighted in the SAMOA pathway for:

- technical assistance for early warning systems,
- risk assessment and data,
- observation equipment,
- disaster risk management,

[33] https://sustainabledevelopment.un.org/samoapathway.html

- 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
- strengthened capacity for acquiring and managing climate data/information to raise awareness and share environmental data, to increase resilience to the impacts of climate change.

To address existing climate impacts and to prepare for predicted increases in climate change and disaster risks, the *Pacific Island Meteorological Strategy 2017-2026*[34], the *Pacific Roadmap for Strengthened Climate Services 2017-2026*[35] and the *Honiara Ministerial Statement on Sustainable Weather, Climate, Oceans and Water Services for a Resilient Pacific* were adopted through the Pacific Meteorological Council, the Pacific Ministerial Meeting on Meteorology and other relevant bodies:

- The *Pacific Island Meteorological Strategy 2017-2026* is a key reference and guidance document for this programme. The programme will directly address many of the PIMS's identified "Pacific Key Outcomes" in the priority areas of improved weather services, disaster risk reduction, improved climate and hydrological services, integrated observing and communication systems, and coordinated support for NMHSs.
- The *Honiara Ministerial Statement* emphasized the importance of climate and weather information and that 80% of disasters in the region are caused by severe weather events. It also emphasized ocean and aviation services to strengthen sustainable economic growth, public safety and security and comply with national obligations under the Safety of Life at Sea (SOLAS) Convention and International Civil Aviation Organization (ICAO) regulations.
- The *Roadmap* identifies key actions for implementing the Global Framework for Climate Services (GFCS).[36] This programme responds directly to the activities prioritized in the *Roadmap* under the GFCS pillars on: climate services information system; observations and monitoring; research, modelling and prediction; and capacity development. The *Roadmap* also emphasizes the importance of institutional capacity to support and coordinate national climate services. In this regard, the Pacific Meteorological Council has created the Pacific Islands Regional Climate Centre (PI-RCC) Network to host and provide climate data and information services.

Most recently, at the 49th Pacific Islands Forum in September 2018, leaders reaffirmed their recognition that the greatest threat to Pacific Nations is climate change. Leaders emphasized the need for greater intra-regional and inter-sectoral collaboration particularly in relation to sustainable fishery resources, which are dependent on marine ecosystems.[37]

At the national level, Pacific Island Countries have identified climate information as a priority area in their national strategies and plans—INDCs/NDCs, NAPAs, NAMAs and NAPs—and have committed to achieving progress. Pacific countries' NAPAs note that awareness and education on weather and climate and on the implications of climate change for communities are critical steps in adapting to climate change. A few illustrative country examples of priorities that will be addressed by this programme are:

- The ***Cook Islands*** Second Joint National Action Plan for Climate Change and Disaster Risk Management 2016-2020 (JNAP II) includes priority actions to enhance national capacity to provide early warnings for slow and fast-onset hazards; and to improve climate and disaster research and monitoring, information generation, management and sharing. Furthermore, the JNAP II prioritizes community-based integrated vulnerability assessment, climate change adaptation and strengthening of disaster risk management and planning.[38]

- ***Niue's*** National Climate Change Policy identifies the following objectives "1. Awareness Raising – To promote public awareness and improve stakeholder understanding of the causes and effects of climate change and climate variability and as well as on vulnerability, adaptation and mitigation responses; 2. Data Collection, Storage, Sharing, and Application – To improve and strengthen the collection, storage, management and application of climate data, including greenhouse gases and emissions, to monitor climate change patterns and its effects".

- One of the strategic goals identified in ***Palau's*** Climate Change Policy (2015) is to establish the enabling framework 'to build safe, resilient, and disaster prepared communities in Palau" by strengthening mechanisms for control, coordination, decision making, accountability, and organizational arrangements for disaster management and disaster risk reduction[39]. Palau's NDC stresses the importance of partnership, finance, technology support and capacity development to implement the national climate chance policy.

[34] https://www.pacificclimatechange.net/sites/default/files/documents/PIMS_2017-2026_FINAL-.pdf
[35] https://www.pacificmet.net/sites/default/files/inline-files/documents/PMC-4%20WP%2024.1%20Att%201%20-%20Pacific%20Roadmap%20for%20Climate%20Services.%20docx.pdf
[36] http://www.wmo.int/gfcs/
[37] https://uploads.guim.co.uk/2018/09/05/1FINAL_49PIFLM_Communique_for_unofficial_release_rev.pdf
[38] JNAP II: https://www.pacificclimatechange.net/sites/default/files/documents/cok170758.pdf
[39] https://www.pacificclimatechange.net/sites/default/files/documents/PalauCCPolicy_WebVersion-FinanceCorrections_HighQualityUPDATED%2011182015Compressed.pdf

- The Joint National Action Plan (JNAP) for climate change adaptation and the Disaster Risk Management National Action Plan (DRM NAP) of the ***Republic of the Marshall Islands*** express priorities such as mainstreaming "natural hazard risk considerations (climate-related, geophysical and others)… in all relevant processes of development and budgetary planning at all levels and in all relevant sectors"; "regularly updating its climate vulnerability assessments"; putting in place "people focussed early warning systems and emergency communications"; improving "national and local capacity to undertake vulnerability and adaptation assessments and planning"; improving "awareness of the causes and impacts of climate change and disasters…including what constitutes an effective adaptation response".

- One of the goals of ***Tuvalu's*** National Climate Change Policy (2012–2021) is "Improving Understanding and Application of Climate Change Data, Information and site-specific Impacts Assessment to Inform Adaptation and Disaster Risk Reduction Programmes". It also highlights the need to provide modern infrastructure and adequate well trained and competent human resources to gather, process, archive and facilitate the rapid exchange of data and products; build capacity to maintain high standards of observation instruments, equipment and data backup system; build and enhance partnerships and cooperation and improve communication systems for sharing of climate information within the Pacific countries with the help of their NHMSs; and improve protection of life and property through early warning services.[40]

B.2. Project/Programme description (max. 3 pages)

This programme will increase resilience and protect the lives and livelihoods of the people of the Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu through a paradigm shift to climate-risk informed planning, decision-making and response actions.

The programme will create an enabling environment for new business model for tailored, timely climate information and early warning services for inhabited islands and ocean areas delivered by NHMSs, which are crucial for building climate resilience and underpinning long-term resilient development. As climate-related hazards increase, the programme will enhance timely, reliable, holistic and easily accessible climate and weather information with a special focus on oceans, for use in policy development, planning, decision-making, response actions and community resilience. This will eventually lead to a reduction in the number of people and assets affected by climate-related hazards.

This will be achieved through the programme's four components, which are fully aligned with the *Pacific Island Meteorological Strategy 2017-2026,* the *Pacific Roadmap for Strengthened Climate Services 2017-2026* and key policy documents of the five countries. Components 1, 2 and 3 focus on national interventions in the 5 programme countries whereas component 4 is regional and aimed at maximizing synergies and knowledge management among the countries. Specific activity plans for each country will be elaborated in the full funding proposal.

Component 1. Strengthened climate information services covering oceans and islands supported by institutions, coordination mechanisms, policies and financial frameworks

This component will address gaps in national institutional settings, policies and coordination mechanisms for effective climate information services and multi-hazard early warning in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu. It will enhance the collection, analysis and use of climate data and information in these countries and build the capacity of decision-makers and national institutions to use climate information. Moreover, this component will put in place the national capacities for end-to-end, multi-hazard people-centred early warning systems.

Output 1.1: Institutional and policy frameworks for climate information services and early warning systems

a) Establishment or strengthening of a national framework and institutional coordination mechanisms for climate information services in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu.
    a. Based on WMO, UNISDR guidelines and international best practice, this will ensure effective governance, coordination and management of national climate services.
    b. It will ensure all agencies with roles in multi-hazard early warning systems in the 5 countries coordinate to provide effective services.
    c. The development, revision or strengthening of national meteorological acts governing NHMSs will be supported.
b) Mainstreaming of climate services in national sustainable development strategies, national development plans, relevant sector strategies and associated budgets.
    a. The integration of climate services in key policies, strategies, plans and budgets will provide a foundation for uptake of climate information in decision-making.

[40] http://prdrse4all.spc.int/system/files/tuvalu_climate_change_policy_te_kaniva_english_final_web_new_0.pdf

b. It will facilitate sustainable service provision in the long term beyond the programme's term by identifying funding modalities for climate information products and promoting integration in national budgets.

c) Establishment of comprehensive multi-hazard monitoring and warning services in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu through the development of hazard monitoring frameworks and early warning services in the 5 countries.

Output 1.2: Generation, analysis and use of climate information and early warnings for islands and ocean areas

a) Implementation of harmonized approaches, protocols and standards to the generation, management and sharing of climate data and geospatial information in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu. This will improve the quality and accessibility of climate data and information—a pre-condition for effective analysis and use of the information. There will be a special emphasis on ocean-related data and information.

b) Design and implementation of systematic data collection and risk assessment processes pertaining to multiple climate-related hazards in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu, to improve risk knowledge among national decision-makers, institutions, sector leaders and communities.

c) Design and implementation of "last-mile" warning dissemination and communication systems for risk information and early warnings on multiple climate-related hazards affecting the populations of Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu. This will include common alert protocols, distribution networks of warning signals and harmonized communication and reporting protocols.

d) Development of a suite of tailored, actionable climate information products for governments, economic sectors, stakeholders and island communities in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu, for use in adaptation planning, decision-making, and response actions. There will be specific engagement with private sector actors (e.g. in agriculture, fisheries, tourism, insurance) to address their needs for climate information through targeted information products. This will create an enabling environment for a new business model for providing climate information services to the private sector, which will contribute to long-erm sustainability beyond the programme's duration.

e) Implementation of a range of capacity building activities for relevant government entities, universities and civil society to address their needs for climate information access, analysis and use in adaptation planning, decision-making, and response actions.

Component 2. Observations, monitoring, modelling and prediction of climate and its impacts on ocean areas and islands

In response to gaps, needs and priorities identified in regional and national strategies and plans, this component will focus on strengthening and modernizing the National Meteorological and Hydrological Services (NMHSs) in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu. This will significantly strengthen the ability of the 5 countries to base climate adaptation planning and decision-making on the best possible climate data and information. The strengthened observations, monitoring, modelling and impact-based forecasting of NMHSs will underpin the national multi-hazard early warning services by providing timely and reliable data and information on climate-related hazards and their expected impact on people, livelihoods and assets. The component will also include outputs and activities that strengthen and institutionalize the linkages between NMHSs and other key actors and end-users to ensure uptake, analysis and use of climate information.

Output 2.1: Technical and infrastructure support for observation and monitoring capacity of NMHSs

a) Strengthening climate observation networks, including for ocean areas, by building the infrastructure of National Meteorological and Hydrological Services (NMHSs) in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu.
   - This will include implementation of the WMO Integrated Global Observing System (WIGOS) in each country, improvement of data quality, and increasing the density of spatial data coverage on main and outer islands by upgrading and, where necessary, adding observing stations compliant with WMO standards.

b) Strengthening marine weather and ocean services through the establishment of training, observation products and tools, such as:
   - downscaled wave models,
   - sea level and international met-ocean forecasts, data and products
   - real-time marine and ocean observations
   - in-situ and remote sensing including for lagoon areas.
   - Training in oceanography and marine meteorology

   Along with capacity building of NMHSs staff in marine meteorology and oceanography, this will strengthen the capability of the five NHMSs to provide marine weather and ocean information and early warnings for shipping,

search and rescue, inter-island boat operators etc., and to align with the Global Maritime Distress and Safety System (SOLAS).

c) Establishing quality management systems (QMS) in the five NHMSs to meet the ISO certification standards that fall under the 9000 category. Beyond the programme's lifespan, this is expected to pave the way for the provision of aviation meteorological services as per ICAO requirements.
d) Development of monitoring products such as extreme value statistics derived from high-quality climate observations for planning decisions.
e) Support for the production of high-quality historical and real-time observations and data across climate systems and relevant environmental and socio-economic variables for the five countries. NMHS staff will be supported in developing their capacity to provide and improve the verification, frequency of updates, security and spatial coverage (particularly of ocean areas) of their national climate data. Including the provision of technical enhancements and network upgrades and expansion, e.g. reliable high speed internet access for isolated communities across the different islands.
f) Developing and using geospatial technologies as one of the tools for strengthening each country's resilience to climate change.[41]

Output 2.2: Technical support for climate modelling, impact-based forecasting and warnings

a) Introduction of modelling and mapping tools and methodologies (including oceanographic models), with on-going capacity building with the 5 NMHSs to ensure hazard and risk modelling capacity is maintained long term.
    - The mapping and modelling tools will be used for the development of dynamic hazard, risk and vulnerability maps for climate-induced hazards affecting the five countries.
    - The programme will support the NMHSs in promoting the use of hazard, risk and vulnerability maps for (spatial) planning and decision making by national government agencies, businesses and communities in their countries.
b) Upgrading forecasting and verification software (including for flood and drought forecasting) in the five NHMSs consistent with with international advances. This will contribute to timely and reliable public weather services and flood and drought forecasting/prediction for priority catchments and water sources.
c) Installation/upgrade and integration of technological processes, tools and techniques to improve capability of national NHMSs in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu to service Multi-hazard Early Warning Systems.
d) Introduction of impact-based forecasting[42]—forecasting that considers the vulnerability of people, livelihoods and assets as well as consideration of the hydrometeorological hazard.
    - This activity will introduce tools and methodologies giving the 5 NMHSs access to vulnerability and exposure information for the targeted users of the forecasts.
    - It will introduce risk matrices combining impact with likelihood.
    - It will support NMHSs' 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
    - It will strengthen partnerships between NMHSs and Disaster Management Authorities and other partner agencies and user communities.
e) Establishment of partnerships between the five NMHSs with national and regional universities, colleges, research institutes and/or training institutes to promote climate services development, data sharing, the application of science and technology in adaptation decision-making, and the training of NMHSs staff to enhance their technical skills and expertise (e.g. on marine meteorology).
f) Contribute to the establishment of national data centers with big data analytics capabilities to acquire, handle and use climate data and information pertaining to islands and ocean areas in the five countries.
g) Facilitate the sharing and updating of information and data between national environmental and related institutions (e.g. forest or water services), national bureau of statistics and treasuries, through virtual, web-based modelling and planning platforms.

Output 2.3: Harmonized climate outlooks, vulnerability assessments and reporting on climate change impacts

a) Establishment of a common process for each NMHS to share climate information to its national stakeholders in each of the five countries, such as of National Climate Outlook Forums. These will feed into the established regional Pacific Meteorological Council (PMC) and Pacific Island Climate Outlook Forum and extend its effectiveness and scope.
b) Establishment of a common process for the five NMHSs to present climate information at the national level, drawing on existing national assessments and other research material.[43]

[41] Scaling-up the work of the GEF-funded "Inform" project, geospatial technologies will be used as one of the tools for strengthening climate change resilience.
[42] https://www.wmo.int/pages/prog/www/DPFS/Meetings/ET-OWFPS_Montreal2016/documents/WMOGuidelinesonMulti-hazardImpact-basedForecastandWarningServices.pdf
[43] The Country Level Impacts of Climate Change (CLICC) project is piloting a common process for countries to present the impacts of climate change at the national level that could be useful.

- This clear and transparent information sharing about climate impacts will underpin effective adaptation.
- It will strengthen the presentation of climate change impacts in country, regional and international forums.
- It will support the development of capacity in government entities and in scientific and educational communities as they develop and refine their reporting standards
- It will support these five countries to comply with their regional and international reporting obligations on climate and environment agreements and frameworks.

c) Production of five harmonized vulnerability assessments of islands and ocean areas for the Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu. This will be done through the collation and analysis of climate data and information and will serve as an essential resource for governments and stakeholders as they consider longer-term climate change impacts and adaptation scenarios.

Component 3. Improved response capability and community resilience to climate risks

This component will significantly enhance social resilience to climate change and build national response capability to multiple climate-related hazards (e.g. tropical cyclones, coastal inundation, floods, drought). Under this component, the programme will not only secure the delivery of climate information and early warnings to end-users but work with them to co-design and co-produce information products and warnings that are actionable and effective. The unique climate information needs of the elderly, people living with disabilities and most geographically and/or socially vulnerable communities will be taken into account, as well as gender responsiveness. Temporary jobs will be created for island populations, including women, by engaging them in on-the-ground activities related to the community-based MHEWSs. Gender mainstreaming will be a key element of the programme and special attention will be paid to the inclusion of vulnerable groups and women to ensure that gender issues are considered, as well as the unique climate information needs of elderly and disabled people. Climate information and early warning centres will be established in selected communities in the five countries as part of community-based early warning schemes that will help secure the lives, assets and livelihoods of remote island communities.

Output 3.1: Strengthened capacity to implement Multi-Hazard Early Warning Systems (MHEWS)

a) Establishment/improvement of MHEWSs in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu through enhanced integration and collaboration across government agencies, sectors and communities.
   - This will include the development of formal agreements with Disaster Management Authorities and non-government stakeholders formalising the role of each NMHS in climate-induced disaster preparedness and response.
   - The programme will facilitate the integration of MHEWSs into government policies, decision-making processes and emergency management systems at national and community levels.
   - Risk analyses and “hot spots” identification will inform disaster risk management, land use planning, flood control, insurance and other relevant agencies.

b) Identification of danger and exposure levels for selected climate-related hazards and identification of the forecast triggers that will initiate early preparedness actions by communities and humanitarian organizations.
   - This will be supported by the establishment of effective partnerships between each NMHS and its National Disaster Management Authority, sector stakeholders and local humanitarian organizations.

c) Development and dissemination of effective warning messages that are clear, consistent and include risk information:
   - designed with consideration for linking threat levels to agreed emergency preparedness and response actions (e.g. low technology solutions such as using colour coded warnings on community message boards, flags, simple river monitoring etc.)
   - understood by authorities and the population
   - Working with the communities through the local council
   - issued from a single (or unified), recognized and authoritative source
   - including working with national disaster authorities and relevant sectors to provide impact information
   - reflecting user feedback on local situations where it is available.

d) Improvement of communications infrastructure for real-time delivery of climate information and early warnings in the five countries, including to remote communities.

e) Development of interface tools in each country that help users and communities access climate related information and information about disaster response systems.

Output 3.2: Community outreach on climate risks

a) Development and dissemination of tailored, actionable weather and climate information products covering ocean areas and islands (including color-coded alerts – advisories, watches and warnings, risk and vulnerability maps).[44]
    - These will be co-designed, co-produced and utilized through participatory processes involving island communities, schools and other end-users in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu.
    - Identification and documentation of traditional and indigenous knowledge on climate risks and response strategies towards multiple hazards
    - The inclusion of traditional knowledge to complement scientific knowledge on climate adaptation and early warning will optimize the acceptance and effectiveness of these information products.

b) Development and implementation of comprehensive nation-wide awareness raising programs on climate risks in the five countries through workshops, seminars and campaigns to prepare the public to adapt to climate change and to secure their lives, assets and livelihoods during climate-related hazards.

c) Development and dissemination of targeted climate information products and warnings for the marine and oceans sector.
    - This will enhance the resilience and response capability of the shipping sector, fisheries, search and rescue services, inter-island boat operators and other relevant stakeholders in the five countries.

d) Implementation in selected island communities in each country of community-based early warning systems and community-based climate risk management approaches to complement the national MHEWS.
    - These activities will aim for full community engagement and will consider the needs of disadvantaged and vulnerable groups.
    - The selected communities will have any of the following: be at relatively high risk, have short lead times for extreme events, have technical constraints for the national systems to effectively service them (e.g. due to remote location on outer islands).
    - Communities will be fully engaged and trained in the design, implementation and operation of early warning systems, including enhancing their understanding of their climate-related hazards and exposure, establishing a monitoring and warning service, establishing appropriate dissemination and communication channels and building community response capabilities to secure their lives, assets and livelihoods during climate-related hazards.
    - A key element of the system will be the establishment of Climate Information and Early Warning Centers at community level (e.g. on outer islands) that will serve as a “go to” places. This could consist of either the use of or refurbishment of a current facility or the construction of new ones.

Component 4. Regional knowledge management and cooperation

This component will optimize regional synergies among Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu. Very small Pacific island countries face similar and sometimes interrelated vulnerabilities, capacity limitations, and have similar needs and priorities for climate information and early warnings. The programme will establish a regional multi-country hub with common ICT infrastructure. The hub will organise learning events and training, using equipment, software and tools common to all five countries and fostering networking among staff of the five NMHSs. This regional approach will ensure optimal knowledge management by disseminating lessons learned and information on best practice. In view of the importance of oceans for the five countries, there will be targeted activities to strengthen marine weather and ocean services. This component will complement existing mechanisms for the entire Pacific region such as the Pacific Climate Change Center at SPREP, the Pacific Meteorological Council (PMC), Regional Climate Outlook Forum, regional meteorological centers and regional learning institutions.

Output 4.1: Regional knowledge management and cooperation

a) Establishment of a knowledge hub to facilitate knowledge management, mentoring and advisory services for NMHSs and other stakeholders in Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu on strengthening climate information services; strengthening observations, monitoring, research, modelling and prediction; establishing MHEWSs at national and community levels; and building community resilience against climate risks.

b) Establishment, as part of the regional hub, of an interactive ICT platform for the management and organization of climate data, information, experiences, case studies and other forms of knowledge from the five countries in standardized 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

[44] For a possible model of the CLIMWARN project, see https://www.unenvironment.org/news-and-stories/video/un-environment-climwarn-project

Islands and Tuvalu. The centre will be equipped with big data analytics capabilities to handle and use climate data and information.

c) Organization of regional learning events for exchanging knowledge and sharing experiences and lessons learned in strengthening climate information services and MHEWs in the five countries. These events will also be critical for regularly reviewing options for upgrading or introducing new methods and systems in NMHSs in the five countries. They will be used for sharing of experiences and information among universities, colleges and other stakeholders to develop and apply consistent and transparent methodologies for assessing, presenting and communicating climate information for multiple purposes.

d) Organization of regional exchanges and advisory services among NMHSs and marine sector actors on strengthening of marine weather and ocean services to support early warnings for shipping, search and rescue, inter-island boat operators etc., and to align with the Global Maritime Distress and Safety System (SOLAS).

As per its GCF Entity Work Programme, the UN Environment Programme offers more than 20 years of experience working on climate change. It brings a comprehensive approach to climate change mitigation and adaptation that is grounded in both natural and economic science and is tied to the environmental and development concerns of countries. Based on its core science-based mandate, one of UN Environment's seven sub-programs is entirely dedicated to keeping the world environment under review. Through its Science Division, UN Environment has longstanding expertise in environmental and climate change information management and early warning. 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 SDGs and MEA (amongst others) reporting. Other examples include the CLIMWARN and Country Level Impacts of Climate Change (CLICC) projects managed within the Science Division. In addition, UN Environment convenes and facilitates regional environmental information networks and the world adaptation science program PROVIA. Through its work on early warning and foresight, UN Environment enables stakeholders to respond to the latest emerging issues related to environment and climate change. UN Environment 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. The Pacific Meteorological Council (PMC) has clearly outlined issues and priorities for the region that have been 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. Moreover, WMO and SPREP will be key partners in the programme. UN Environment and SPREP are respectively implementing and executing a GEF-funded cross-cutting capacity development project known as 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 scale-up the outcomes of "Inform" and more generally, build on existing efforts on climate monitoring management and support to policy-making in the region.

The programme will put in place mitigation strategies for several institutional, policy, financial, technical and operational risks. For instance, the programme will continuously engage with high-level Pacific government representatives in the 5 countries to ensure their sustained commitment to enhancing and using climate information. Moreover, it will prioritize capacity development of all relevant national agencies, universities, colleges and other stakeholders, including through a dedicated component for Regional Knowledge Management Cooperation. The programme will engage a wide range of stakeholders, including the private sector, to mitigate the risk that strategies and plans remain unimplemented. Lastly, the programme will conduct awareness raising and community mobilization activities at grassroots' level on climate-related natural hazards, vulnerabilities and risks and benefits of using climate information for response actions. This should generate a high level of interest and foster participation by communities in the development and implementation of this programme.

B.3. Expected project results aligned with the GCF investment criteria (max. 3 pages)

This programme will promote a paradigm shift to evidence-based climate-resilient development pathways in five Pacific Island Countries enabling them to adapt to the present and expected impacts of climate change: it is therefore fully aligned with the GCF investment criteria as follows:

Impact potential

The programme contributes to the achievement of GCF strategic-level impacts through increased resilience and enhanced livelihoods of the most vulnerable people and communities in the Cook Islands, Niue, Palau, RMI and Tuvalu. The programme will contribute to the achievement of the GCF indicator of the reduction in the number of people affected by climate-related disasters for the populations of these island countries. The programme will deliver climate change adaptation benefits through:

- Improving the resilience of up to 100,000 people (48,800 women, 51,200 men). This is the estimated entire population of the Cook Islands, Niue, Palau, the Republic of the Marshall Islands (RMI) and Tuvalu using figures

from the Statistics for Development Division of the Pacific Community—the whole population is at risk from climate-related hazards such as cyclones, storm surges, coastal inundation, floods and droughts, but particularly vulnerable communities in remote island locations. The most vulnerable groups include the population living in coastal zones (estimated at 90-100% for the 5 countries). Impacts will be achieved through a variety of programme interventions including country-level MHEWs and community-based early warning systems that will build community response capabilities to secure their lives, assets and livelihoods during climate-related hazards.

- Increasing the safeguarding of assets (such as fishing boats and equipment, agricultural land, properties) from climate-related hazards through accurate, timely and actionable early warning services established by this programme. As stated in the 2015 UNISDR Global Assessment Report[45], the concentration of economic assets, infrastructure and populations along the coasts in Pacific Island Countries means risk is heavily influenced by exposure. In relation to annual capital investment, SIDS have very high concentrations of risk—this will be reduced through the establishment of MHEWs in the five countries. 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.

- Reducing the number of lives lost due to the impacts of climate-related hazards through the implementation of MHEWSs and community-based MHEWSs especially on remote outer islands in the five countries. Losses of lives to tropical cyclones since 1831 for these countries have been estimated on UNISDR platforms as 79, 24, 16, 13 and 24 respectively (see section B1 for more details). Although no accurate data are available by year and projections are therefore difficult to make, it is estimated that this programme will reduce average loss of lives by 50%.

- Strengthening NMHSs with infrastructure, tools and institutional effectiveness in the five countries will have a significant impact on their service provision. It will enable them to provide more reliable impact-based forecasts and targeted, actionable climate information products. Moreover, it will equip them to function as hazard monitoring and warning services as part of people-centred MHEWSs. In addition, the programme will enhance the capacities of a range of stakeholders and decision-makers to access to and use these climate information products and services, which will lead to smarter adaptation decisions and response actions resulting in more resilient and sustainable development for the countries and the Pacific region as a whole.

Paradigm shift

The proposed GCF programme will generate and disseminate critical climate risk information that will enable the Governments of the Cook Islands, Niue, Palau, the Republic of the Marshall Islands (RMI) and Tuvalu to design and implement transformative policies and plans for reducing the exposure and vulnerability of their people, economic sectors (e.g. agriculture, fisheries, tourism, health) and critical infrastructure (ports, roads, bridges, electricity transmission lines, water and sanitation facilities) to climate-related hazards and the impacts of climate change. The programme will thus effect a paradigm shift to evidence-informed climate adaptation, risk reduction and upscaled multi-hazard early warning policy and practice. The programme will catalyze and scale-up the use of climate information and innovative approaches across all government entities and stakeholders as follows:

- **Innovation:** 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 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 the private sector, which will contribute to long-erm sustainability beyond the pogramme's duration. In the long-term, the programme will also support an enabling environment for the development of domestic non-life insurance markets by lowering the economic losses faced by vulnerable communities as a result of climate change induced disasters. At present, non-life insurance penetration in the Pacific region, at a rate of 1.6%, is extremely low compared to the EU (3.1%) and USA (6.0%).[46] Two main reasons cited are "inadequate disaster risk mitigation measures" and "insufficient baseline information for designing insurance products", which will both be addressed by this programme.

- **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

[45] https://www.preventionweb.net/english/hyogo/gar/2015/en/gar-pdf/GAR2015_EN.pdf
[46] GSDRC 2015 (http://www.gsdrc.org/wp-content/uploads/2016/01/HDQ1314.pdf)

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, Republic of the Marshall Islands and Tuvalu will have a high potential for replicability in other islands communities within the same countries. 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.

- **Potential for knowledge and learning:** knowledge management is a key component in this programme as the multi-country approach will facilitate learning and knowledge sharing among the 5 NHMSs and other entities through the dedicated regional knowledge management activities in Component 4. 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. 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 in 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.

- **Contribution to the regulatory framework and policies:** 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 harmonized vulnerability assessments to assist governments with long-term adaptation planning;
    - ensuring each country's full compliance 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 mal-adaptation. 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.

Sustainable development

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 as follows:

- 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.

- 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*"[47].

- The Sendai Framework for Disaster Risk Reduction 2015–2030[48], 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 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*".

- The SAMOA Pathway adopted by the Third International Conference on Small Island Developing States in 2014.[49] 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*.

The five partner countries have made commitments to these regional and international agreements and frameworks and this programme will support their achievement of their objectives. Through enabling climate-informed (spatial) planning and sustainable management of natural capital based on accurate climate information, the programme will support healthy and productive ecosystems in the five countries. It will improve fisheries and catchment management (through climate monitoring of at risk coastal and marine ecosystems) and protect terrestrial ecosystems through monitoring environmental conditions.

Needs of recipients

Pacific Island Countries are already experiencing climate change impacts including variations in long-term average 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.[50] . For example, weather station records and ship-based observations indicate that most Pacific Island Countries warmed on average between about 0.3 and 0.8°C during the 20th century). Both mean annual air temperature and precipitation anomalies show marked inter-annual variability and are closely associated with the El Nino Southern Oscillation (ENSO) cycle.[51] Such extreme events coupled with rising sea levels are main drivers that threaten the habitability, economies and survival of Pacific islands,

The IPCC advises that tropical cyclones and associated rainfall are expected to be more frequent and more intense in the future, amplified by rising sea levels. Damage costs of climate change are significant for SIDS: in a study in 1998-2009 conducted by ESCAP and UNISDR (2010) Niue was listed as the second top country in Asia-Pacific based on relative physical exposure to storms and impacts on its population, and in the top three losses to its GDP. The associated costs of increased climate change impacts is projected to increase substantially and a study predicted that Palau and RMI will be among the five Pacific countries whose GDP is most affected by sea level rise in terms of their GDP.[4] Weather and climate monitoring and impact-based forecasting are critical for informed decision-making about adaptation options and response actions to climate-related hazards, and thereby for climate resilience. Improved access to and use of climate information and early warnings can greatly reduce the climate-related hazard risks through an increase in community preparedness for response and recovery.

The need for enhanced climate information and early warning has been demonstrated in several Pacific regional and national processes and official documents, including:

- *Pacific Islands Meteorological Strategy 2017–2026*, which recognizes that NMHSs underpin economic growth and sustainable development in the Pacific Islands region by supporting key economic and livelihood areas including agriculture, aviation, shipping, forestry, fishing, water resource management, energy, transportation and tourism. These services are crucial to enhancing resilience to and reducing the vulnerability of Pacific people to natural hazards and the effects of climate variability and climate change. The Strategy identifies five priority areas for action: i) Improved weather services, ii) Disaster risk reduction, iii) Improved climate and hydrological

[47] https://unfccc.int/sites/default/files/english_paris_agreement.pdf
[48] https://www.unisdr.org/files/43291_sendaiframeworkfordrren.pdf
[49] https://sustainabledevelopment.un.org/samoapathway.html
[50] IPCC, 2014 (https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap29_FINAL.pdf).
[51] Ibid.

services, iv) Integrated observing and communication systems and v) Coordinated support for NMHSs. This programme will address all 5 priority areas by strengthening climate services, observation, modelling, impact-based forecasting, MHEWS and improving community resilience.

- *Pacific Roadmap for Climate Services 2017-2026*, which identifies key actions for implementing the Global Framework for Climate Services (GFCS). This programme responds directly to the activities prioritized in the *Roadmap* under the GFCS pillars on: climate services information system; observations and monitoring; research, modelling and prediction; and capacity development. The *Roadmap* also emphasizes the importance of institutional capacity to support and coordinate national climate services, which will be addressed through this programme's component on regional knowledge management and cooperation.

- Outcomes of the *Pacific Meteorological Council* (PMC) and *the Pacific Ministerial Meeting on Meteorology* such as the 2017 *Honiara Ministerial Statement for Strengthening Sustainable Weather, Climate, Ocean and Water Services for a Resilient Pacific*, which emphasized the importance of climate and weather information and that 80% of disasters in the region are caused by severe weather events. It also emphasized ocean and aviation services to strengthen sustainable economic growth, public safety and security and comply with national obligations under the Safety of Life at Sea (SOLAS) Convention and International Civil Aviation Organization (ICAO) regulations. The statement expressed the political will of Pacific Island Governments "to support the development of sustainable weather, climate, ocean and water services in the Pacific Island Countries and Territories (PICTs) fully taking into account national development priorities, regional and global meteorological strategies and other relevant frameworks"[52]. This programme will respond directly to the call of Pacific leaders for support to improve the capacity of NMHSs.

- Direct support for this programme from the *Pacific Meteorological Council (PMC)* though a letter from its Chairman dated 24 July 2018 reiterating that it was "developed with the intention of implementing the PMC meeting outcomes, the Nuku'alofa Ministerial Declaration for Sustainable Weather and Climate Service for a Resilient Pacific endorsed in 2015, the Honiara Ministerial Statement for Sustainable Weather, Climate, Oceans and Water Services for a Resilient Pacific endorsed in 2017, the Pacific Island Meteorological Strategy and the Pacific Roadmap for Strengthened Climate Services and the Framework for Resilient Development in the Pacific".

- 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[53], which highlights that SIDS such as Tuvalu experience significantly larger per capita losses, amounting to 4 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 per cent 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 per cent of their total annual capital investment, compared to around 1.2 per cent in Europe and Central Asia. Similarly, the AAL in SIDS is equivalent to almost 20 per cent of their total social expenditure, compared to only 1.19 per cent in North America and less than 1 per cent in Europe and Central Asia[54].

Country ownership

The programme is a direct response to priorities highlighted by Pacific Island Countries particularly in the *Pacific Roadmap for Strengthened Climate Services 2017–2026* and the decisions of the Pacific Meteorological Council. The *Roadmap* highlights the need for sustainability and a holistic approach to climate information services, which is precisely what this programme aims to achieve. This programme responds directly to the activities prioritized in the *Roadmap* under the GFCS pillars including: climate services information system; observations and monitoring; research, modelling and prediction; and capacity development. The *Roadmap* emphasizes the importance of regional institutional capacity to support and coordinate national climate services. At the national level, all five countries have identified climate information, early warning and/or disaster risk reduction as priority areas in national strategies and plans, such as INDC/NDC, NAPAs, NAMAs and NAPs. For example, NAPAs in the Pacific have highlighted that awareness and education on the implications of climate change, weather and climate on communities were critical steps in adapting to climate change. Examples of national priorities and strategies to which the programme will contribute have been provided in section B1. During the preparation phase of the Funding Proposal, national stakeholders will be further engaged in the programme, including through the PMC. This process will ensure that the programme design is consistent with and

[52] https://www.mic.gov.to/news-today/press-releases/6870-honiara-ministerial-statement-for-strengthening-sustainable-weather-climate-ocean-and-water-services-for-a-resilient-pacific-18-august-2017-honiara-solomon-islands
[53] https://www.preventionweb.net/english/hyogo/gar/2015/en/gar-pdf/GAR2015_EN.pdf
[54] Ibid.

complementary to the priorities of regional and national plans and strategies. Detailed end-user engagement to review and ground-truth climate information, policy and planning will be undertaken, as well as a detailed stocktaking of existing programme and initiatives. This will ensure that final programme work plans fully address priority needs and more generally, contribute to the national implementation of global priorities such as the Paris Agreement and Sustainable Development Goals. (especially 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*"). To this end, the programme is fully aligned with 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*"[55] and the Sendai Framework for Disaster Risk Reduction 2015 – 2030[56], 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 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*".

Efficiency and effectiveness

This programme will help to make evidence-based, informed planning for climate change possible for five very small Pacific countries. It is a cost-effective alternative to reactive approaches to climate-related hazards that focus on ad-hoc recovery and investment in hard infrastructure and risk expensive mal-adaptation. It will significantly enhance the risk knowledge and response capabilities of island communities as well as contributing to the capacity building of NMHSs. Enhanced risk knowledge will enable them to proactively respond based on timely and accurate information and reduce the costs of damage to assets and livelihoods. Key elements of the value proposition of this programme include:

- A high expected benefit-cost ratio (BCR) on investments in upgrading and modernizing NMHSs in the 5 Pacific Island Countries that can only be achieved with a sizeable and multi-year investment like the proposed programme. This is backed up amongst others by a 2015 economic assessment report by WMO, which [57] indicated that improvements in early warning systems and preparedness make it possible to limit losses from hydrometeorological disasters, which would not be possible without the informed use of constantly improving meteorological, hydrological, oceanographic, social, behavioral and related information. The report furthermore stated that economic studies have consistently generated BCRs of greater than one. For example, for NMHS improvements to reduce disaster losses in developing countries BCRs range from 4 to 1 to 36 to 1[58].

- Effective expected impacts from saving of lives, assets, and livelihoods. Based on examples of similar efforts to strengthen climate information and MHEWS, it is estimated that integrated early warning systems can potentially be 100% effective in reducing loss of life by cyclones, 60% effective for floods, and 20% effective in case of drought (Teisberg and Weiher (2009))[59].

- Effectiveness of tailored, flexible and community-based MHEWs as proposed under this programme. From related efforts such as UNEP's CLIMWARN projects, it can be concluded that "to be effective, early warning systems must themselves incorporate aspects of resilient systems: diversity, flexibility, local relevance, learning, acceptance of change, consideration of justice and equity" and that "the success of early warning is not based solely on technical or meteorological systems, but is dependent on social systems"[60].

- Effectiveness and efficiency of the regional multi-country approach of this programme. The small size of the Pacific SIDS and similarities in their vulnerabilities, climate change impacts and socio-cultural factors mean this approach will be more effective and efficient than the alternative of standalone country programmes. Benefits are achieved through the regional knowledge management and cooperation component of this programme, which will enable learning, mentoring, harmonization and economies of scale. Both the *Pacific Island Meteorological Strategy 2017-2026* and the *Pacific Roadmap for Strengthened Climate Services 2017-2026* have called for a combination of national and regional efforts, exactly as this programme is proposing to undertake.

- The proposed programme builds on lessons learned of past and on-going projects, existing data and information, institutional and management frameworks and capacities and communications and coordination mechanisms.

[58] Ibid.
[59] https://www.gfdrr.org/sites/gfdrr/files/Teisberg_EWS.pdf
[60] UNEP, 2015 Early Warning as a Human Right: Building resilience to climate-related hazards: https://wedocs.unep.org/bitstream/handle/20.500.11822/7429/-Early_Warning_as_a_Human_Right_Building_Resilience_to_Climate-related_Hazards-2015Early-Warning-As-A-HumanRight-Building-Resilience-For-Climate-Rela.pdf?sequence=4&isAllowed=y

For example, it will upscale some of the work of the GEF-funded "*Inform*" project on streamlining data management. By adopting a holistic approach to climate information services and MHEWS that goes well beyond upgrading infrastructure, the programme will add value to existing national projects.

- While the programme is focusing on strengthening public institutions providing public goods and services, it will create opportunities for participation by the private sector, which in Pacific Island Countries is typically characterized by a large informal sector engaged in small-scale or subsistence agriculture and fishing, retailing, services widespread subsistence agriculture and fishing; the cultivation and export of indigenous root crops; and exports of root crops and some specialized agricultural products[61]. The programme is expected to generate interest of private sectors in using climate information products and MHEWS as an effective means to enhance their resilience by promoting evidence-informed adaptation options and response capabilities in key economic sectors.

- The long-term financial viability of the programme's activities will be addressed through:
  - activities in Component 1 to integrate climate services in 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
  - identification of funding modalities for climate information products including by integration in national budgets
  - activities in Component 3 will facilitate the integration of MHEWSs into government policies, decision-making processes and emergency management systems at national and community levels.
  - Lastly, the co-financing expected to be generated from countries will ensure operation and maintenance of equipment and infrastructure beyond the duration of the programme.

B.4. Engagement among the NDA, AE, and/or other relevant stakeholders in the country (max ½ page)

This Concept Note has been developed through a participatory process engaging NDAs, environment authorities, climate change focal points and other relevant stakeholders. Initial engagement was with all 14 independent western Pacific island countries, during which the five countries covered by this programme expressed their interest. This process can be summarized as follows:

- **November 2017:** Engagement with Pacific Governments on this programme started during the inception workshop of the GEF-funded "Inform" project held in Apia, Samoa. Participants in the workshop included senior officials of Ministries of Environment (or equivalent) of all 14 Pacific island countries. They identified the need to upscale some of the work of "Inform".
- **December 2017:** In the margins of the third UN Environment Assembly in Nairobi, Kenya, the Director General of SPREP and the UN Environment Chief Scientist/Acting Director of the Science Division agreed to initiate the development of the programme.
- **April 2018:** a short version of the programme concept was circulated to all 14 Pacific NDAs by the Head, UN Environment sub-regional office for the Pacific.
- **May 2018:** Circulation of a briefing note to Pacific delegations attending the Bonn Climate Change conference by SPREP and verbal briefing to the Pacific Negotiators Group by UN Environment Team in Bonn, Germany (GCF Coordinator, Regional Climate Change Coordinator for Asia and the Pacific, Senior Programme Officer, Science Division).
- **May 2018:** bilateral meetings with NDA of the Republic of the Marshall Islands and NDA representative of Tuvalu in Bonn, Germany.
- **May 2018:** Follow-up email on the circulation of a short version of the programme concept and information on the Pacific Regional Training Workshop on "Appraisal and Prioritization of Options for Adaptation Planning (NAP)" on 28-31 May in Nadi, Fiji, to NDAs and UNFCCC focal points of all 14 Pacific Island Countries by the Head, UN Environment sub-regional office for the Pacific.
- **May 2018:** presentation of the programme concept to participants of the Pacific Regional Training Workshop on "Appraisal and Prioritization of Options for Adaptation Planning (NAP)" in Nadi, Fiji, by the UN Environment Senior Programme Officer, Science Division. Bilateral discussions held with participants from Niue, Palau, Republic of the Marshall Islands, Tuvalu, Cook Islands and others, as well as with the SPREP Director for Climate Resilience.
- **May-August 2018:** based on interest expressed by selected Pacific Island Countries, intensive e-mail consultations with NDAs and other key government representatives of Niue, Palau, Republic of the Marshall Islands, Tuvalu and Cook Islands by the UN Environment Senior Programme Officer, Science Division and the Head, UN Environment sub-regional office for the Pacific.
- **June-July 2018:** e-mail exchanges and teleconference with the Chair, Vice-Chair and other members of the Pacific Meteorological Council (PMC) by the PMC Secretariat and the Head, UN Environment sub-regional office for the Pacific.

[61] https://www.adb.org/sites/default/files/linked-documents/rcs-pacific-2016-2020-ld-07.pdf

- **27 June 2018:** support message received from N. Nick Ngwal, Palau NDA.
- **30 June 2018:** support message received from Felicia Pihigia Talagi, Niue NDA.
- **16 July 2018:** support message received from Clarence Samuel, Republic of the Marshall Islands NDA.
- **24 July 2018:** support letter for the programme concept issued by David Hiba Hiriasia; Chairman of the Pacific Meteorological Council (PMC) and Director of the Solomon Islands Meteorological Services.
- **3 September 2018:** support message received from Ms. Pepetua E Latasi, Secretariat to the Tuvalu NDA.
- **15 September 2018:** support message received from Mr. Wayne King, Cook Islands NDA.
- **August 2018:** during the GCF structured dialogue for the Pacific held in Pohnpei, Federated States of Micronesia, further bilateral discussions were held by the UN Environment Senior Programme Officer, Science Division with the NDAs and the teams of the Cook Islands, Niue, Palau, Republic of the Marshall Islands and Tuvalu. In a meeting with all NDAs, the SPREP Director for Climate Resilience also reiterated that the programme will deliver on regional priorities.
- **August 2018:** circulation of a revised Concept Note with a focus on 5 countries (Cook Islands, Niue, Palau, RMI and Tuvalu) to NDAs.
- **August 2018:** presentation of the programme concept by the UN Environment Senior Programme Officer, Science Division to stakeholders in RMI during an "Inform" project workshop in Majuro and follow-up discussion with the NDA and the deputy director of the NMHS.
- **August-September 2018:** exchanges with the NDAs of Cook Islands, Niue, Palau, RMI and Tuvalu to confirm alignment of the revised Concept Note with country priorities. Confirmations in writing were received from the NDAs on 10 August 2018 (Palau), 3 September (Tuvalu), 14 September (Niue, with support message from the Director, Niue Meteorological Service), 15 September (Cook Islands, mentioning consultation with the Cook Islands Meteorological Service director) and 19 September (RMI).
- **November-December 2018:** in response to GCF technical review comments on the Concept Note and subsequent revisions proposed by the AE, exchanges with the NDAs of Cook Islands, Niue, Palau, RMI and Tuvalu to confirm and validate revisions prior to re-submission. Feedback was provided by several NDAs and addressed in the final draft of the Concept Note.

C. Indicative Financing/Cost Information (max. 3 pages)

C.1. Financing by components (max ½ page)

Please provide an estimate of the total cost per component/output and disaggregate by source of financing.

Component/Output	Indicative cost (USD)	GCF financing		Co-financing[62]		
		Amount (USD)	Financial Instrument	Amount (USD)	Financial Instrument	Name of Institutions
1. Strengthened climate information services covering oceans and islands supported by institutions, coordination mechanisms, policies and financial frameworks	6 million	5.5 million	Grant	0.5 million	TBC	UNEP/Countries
2. Observations, monitoring, modelling and prediction of climate and its impacts on ocean areas and islands	26 million	24.5 million	Grant	1.5 million	TBC	UNEP/Countries for operation and maintenance
3. Improved response capability and community resilience to climate risks	16 million	15.5 million	Grant	0.5 million	TBC	UNEP/Countries for operation and maintenance
4. Regional knowledge management and cooperation	2 million	1.5 million	Grant	0.5 million	TBC	UNEP

[62] Co-finance will be further clarified and new sources identified during the Full Proposal formulation. Similarly, budgets for each country and the regional component will be elaborated then.

Indicative total cost (USD)	50 million[63]					

C.2. Justification of GCF funding request (max. 1 page)

The GCF grant is requested to provide the crucial public good of climate information services and their use to reduce the climate risks and enhance the resilience of populations of Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu, including the most vulnerable communities living on remote outer islands. The climate information and communication products that will be developed and rolled-out under this programme will enable them to safeguard their lives, livelihoods and assets from climate-related hydrometeorological risks.

The economies of Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu reflect the special challenges facing small, remote economies. They are highly dependent on a limited number of sectors including fisheries, tourism and agriculture. Their isolation and distance from markets increases costs, and on some islands the large seasonal influxes of tourists place significant stresses on local infrastructure and resources. They are highly dependent on air transport and shipping services to support their economies and more generally on external aid and remittances.[64] Debt is also a problem in the Pacific region, including concessional loans from International Financial Institutions, loans from bilateral donors, domestic borrowing and bank overdrafts[65]. For example Palau's total central government debt (% of GDP) rose from 23.8% in 2008 to 67% in 2016[66]. Cook Islands, Niue, Palau, the Republic of the Marshall Islands and Tuvalu require GCF support for funding the cost not only of adaptation measures to climate change, but also of a set of catalytic measures that will improve the way that climate change is dealt with in the region, including the foundational climate information systems required to base these measures on. The small size of the countries' economies is insufficient for meeting such cost without external support and regional partnerships.

It is unlikely that direct revenue will be a result of the GCF investment and therefore loans or non-grant instruments are not considered feasible for the Pacific SIDS included in this programme. Although there is a clear need for climate information, there is currently no significant market demand for climate information services, due to lack of awareness of its value in relation to adaptation measures, capacity in providing high-quality and reliable climate information and data and understanding of the value of climate information for the preparedness and prevention of the impacts of climate change in various sectors. Moreover, the isolation and small market size with limited or no opportunities for scale economies in production, constrains economic activity in the five countries and the private sector which usually consists of a large informal sector engaged in small-scale agriculture and services; widespread subsistence agriculture and fishing; the cultivation and export of indigenous root crops; and exports of some specialized agricultural products[67]. While the programme is expected to generate interest in the private sector in using climate information products and MHEWS and pave the way for a new business model with NMHSs providing climate information products to the private sector (e.g. the aviation industry) in the long-term, cost-recovery is not considered feasible. Donor and bi-lateral support is 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. Pacific island populations are also not in a position to pay for climate information services and so cost-recovery for these essential services to the public is not practicable. Since leveraging public and private finance for a public good of this nature can be challenging, the programme includes dedicated activities for integrating climate information services in national policies, plans and budgets, and will also engage with the private sector with a view to create 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, is also expected to be leveraged by the programme.

The programme is very well aligned with regional priorities, particularly as elaborated in the *Pacific Island Meteorological Strategy 2017-2026* and the *Pacific Roadmap for Strengthened Climate Services 2017-2026*, as well as national government plans for strengthening their hydro-meteorological 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 plans and facilitate the

[63] This figure is subject of validation during the Full proposal formulation
[64] UNEP 2014. GEO Small Island Developing States Outlook
[65] http://www.worldbank.org/content/dam/Worldbank/document/SSF13%20Session1%20Volatility%20Resilience%20and%20Fiscal%20Policy%20in%20Pacific.pdf
[66] http://databank.worldbank.org/data/reports.aspx?source=2&series=GC.DOD.TOTL.GD.ZS&country=PLW
[67] https://www.adb.org/sites/default/files/linked-documents/rcs-pacific-2016-2020-ld-07.pdf

communication of public and private sector entities. The Readiness project identifies a wide range of sectoral priorities, including climate information services and knowledge management, that will be taken forward under this programme. [68]

C.3. Sustainability and replicability of the project (exit strategy) (max. 1 page)

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This programme is designed to address existing root causes and barriers to sustainable climate information services and MHEWs in Niue, Palau, the Republic of the Marshall Islands, Tuvalu and Cook Islands. In particular, the following are key elements of the exit strategy to ensure sustainability beyond the programme's lifespan:

- The programme is aligned to robust regional coordination and cooperation mechanisms such as the Pacific Meteorological Council (PMC) in which Cook Islands, Niue, Palau, RMI and Tuvalu play an active role. As demonstrated in previous sections, the programme is based on country and regional priorities, and has the support of the PMC. The strong country and regional ownership are important pre-conditions for long-term institutional sustainability.

- The programme will strengthen existing NHMSs in the 5 countries rather than creating new parallel structures. Sustainability will be supported by the establishment of 5 holistic national frameworks, associated institutional coordination mechanisms to ensure effective governance, coordination and management of national climate services. The integration of climate services in key policies, strategies, plans and budgets supported by this programme will provide a foundation for uptake of climate information in decision-making and facilitate sustainable service provision in the long term. The identification of funding modalities for climate information products including by integration in national budgets will contribute to sustainability.

- New hydrometeorological equipment and tools for observations, monitoring, modelling and prediction will be integrated in the existing NHMSs. Staff have baseline capacity and will be further strengthened, and equipment will be modernized through this programme. The NHMSs are committed to providing proper Operations and Maintenance (O&M) to their expanded hydrometeorological networks and newly created MHEWSs during and after the end of the programme. The programme will help the 5 NMHSs and other relevant authorities in developing and implementing long-term sustainable strategies for O&M and will support them in designing and disseminating a suite of tailored climate information products that in the long-term may catalyse modest levels of additional resources for NMHSs through sector demand.

- The programme will adopt a broad multi-stakeholder approach and bring on board different ministries, agencies, universities, NGOs, private sector actors, communities and others, representing both producers and users of climate information and early warning. Through capacity development activities, awareness raising and a dedicated knowledge management component, their capacity will be enhanced and sustainability of results facilitated. The holistic approach to climate services is tailored to the circumstances of the Pacific and therefore more likely to lead to sustainability than a focus on the provision of technical infrastructure alone as many other projects have tended to do. Moreover, for various activities such as community-based MHEWSs local support (either in-kind or in cash) will be leveraged in the implementation, which will further increase ownership.

- 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 organizations are cooperating in the implementation of the GFCS through the PIMS 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, thereby ensuring high relevance of activities and enabling uptake and continuation beyond the programme duration.

D. Supporting documents submitted (OPTIONAL)

- ☒ Map indicating the location of the project/programme
- ☒ Diagram of the theory of change
- ☐ Economic and financial model with key assumptions and potential stressed scenarios
- ☐ Pre-feasibility study
- ☐ Evaluation report of previous project
- ☒ Results of environmental and social risk screening

[68] https://www.greenclimate.fund/documents/20182/466992/Readiness_proposals_-_Cook_Islands___MFEP___NDA_Strengthening.pdf/177c612d-2252-4256-9fca-de8e968b17a1

Self-awareness check boxes
Are you aware that the full Funding Proposal and Annexes will require these documents? Yes ☒ No ☐ • Feasibility Study • Environmental and social impact assessment or environmental and social management framework • Stakeholder consultations at national and project level implementation including with indigenous people if relevant • Gender assessment and action plan • Operations and maintenance plan if relevant • Loan or grant operation manual as appropriate • Co-financing commitment letters
Are you aware that a funding proposal from an accredited entity without a signed AMA will be reviewed but not sent to the Board for consideration? Yes ☒ No ☐